

Transportation Transformation

Building Complete Communities and a Zero-Emission Transportation System in BC

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By Patrick Condon, Eric Doherty, Kari Dow, Marc Lee and Gordon Price

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THE UNIVERSITY OF BRITISH COLUMBIA



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SUMMARY

Transportation Transformation

MOST BRITISH COLUMBIANS WANT TO SEE ACTION ON CLIMATE CHANGE.

Because two-fifths of BC's greenhouse gas emissions are from transportation, this means rethinking our reliance on cars and trucks that burn fossil fuels to move people and goods large distances every day.

Most people have trouble imagining what an alternative system would look like. Not only do we rely on these forms of transportation, they have played a central role in our prosperity. Our society has grown and evolved around car-based mobility, culminating in the post-war dream of a single-family home in the suburbs.

We argue that a zero-emissions transportation system by 2040 is both desirable and achievable. It will rely heavily on renewable electric power, shifts toward electric vehicles, and expansion of public transit and cycling infrastructure. But for the transportation system to be as efficient and enjoyable to use as a private car, we will also need to develop *complete communities*.

Complete communities exist where people do not have to travel far to meet their day-to-day needs, making it possible to walk, bike and use high-quality public transit. Mobility may be supplemented by shared or private electric cars, but a large percentage of trips would not need them. These communities include a mix of housing types (including affordable housing options), decent jobs, public services, parks and other public spaces, and commercial districts with restaurants, offices and retail outlets.

This way of designing communities levels the playing field for seniors, youth, people with disabilities, and low-income families so they can live and move easily, even if they are not able to drive or cannot afford a car. It also means families are not forced to choose between long commutes by car and even longer commutes by transit. In addition to environmental benefits from reducing automobile emissions, they provide health benefits from greater walking and cycling.



We argue that a zero-emissions transportation system by 2040 is both desirable and achievable. It will rely heavily on renewable electric power, shifts toward electric vehicles, and expansion of public transit and cycling infrastructure.

While complete communities offer a new vision of transportation and urban design, changing land uses can be a slow process. The three decades between today and 2040 are a relatively short period of time. Large new investments in alternative transportation infrastructure must support the development of complete communities, as streetcars and trains shaped pre-automobile neighbourhoods a century ago. The need for new housing for a growing and aging population also provides an opportunity for redevelopment plans that reinforce complete communities.

Complete communities are equally amenable to large urban areas, suburbs and small towns, though each will have its own particular needs and challenges. We outline key strategies to drive the transition, based on the following objectives:

- Shorten the average trip length for all modes of transportation;
- Shift auto trips to more efficient modes, such as bike trips or public transit;
- Switch to clean fuels, primarily zero-emission electricity;
- Make transportation connections seamless; and
- Integrate actions to maximize other benefits (such as improved health and safety).



LARGE URBAN CENTRES: BUILDING ON THE MOMENTUM

The City of Vancouver, key zones in other Metro Vancouver municipalities, and central Victoria are already moving toward low-carbon, efficient transportation systems. The focus should be on accelerating and expanding these projects.

The City of Vancouver, key zones in other Metro Vancouver municipalities, and central Victoria are already moving toward low-carbon, efficient transportation systems. The focus should be on accelerating and expanding these projects.

- **Expand transit capacity and infrastructure**—High-quality, affordable public transit acts as a catalyst for transit-oriented development, where residents tend to own fewer vehicles, drive less and rely more on alternative modes. Public transit networks can be improved quickly and affordably using light rail and trolley buses.
- **Repurpose road and parking space for public transit and bicycles**—If we steadily reallocate space to walking, biking and public transit, these modes will become more attractive. Buses and light rail using dedicated lanes can move faster through traffic than cars. Similarly, separated bike lanes can create faster and safer pathways for riders, making cycling a more attractive option.
- **Make driving more expensive and transit more affordable**—To increase the cost of driving we should focus more on increasing the direct, out-of-pocket costs of taking a trip, and less on annual costs like insurance and maintenance. Distance-based auto insurance, carbon taxes and increased parking prices, in combination with low transit fares, are key parts of a pricing strategy.
- **Develop affordable housing as part of complete communities**—Affordable housing must be woven into the fabric of urban spaces, not left to the suburbs. Zoning bylaws can ensure that a certain percentage of new units are affordable. Strategic public sector investments can also accelerate change, including social housing, long-term care for seniors, libraries, and community healthcare centres.



Under the transportation transformation, car-dependent neighbourhoods would evolve to become complete communities, with goods and services within walking distance, zero-emission transportation alternatives, and affordable housing.

NORTH VANCOUVER VISUALIZATION COURTESY JON LAURENZ, UBC-CALP

RETROFITTING THE SUBURBS

The large suburban areas of Metro Vancouver and Greater Victoria, and mid-sized cities like Cranbrook and Kelowna that have suburban-like development patterns, will require more than just expanded public transit in order to be sustainable.

- **Redevelop main streets and neighbourhood/city centres**—New developments should emphasize getting more people living in closer proximity to main streets and transit hubs, accompanied by a greater mix of nearby services, retail spaces and office spaces—all of which would greatly enhance the range of jobs close to where people live. The redevelopment of single-purpose shopping malls into mixed-use neighbourhood centres also presents a tremendous opportunity.
- **Create transit networks**—Whatever the specific modes of transportation—such as metros, light-rail trams, and trolley buses—zero-emission technology deployed in effective networks can greatly enhance service quality and efficiency. Transit investments should emphasize the development of a *frequent transit network*, where more regular service facilitates ease of movement for short- and medium-distance trips (rather than primarily for feeding long-distance trips).
- **Give priority to more efficient, low-carbon modes**—Transit lanes and traffic signal priority, combined with bike lanes and sidewalks, can make these modes safer, faster and therefore more attractive. The conversion of parking space into residential and commercial space is a major ingredient in support of new complete communities.

SMALLER COMMUNITIES AND RURAL AREAS

Rural areas and small towns are extremely difficult to serve with conventional transit, because people are so widely dispersed. Many of the lowest-income households in BC are in rural areas, including First Nations people living on reserves. Unlike urban centres and suburbs, many rural communities are not growing, but their populations are aging, and need more accessible transit options and a greater concentration of public services, retail outlets and other amenities nearby.



Unlike urban centres and suburbs, rural communities are not growing, but their populations are aging, and need more accessible transit options and a greater concentration of public services, retail outlets and other amenities nearby.

- **Redevelop new main streets and town centres**—Development strategies should aim to recreate town centres that reduce the distance between housing, services and jobs. Higher-density housing along the main routes into town could replace, over time, what currently tends to be highway-oriented commercial uses. Public sector investments could serve to anchor residential, public, and commercial services in the centres of many small towns instead of in a few large regional centres.
- **Expand regional transit options**—Private electric vehicles will be a major strategy for lowering GHG emissions in rural areas. However, investments in improving low-carbon mobility options, including affordable electric passenger rail and bus services, would facilitate reduced automobile use for longer trips by both urban and rural residents.
- **Seek innovative alternatives**—New ways to provide lower emission transportation are needed to reflect the unique situation of each community, and to a large extent these ideas must come from local residents themselves. Local adaptation to higher fuel prices is a key point where communities can be engaged to develop plans that increase resilience to external shocks.

MOVING FREIGHT

Greenhouse gas emissions from freight transportation are estimated at anywhere from one-third to one-half of total transportation emissions. Movement of freight by truck in BC has grown much more than movement by rail over the past couple of decades.

- **Reduce, reuse, recycle and re-localize**—Reducing freight shipment must ultimately be linked to reductions in wasteful production and consumption of disposable products, and a switch to “closed-loop” production systems that re-use, re-manufacture and recycle waste products. Support for BC agriculture and manufacturing for local consumption is needed to reduce the overall distances that food and goods travel.
- **Pursue clean energy and more efficient alternatives**—Switching to clean energy sources may be quicker and more cost-effective for freight than passenger transport since electric trains are less expensive to buy and operate than diesel. Many countries are rapidly electrifying their rail networks. Intermodal freight systems (using standardized containers across different transportation modes) have a long history in BC, and need to be optimized to ensure that goods move by low-carbon modes, such as rail and short sea shipping, until near their final destination.

DIALOGUE AND DOLLARS

An aggressive approach to the transportation transformation should include a rapid start: \$2 billion per year—about 1% of BC's GDP—in new investment for 10 years. Maximizing local access to zero-emissions transit, designed more for short- and medium-length trips within complete communities, must be a top criteria for allocating funds.

Making this transportation plan happen will ultimately come down to two things: political will and leadership, backed by commitments to greatly increase the funding of transit and transportation infrastructure; and, public acceptance and buy-in to the details of plans at a very local level.

- **Involve the public in creating solutions**—Public participation in decision-making will be essential to making the transition toward a zero-emission transportation system. And meaningful participation is impossible without an informed citizenry with a basic understanding of the options available. Going beyond standard consultation exercises should include the use of deliberative, visualization processes (charettes).
- **Reallocate funds**—A substantial proportion of needed funding must be reallocated from carbon-intensive infrastructure spending on highway, bridge, deep-sea port and airport expansions. It would be extremely difficult to create a zero-emission transportation system in only 30 years without this shift in investment.
- **Innovative new financing**—An increase in transit capacity and other low-carbon infrastructure requires either increases in funding from senior levels of government, increases in existing taxes, or new sources of revenue at the regional level. BC's carbon tax would appear to be an ideal revenue source. A new financing model should also seek to capture some of the lift in property values arising from transit investments and up-zoning, on and near main streets and transit nodes.

Responsibility for reductions in GHG emissions cannot, for both moral and political reasons, fall inappropriately on the poor, on the old, and on working families. The emergence of automobile-dominated communities and regions has created burdens for these groups. Strategies must be found that simultaneously reduce social exclusion and negative health outcomes.

Our 30-year initiative is aimed at transforming communities of all sizes, and how people and goods move across the province. This rapid evolution must increase affordable housing choices, availability of jobs, transportation options, and, ultimately, quality of life.

A zero-emission transportation system is both plausible and achievable with existing and near-term technologies. And if we start right away, and others do the same in other parts of the world, we can transform our transportation system in a way that vastly improves mobility, health, communities, and social justice.



Public participation in decision-making will be essential to making the transition toward a zero-emission transportation system. And meaningful participation is impossible without an informed citizenry with a basic understanding of the options available.

PHOTO COURTESY HB LANARC

Introduction

We outline a strategic framework that aims to achieve a target of zero fossil fuels in transportation by 2040—equivalent to the target set by the Greenest City Action Team for the City of Vancouver.

THIS PAPER CONTEMPLATES A VISION for transportation in BC that sees the province dramatically reduce, and eventually eliminate, the greenhouse gas emissions attributable to transportation. We outline a strategic framework that aims to achieve a target of zero fossil fuels in transportation by 2040—equivalent to the target set by the Greenest City Action Team for the City of Vancouver.

More importantly, we wrestle with the key equity and social justice issues that arise in such an aggressive rethink of transportation. In particular, we articulate policies to facilitate a smooth transition for already disadvantaged social groups (poor, disabled, working families, elderly, and marginalized groups), and to win over, rather than punish, the wide range of households who are dependent on cars for their mobility because they have “just played by the rules.” The challenges facing British Columbians living in rural parts of the province are greater than for urban areas, but not insurmountable.

A zero-emission transportation system by 2040 is both desirable and achievable, and will rely heavily on renewable electric power, shifts toward electric vehicles, and expansion of public transit. But a sustainable and equitable transportation future cannot be achieved by simply replacing all internal combustion engines with electric ones, or by replacing long commutes by car with equally long commutes by public transit. Deep reductions in emissions from transportation will also require substantial changes in land use patterns toward more compact and complete communities.

Complete communities exist where people do not have to travel far to meet their day-to-day needs, making it possible to walk, bike and use high-quality public transit. Mobility may be supplemented by shared or private electric cars, but a large percentage of trips would not need them. These communities include a mix of housing types (including affordable housing options), decent jobs, public services, parks and other public spaces, and commercial districts with restaurants, offices and retail outlets. This way of designing communities levels the playing field for seniors, youth, people with disabilities, and low-income families so they can live and move easily, even if they are not able to drive or cannot afford a car. It also means families are not forced to choose between long commutes by car and even longer commutes by transit. In addition to



environmental benefits from reducing automobile emissions, they provide health benefits from greater walking and cycling.

This vision is already nascent in some neighbourhoods in Vancouver, but also in smaller centres like Nelson. It speaks to how a dramatic reduction in automobile dependency can become a key element of climate justice. Not only does it mean fewer greenhouse gas emissions, but a smaller financial burden on households, less time spent in traffic, stronger communities, and more healthy and active lifestyles – all of which point to a better quality of life. Importantly, complete communities must be inclusive, mixed-income communities: affordable housing cannot be left to the urban fringe.

Our primary focus is on the movement of people over land, rather than by air or water (whether within BC or to/from other jurisdictions). And with the vast majority of people (and emissions) on the south coast of BC, our analysis is weighted toward urban and suburban transportation. We also review the major steps in reducing emissions from goods movement. A large share of BC's transportation emissions stem from the movement of freight, such as the raw commodities BC exports and goods imported for sale to consumers.

Complete communities exist where people do not have to travel far to meet their day-to-day needs, making it possible to walk, bike and use high-quality public transit. In addition to environmental benefits from reducing automobile emissions, they provide health benefits from increased walking and cycling.

Auto-Dependency and Transportation Justice

How we rethink transportation and what that translates to on the ground will have significant implications for equity and social justice. Central to this is the tension between automobiles and other modes of travel, and the overwhelming dominance of the car as a “necessity” of modern life.

BURNING FOSSIL FUELS IS THE SINGLE-LARGEST CONTRIBUTOR TO GLOBAL CLIMATE CHANGE. In BC, two-fifths of provincial greenhouse gas (GHG) emissions come directly from transportation. Between 1990 and 2007 transportation emissions increased by 35%, compared to population growth of 29%.¹ Although there have been some improvements in fuel efficiency, these have for the most part been offset by increases in vehicle size so that the energy intensity of on-road passenger transportation has changed little since 1990. The main reason for the increase in transportation emissions is an increase in the number of vehicles and the amount of travel.²

Any meaningful climate action plan must drastically reduce mobility-related emissions if it has any hope of being successful. But what does that mean for the quality of life of many British Columbians? How we rethink transportation and what that translates to on the ground will have significant implications for equity and social justice. Central to this question is the tension between automobiles and other modes of travel, and the overwhelming dominance of the car as a “necessity” of modern life.

THE ERA OF THE AUTOMOBILE

It was not always so. Many BC communities grew up around train stations and streetcar lines, creating a legacy of walkable communities and commercial streets of small businesses.³ Others developed around transit lines and railway stations that are no longer in operation, such as the central area of the City of Langley, which developed around an interurban electric railway station.

1 BC Ministry of Environment, *Summary of GHG Emissions, 1990—2007, 2009*.

2 BC Ministry of Environment, *Factors Influencing Changes in Emissions, 2009*.

3 Much of the next paragraphs draw on Gordon Price’s history of the automobile, based on Peter Norton’s framework of “motordom,” the collection of economic interests with a stake in the expansion of the automobile. In particular: <http://communities.canada.com/vancouverun/blogs/communityofinterest/archive/2009/07/27/motordom-defined.aspx> and www.sfu.ca/aq/archives/April_09/features/vancouverism_print.html.



In just a few decades, Vancouver's golden age of the streetcar was lost. People wanted what the automobile delivered: freedom and mobility. As a result, the very idea of the city was reconstructed—a new vision designed for the car grabbed the popular imagination.

PHOTOS COURTESY VANCOUVER HISTORICAL SOCIETY

Into this mix came the automobile: a new form of transportation that clashed with old uses. The automobile was not universally welcomed. In early days, it was a noisy luxury that occasionally killed people. Pedestrians who presumed an equal right to the road, crossing wherever and whenever they wanted, found that conflict could be deadly. Even civic engineers argued that automobiles took up too much space for the number of people they carried.

But people wanted what the automobile delivered: freedom and mobility. As a result, the very idea of the city was reconstructed—a new vision designed for the car grabbed the popular imagination. Those who had an interest in selling and driving cars sought to get the other users out of the way. Roads would have to be designated for auto use only unless otherwise indicated. People could not simply cross the street wherever they chose; they became “jaywalkers.”

The automobile moved into its golden age after World War II, with a transformational impact on cities and land use. The core task of engineers was to provide enough space for the car in order to avoid congestion. In Los Angeles, for instance, the Major Traffic Street Plan of 1924 led to the widening of arterial roads in a crosstown grid; little attention or money was devoted to the transit system. Vancouver in 1926 undertook a similar initiative by commissioning planner Harland Bartholomew (who had helped with the Los Angeles plan), which became the basis for street expansion through to the 1980s.

By the 1950s, suburban developments embodied a post-war dream built on insured mortgages, cheap land and even cheaper energy. The combination of low population densities and widely separated land uses along with the high-speed infrastructure of arterial roads and freeways, with abundant free parking, succeeded beyond its expectations. So pervasive was car-based mobility that many people saw no alternative.

Today, this development pattern continues to be reinforced by more affordable real estate far from the central city. The ideal of a single-family home with a large backyard remains, even if typically accompanied by long commutes to work, dependence on driving to purchase necessities like food, and growing greenhouse gas emissions. Large public investments to expand road capacity in the name of reducing congestion continue to underwrite this dream.

Rising fuel prices may be a wake-up call, with the peaking of conventional oil supplies and rising demand worldwide conspiring to expose the massive amounts of energy required to support suburban development patterns.⁴ A rapid onset of higher prices would be a harsh reckoning for households dependent on their cars, and whose family budgets are already maxed out. The coming decades could well see a wild rollercoaster ride of oil price spikes, with devastating effects on low- and middle-income households.⁵ The biggest danger, as Anthony Perl and Richard Gilbert argue in their book, *Transport Revolutions*, is that we will be caught flat-footed by unfolding events due to lack of preparation.⁶

TRANSPORTATION AND JUSTICE



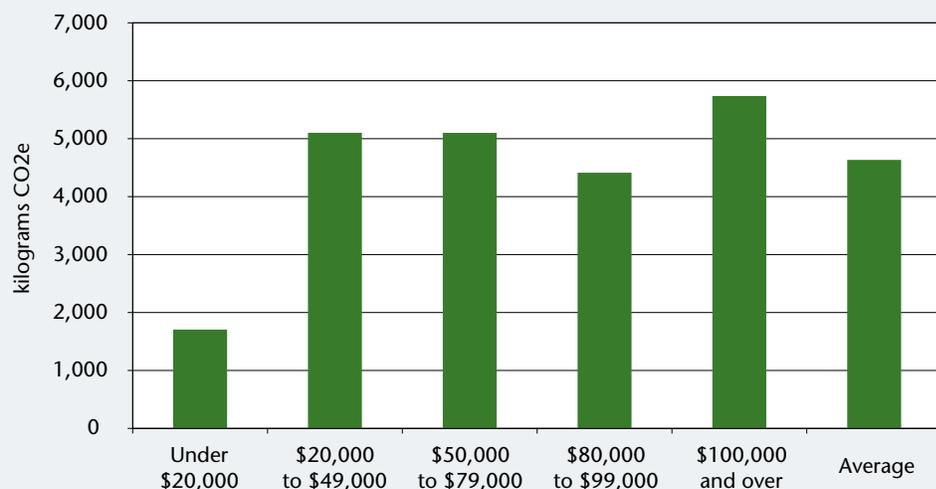
Although they may be part of the solution, a new generation of electric vehicles does little to address the mobility needs of those who cannot afford them, or those who do not or cannot drive.

A widely promoted transportation solution to climate change and peak oil is the electric car. But such a shift would fail the test of equity and justice. Large swaths of the population never experienced affluence in the era of cheap oil, and may now disproportionately bear the costs of expensive oil. Low-income households tend not to own cars, and acquiring a vehicle represents a major step up in standard of living. In a society characterized by growing inequality of incomes, greater auto dependency inevitably fosters social exclusion, defined as “constraints that prevent people from participating adequately in society, including education, employment, public services and activities.”⁷

On average, Canadian households with incomes under \$20,000 produce only about one-third the GHG emissions from private vehicles of those with higher incomes (Figure 1). These households represent about 15% of the population, but only 6% of GHG emissions. At the very top (incomes above \$100,000), per capita emissions rise due to multiple cars driven longer distances. While BC per capita emissions are slightly less than the national average, the relationship between income and auto use is clear.

- 4 The International Energy Association, an organization long known for denying “peak oil,” now cites 2006 as the year that world production peaked (World Energy Outlook 2010). The financial cost and environmental impact of extracting and processing each barrel of oil is also expected to greatly increase over time, as seen with the shift in Canada from pumping conventional oil from the ground to mining tar sands bitumen and then converting it to synthetic crude oil.
- 5 Jeff Rubin, a former Bay Street economist and financial market analyst, predicts that \$200 per barrel oil is likely in the next economic cycle, and \$300 to \$400 a barrel oil in the cycle after that. The implications include the possibility of price hikes for food, fuel and other necessities coincident with the lowered incomes and elevated unemployment that characterize global economic downturns. Jeff Rubin, *Why Your World is About to Get a Whole Lot Smaller* (Random House of Canada, 2009).
- 6 Richard Gilbert and Anthony Perl, *Transport Revolutions: Moving People and Freight Without Oil* (second edition, New Society Publishers, 2010).
- 7 Todd Litman, *Evaluating Transportation Equity: Guidance For Incorporating Distributional Impacts in Transportation Planning* (Victoria Transport Policy Institute, 2007) www.vtppi.org/equity.pdf

Figure 1: GHG Emissions from Private Vehicle Operation, by Income Group, Canada, 2007



Source: Statistics Canada 16-001-M, No. 12, www.statcan.gc.ca/pub/16-001-m/2010012/t004-eng.htm

Demographically, there are large groups of people who are disadvantaged in terms of mobility options, or for whom personal safety/security (or perceptions of) is a limitation on mobility. This includes women, children and youth, seniors, and people with disabilities. A new generation of electric vehicles does little to address the mobility needs of those who do not or cannot drive.

Transportation and land use patterns shape auto dependency. In larger urban areas, affordable housing is more likely to be located in automobile-dependent suburban areas. Public transit options, if available at all, often require much more time spent commuting. Many low-wage occupations require travel at off-peak times when transit is infrequent or unavailable. This highlights the need for structural changes in how we live, work and play—and the distances between those locales—that fundamentally level the playing field for mobility-disadvantaged populations.

Moreover, the negative impacts of automobile infrastructure tend to fall heavier on lower income people, while the benefits accrue to those who can easily afford one or more cars.⁸ Having a freeway next door is not a benefit to someone who does not own a vehicle; it is more likely to be a detriment to health through reduced air quality, increased noise and traffic danger. Rather than providing mobility, freeways are barriers to free movement for non-drivers and even for many transit trips.

An ever-greater commitment of time and money devoted to travel and to the maintenance of a personal car is neither sustainable for families nor sustainable for regions. At its worst, in North American metropolitan areas such as Los Angeles and Atlanta, the extreme auto dependence has led to incurable transportation gridlock, and a crushing annual cost for personal transportation. Moreover, a greater prevalence of low income among certain demographic groups mean that race, gender, age, disability, and immigration status are important dimensions of transportation justice.



Many low-wage occupations require travel at off-peak times when transit is infrequent or unavailable.

8 For evidence linking proximity to freeways with higher incidence of asthma and other respiratory diseases, see C-H. C. Bae, G. Sandlin, A. Bassok and S. Kim, “The exposure of disadvantaged populations in freeway air-pollution sheds: a case study of the Seattle and Portland regions” in *Environment and Planning B: Planning and Design* (2007), 34(1): 154-170, www.envplan.com/abstract.cgi?id=b32124

Complete communities will have environmental benefits from reducing transportation emissions and health benefits from more active modes of transportation such as walking and cycling (with public transit as an extension of these).



To address fundamental issues of inequity and social injustice, transportation planning must therefore go beyond efforts to reduce emissions through switching to cleaner technologies. At a society-wide level, policies to encourage a more equitable distribution of income (whether through the labour market or via the tax and transfer system) would greatly ameliorate the inequality issues in transition to a zero-carbon transportation system. While a full discussion of the relationship between greater equality and reducing GHG emissions is beyond the scope of this report, there is good reason to believe that lower levels of inequality would have beneficial social and health outcomes in addition to greater transportation justice.⁹

Alone, an auto electrification strategy would fail the test of social justice by perpetuating the auto-dependence of many disadvantaged families and individuals. In the next section we outline an alternative vision of compact communities that remove the need to own a car, freeing up the more than \$6,000 average annual cost to own and operate a car.¹⁰ These benefits are rarely counted when the costs of new infrastructure or public transit investments are considered.

Complete communities will have environmental benefits from reducing transportation emissions and health benefits from more active modes of transportation such as walking and cycling (with public transit as an extension of these), but they are also more profoundly just because they would fundamentally level the playing field, providing a greater benefit relative to income for low-income households than to the well-off. Even if car-sharing and taxis are used for occasional trips when walking, biking and transit are not options, the savings for households from not owning a car are a substantial financial benefit of reducing auto dependence.

9 For example, Richard Wildinon and Kate Pickett, *The Spirit Level: Why Equality is Better for Everyone*, (Penguin, 2010).

10 This estimate is on the low end of the scale. See J. Cato, "Consumer Update: Owning a car isn't cheap" in *Canadian Driver*, June 20, 2005, www.canadiandriver.com/2005/06/20/consumer-update-owning-a-car-isnt-cheap.htm

Solutions for a Transportation Transformation

IF AUTO-DEPENDENT URBAN PLANNING BASED ON THE ASSUMPTION of limitless supplies of cheap fossil fuels has negative environmental and social consequences, a sustainable transportation system is anchored in the development of more compact, affordable, and complete communities that reverse auto dependence. Co-ordinated transportation and land use planning will be needed to develop communities with a mix of uses, including good and plentiful jobs, commercial districts and public services, a range of housing types, and natural areas and parks.¹¹ With thoughtful urban planning, people will make green choices, not necessarily through feelings of moral obligation, but because the right choice is convenient and affordable.

BC may be better prepared for a transition away from automobile dependence than many jurisdictions. Across the province, sprawl has been constrained by mountainous terrain and the Agricultural Land Reserve. About half the population of BC lives in Metro Vancouver and about two-thirds in the South Coastal region; rural populations are less population dense but generally located along a handful of major transport corridors.

A general policy consensus favouring the creation of complete communities and alternatives to the car is embodied in Metro Vancouver region's *Livable Region Strategic Plan* and Translink's *Transport 2040* plan. However, there is a dichotomy between long-run vision and short- to medium-term actions to realize that vision. Recent changes in transportation investment and land use controls have led some to fear that a new wave of sprawling, auto-dependent development may be unleashed.

While complete communities offer a new vision of transportation and urban design, changing land uses can be a slow process. The three decades between today and 2040 are a relatively short period of time for this transformation. Current land use patterns in key locations may not economically support extension of public transit, but without transit options it may be difficult to change land use patterns quickly—a “chicken and egg” problem.

With thoughtful urban planning, people will make green choices, not necessarily through feelings of moral obligation, but because the right choice is convenient and affordable.

¹¹ Design Centre for Sustainability, *Sustainability by Design: A Vision for a Region of 4 Million*, 2006.

Reducing carbon emissions in a just manner requires that we begin aggressively investing in smart transportation systems now, in advance of when major land use changes can be realized. Transit investments now can create the conditions for the evolutionary development of compact and complete communities.

We propose that BC's transportation system of the future be:

- *Affordable for households with low to moderate incomes;*
- *Environmentally sustainable—low to zero-carbon on an operating basis;*
- *Secure—less vulnerable to external shocks, such as disruption in oil supply;*
- *Cost-effective in its use of public resources;*
- *Inclusive and accessible for people of different ages and physical abilities; and*
- *Driven by engaging the public in decision-making.*

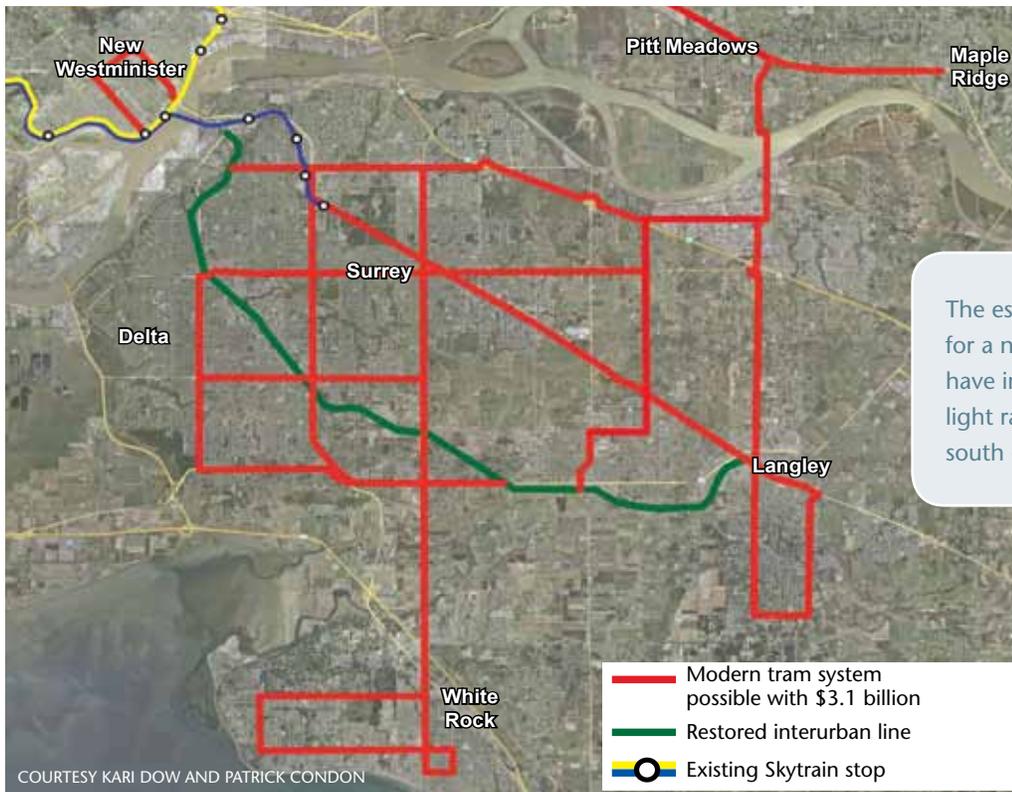
Reducing carbon emissions in a just manner requires that we begin aggressively investing in smart transportation systems now, in advance of when major land use changes can be realized.

TRANSPORTATION TRANSFORMATION OBJECTIVES

Consistent with the vision and principles described above, we set out the following key objectives as a strategic framework, then develop actions in the next sections for each of large urban areas, suburbs, and small towns and rural areas.

- **Objective 1: Shorten average trip length, no matter the mode**—For decades the average distance that citizens travel every day has been increasing. Reducing the average distance travelled, by whatever mode of travel, will thus free up time and reduce energy demand. In complete communities, where most everyday needs are close at hand, it is realistic to expect as many as half of all trips to be walk or bike trips (including electric bikes, wheelchairs, and electric mobility scooters)—a pattern seen in some of BC's more complete urban districts already.¹² Mobility is extended and supplemented by frequent public transit, taxis and car-sharing to create choices that lead to a much-reduced dependence on the personal automobile.
- **Objective 2: Shift auto trips to more efficient modes**—Much greater use of walking, biking, transit and car-sharing is the objective, corresponding to less auto dependence. This means a reallocation of road and parking space to other modes. "Extreme commuting" in single-occupant vehicles would become the exception. In urban areas, transit would be more economical, faster and more convenient than driving. Transit lanes and signal priority would make it rare for transit vehicles to be slowed by automobile traffic. These preferred options would be reinforced by policies and investments that change the relative costs (financial and time) associated with cars versus different modes.

¹² For example, in 2006, walk and bike had a combined journey-to-work mode share of 41% in downtown Vancouver. City of Vancouver, *Cycling in Vancouver: Looking Forward to 2010/2011*, Administrative report to Standing Committee on Transportation and Traffic, April 30, 2010.



- **Objective 3: Switch to clean fuels**—The transportation system of the future will be primarily based on clean electricity, plus some limited use of biofuels and hydrogen fuel cells for certain applications. Electric trains, trams, and trolley buses have provided cost-effective transportation for about a century. Now, manufacturers are developing fully electric vehicles with new types of batteries, and utilities are contemplating the infrastructure needs for such vehicles.
- **Objective 4: Make transportation connections seamless**—Information systems that allow users to easily and quickly make transfers must be pervasive throughout the transit network (and between core transit and services like bike sharing). Information technology has great potential to provide transit users and transit authorities greatly improved system convenience and function (e.g. shorter wait times between trip segments). Other design and technical solutions that would increase convenience include signal priority systems and dedicated transit lanes on arterial streets.
- **Objective 5: Integrate actions to maximize co-benefits**—Done right, this transformation will lead to better air quality, greater social cohesion, stronger communities, and more healthy and active lifestyles.¹³ Personal safety and security are also enhanced by shorter travel distances and higher-density communities (as urban planning guru Jane Jacobs pointed out, more “eyes on the street” leads to safer streets).

13 Andrew Devlin, Lawrence Frank and Josh vanLook, *Physical Activity and Transportation Benefits of Walkable Approaches to Community Design in British Columbia*, prepared for the BC Recreation and Park Association, January 2009; L.D. Frank, J. Kerr, J. Sallis, R. Miles and J. Chapman, “A hierarchy of sociodemographic and environmental correlates of walking and obesity” *Preventative Medicine* (2008), 47(2): 172–178; L.D. Frank and S. Kavage, “Urban planning and public health: A story of separation and reconnection,” *Journal of Public Health Management Practice* (2008), 14(3): 214–220.

ENERGY IN A ZERO CARBON TRANSPORTATION SYSTEM

Most transportation is currently powered by fossil fuels because of their high energy density and portability—Metro Vancouver’s trolley bus fleet and Skytrain system being notable exceptions. A number of initiatives are underway in BC and other jurisdictions that aim to reduce emissions from motor fuels through tailpipe emission standards, fuel mixing with biofuels, smaller and lighter vehicles, and hybrid automobiles. Each of these approaches has the capacity to reduce emissions and oil consumption in some circumstances, but none of them will be adequate for a long-run transportation system with near-zero emissions.



Zero-emission vehicles will still be responsible for GHGs related to their manufacture, maintenance and repair, and infrastructure such as roads and parking facilities. Only if all of these activities can be powered by clean energy sources and process emissions are eliminated will electric cars be truly zero-emission vehicles.

Fossil fuels used in the bulk of BC’s transportation must eventually be replaced by clean sources of power. The most likely candidate for this is electricity, used in both grid-tied vehicles, such as trolley buses, and battery electric vehicles. As much of BC’s electricity comes from existing renewable, low-carbon hydroelectric dams, the prospect of electrifying our transportation system is much greater than in regions still dependent on coal, oil, or natural gas burning power plants.

However, adding new renewable generation capacity is expensive and has other social and environmental consequences. Reducing the need for travel and shifting to more efficient modes is essential. BC Hydro estimates that conversion of all passenger vehicles to electric would require an increase of 9,000 GWh per year, or 15% above current electricity generation. This is twice the capacity of the proposed Site C dam.¹⁴ There would certainly be environmental costs to this scale of increased electricity generation (unless fully offset by reductions from households, industry or government).

Moreover, zero-emission vehicles will still be responsible for greenhouse gas emissions related to their manufacture, maintenance and repair, and infrastructure such as roads and parking facilities (i.e. lifecycle emissions).¹⁵ Only if all of these activities can be powered by clean energy sources and process emissions are eliminated will electric cars be truly zero-emission vehicles.¹⁶

In addition to electricity, there may be some limited potential for biofuels and hydrogen as alternative fuel sources, but each comes with a number of caveats and concerns. Caution should be applied in these areas, as they are likely to be appropriate only in certain niche applications.

Biofuels, or fuels derived from organic matter, have been promoted as an alternative to fossil fuels, but have already proven problematic due to conflicts with other potential land uses, in particular agricultural land needed for food production. Burning food in vehicles raises obvious social justice concerns when many people have difficulty affording adequate nutrition. In 2007, when global energy prices rose significantly, the value of corn as an energy source skyrocketed.¹⁷ This in turn had impacts on the price of corn for the food industry and for feeding livestock, such as pigs and chickens. Clearing forests to grow biofuels can also lead to land use emissions as high or higher than the fossil fuels replaced.¹⁸

14 BC Hydro, *2008 Long-Term Acquisition Plan*; BC Hydro, *What is Site C?* (2010), www.bchydro.com/planning_regulatory/site_c/site_c_an_option/what_is_site_c.html

15 Lifecycle emissions are typically about one-third higher than tailpipe emissions. See Luc Gagnon, *Greenhouse Gas Emissions from Transportation Options* (Hydro Quebec, 2006) www.hydroquebec.com/sustainable-development/documentation/pdf/options_energetiques/transport_en_2006.pdf

16 The process of making some products, including cement and aluminum, releases GHG emissions through chemical processes not related to burning fossil fuels.

17 Nils Blythe, “Biofuels Demand Makes Food Expensive,” *BBC News*, March 23, 2007.

18 Timothy Searchiner, Ralph Heimlich, R.A. Houghton, Fenxia Dong, Amani Elobeid, Jacinto Fabiosa, Simla Tokgoz, Dermot Hayes and Tun-Hsiang Yu, “Use of U.S. Cropland for Bio-Fuels Increases Greenhouse Gases through Emissions from Land-use Change” *Science* (2008), 319(5867):1238.

While hydrogen has often been publicized as the fuel of the future, it also faces challenges in terms of the infrastructure needed to support its use in vehicles. More important, however, is the low energy efficiency associated with its use. Hydrogen must be produced from processing fossil fuels (which produces CO₂) or from electrolysis of water. For the latter, using clean electricity to make hydrogen, which is then converted back into electricity to power a vehicle, can lead to a loss of three quarters of the initial energy inputs.¹⁹

For long-haul bus and truck transportation, electric vehicles may require innovative new technologies such as large interchangeable battery packs, hydrogen fuel cells or direct connections to the electricity grid through overhead trolley wires on major highways.²⁰ Because of this, the well-proven and cost-effective electric train may become the dominant mode of longer distance freight movement and passenger travel, a trend that is already well under way in Europe on its largely electric railway network.²¹

APPLYING THE FRAMEWORK TO BC: LESSONS FROM THE 2010 OLYMPICS

During the 2010 Winter Olympics Vancouver engaged in one of the most fascinating experiments in transportation planning ever conducted in North America. Previously unthinkable measures were undertaken to keep downtown Vancouver and the many Olympics venues from being overwhelmed by gridlock. Vast swaths of parking disappeared and several major arteries into the downtown core were closed down completely. In place of the status quo of roads and parking for cars, the city got a massive increase in transit service, pedestrian thoroughfares, and even valet bike parking facilities. In the end, more people ended up walking the streets, crowds festively draped in Canadian colours, than anyone had thought possible.

While the Olympics was a unique and high-profile event of limited duration, the experience suggests that if the funding, and perhaps more importantly, the political will, are available, major shifts in behaviour can happen with minimal disturbance and public outcry. Both the financial and time costs of taking a trip, door to door, shape the choice of travel mode, with a secondary but still important consideration being the quality of the experience.

Just as important as having the funding and political will to implement change is having an understanding of the unique challenges and opportunities inherent to communities of different sizes. The way strategies are applied in one context may differ significantly in others. The following section explores how just and equitable transportation strategies can be applied in large urban centres, suburban districts, and small cities and rural areas.



During the Olympics, vast swaths of parking disappeared and several major arteries into the downtown core were closed down completely. While of limited duration, the experience suggests that major shifts in behaviour can happen with minimal disturbance and public outcry.

19 Ulf Bossel, "Does a Hydrogen Economy Make Sense?" in *Proceedings of the IEEE*, 94(10), October 2006; also, J. Wise, "The Truth About Hydrogen," *Popular Mechanics*, November 2006, www.popularmechanics.com/technology/industry/4199381.html

20 Gilbert and Perl, *supra* note 6.

21 Department for Transport, *Britain's Transport Infrastructure: Rail Electrification*, 2009, <http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/rail/pi/rail-electrification.pdf>

Large Urban Centres: Building on the Momentum

Movement toward low-carbon, efficient transportation systems is already happening, and strategies should focus on how they can be accelerated and extended to encompass a greater geographical area.

THE VISION OF A ZERO-EMISSIONS TRANSPORTATION SYSTEM is already embryonic in much of the City of Vancouver, key zones in other Metro Vancouver municipalities (for example, North Burnaby and central New Westminster), and central Victoria. These areas are characterized by high population densities, a wide range of employment opportunities, a mix of uses on main streets, and a robust (if underfunded) transit system. There is a regular grid pattern to city streets, and higher density development occurring in proximity to main arterial roads and transit hubs. Thanks to public opposition to freeway building proposals in the 1970s, the City of Vancouver is the largest central city in any North America metropolitan area without a freeway.

Many of these higher-density development patterns were established by the historical streetcar routes of the early 20th century. As in our vision for the future, these transportation routes were built out as an inducement for people to move into nearby housing. In these places, movement toward low-carbon, efficient transportation systems is already happening, and strategies should focus on how they can be accelerated and extended to encompass a greater geographical area. Over a longer period of time, such land use changes can drive a significant reduction in the need to own and operate a car, and in the average distance travelled per trip.

STRATEGY 1: EXPAND TRANSIT CAPACITY AND INFRASTRUCTURE

High quality public transit acts as a catalyst for the type of “transit oriented” development where residents tend to own fewer vehicles, drive less, and rely more on alternative modes. In Metro Vancouver, trolley buses already provide low-carbon, non-polluting public transit to many residents in the region. Expanding this system by adding more buses is achievable very quickly.

Another option is to rebuild and expand historic streetcar routes. Streetcars differ from trolley-buses in that they run on rail rather than wheels so they are more energy efficient, have higher vehicle capacity and durability, and offer a smoother ride, which is particularly important for the



In complete communities, people don't have to travel far to meet day-to-day needs, making it possible to walk, bike and use high-quality public transit. These communities include a mix of housing types, decent jobs, public services, parks and other public spaces, and commercial districts with restaurants, offices and retail outlets.

KINGSWAY VISUALIZATION COURTESY DAVID FLANDERS, UBC-CALP

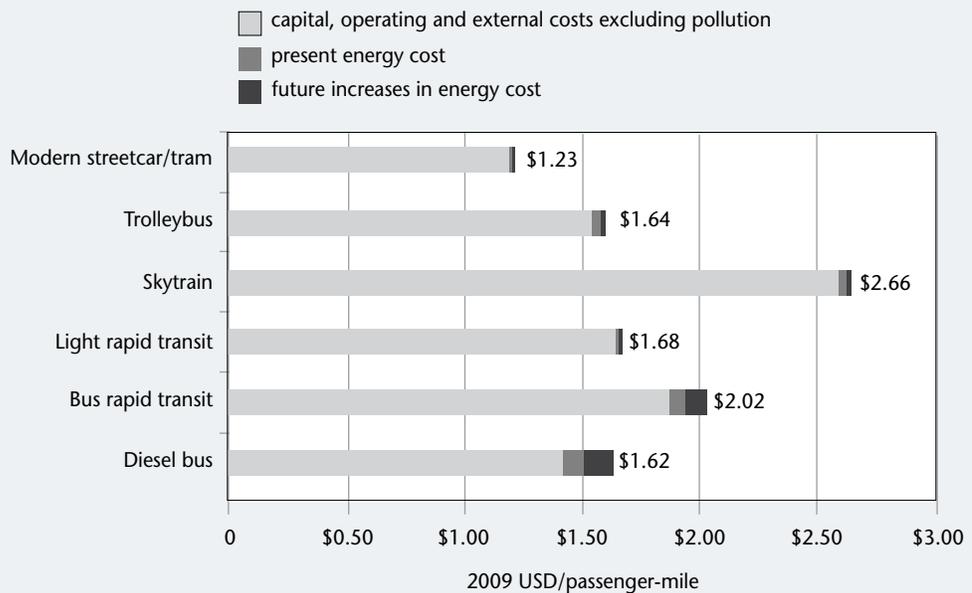
elderly and people with disabilities. They require a larger initial capital investment than buses but offer benefits in lower cost and emissions over the long term.²²

Alternatives such as Metro Vancouver's Skytrain system provide fast, frequent service but huge capital investments are needed to build the infrastructure. Given this great cost, it cannot be close to the homes of most potential users, so is best suited to key backbones for the transit system on a regional basis. Also important is that Skytrain requires vast amounts of carbon-intensive concrete used to build the infrastructure compared to other surface modes (although roadways are also extremely carbon-intensive).

Transportation infrastructure is a long-term investment, but we need to make big changes quickly. All costs and benefits need to be considered to find the most appropriate transportation mode given the need to eliminate emissions in only 30 years. A comparison of the estimated costs per passenger mile of different transit modes is shown below in Figure 2. Costs can vary widely so these figures should be used with caution, and they may understate benefits (leverage effects) associated with high-quality public transit investments as a catalyst for more compact, mixed use land use development.

²² The financial and environmental cost of installing tracks can vary greatly due to factors such as underground pipes, which sometimes must be relocated.

Figure 2: Typical Costs per Passenger Mile (excluding pollution)



Source: Patrick M. Condon and Kari Dow, *A Cost Comparison of Transportation Modes*, Sustainability by Design Foundation Research Bulletin No. 7, 2009.

An important component of this strategy is choosing public transit systems that are the most affordable and serve the greatest number of people. For example, moving one person one mile on Skytrain is more than double the cost of moving that same person on a tram.

Much of the transportation planning debates in recent years have surrounded expensive mega-projects, like the new Canada Line, the planned Evergreen and UBC Skytrain extensions, and the Gateway freeway scheme. These costs must be weighed against alternative expenditure options. For example, for the estimated cost of the UBC line, a web of light rail transit could be spun over the whole city of Vancouver,²³ whereas diverting the cost of the new Port Mann super-bridge and freeway widening to transit could create a light rail network servicing most of Surrey.²⁴

An important component of this strategy is choosing public transit systems that are the most affordable and serve the greatest number of people. For example, when the full costs of infrastructure, operation and maintenance are taken into account, moving one person one mile on Skytrain is more than double the cost of moving that same person on a tram.²⁵ Equally important is the efficiency and quality of transit service. This includes design features such as separated bus/tram lanes and other priority measures, prepaid fares (to reduce delays when picking up passengers), improved user information, and amenities such as on-board wireless internet.

In addition to expanding the network of transit vehicles it will be important to significantly improve stations as transportation hubs. As much as possible, bus and train stations should be attractive, integrated neighbourhood activity centres that include coffee shops, stores, public services, and

23 Patrick M. Condon, Sigrid Gruenberger and Marta Klaptocz, *The Case for the Tram: Learning from Portland* (Design Centre for Sustainability, 2008) www.sxd.sala.ubc.ca/8_research/sxd_FRB06_tram.pdf

24 Patrick M. Condon and Kari Dow, *One Port Mann Bridge or a Light Rail Network* (Design Centre for Sustainability, 2009) www.sxd.sala.ubc.ca/8_research/sxd_FRB08PortMann.pdf

25 Patrick M. Condon and Kari Dow, *Cost Comparison of Transportation Modes* (Sustainability by Design Foundational Research Bulletin, 2009). The current configuration of land use and transportation places a disproportionate burden on lower income households. Solutions to the transportation crisis must therefore also address issues of inequity and social injustice.

worksites. Stations should also serve as launching points for cycling options, including secure parking spaces and bike sharing services, as an extension of the transit network. In addition to expansion of bike-oriented lanes and infrastructure, bike sharing would greatly improve the range of transit options readily available to residents and visitors alike. Montreal's *bixi* bike-sharing program is a successful model that emphasizes short trips, with installations all over the city.

STRATEGY 2: REPURPOSE ROAD AND PARKING SPACE FOR PUBLIC TRANSIT AND BICYCLES

Vast amounts of urban space are dedicated to roads and parking spaces for cars—about one-quarter of the land area in the City of Vancouver.²⁶ By steadily reallocating this scarce public resource to walking, biking and public transit, these modes will become more attractive to people making decisions about their personal transportation. Creating urban areas where the quality of life for non-car owners is as high as for the people who own cars has the obvious social justice benefit of increasing the quality of life for people who already do not own cars for economic reasons or disability.

There is no reason for public transit vehicles to get stuck in traffic alongside private automobiles in most circumstances. Transit vehicles have to stop to pick up and drop off passengers, and many transit riders have to make at least one transfer per trip. If transit vehicles must compete for road space in the same lanes as general traffic, the private automobile will always provide the faster trip. This has equity dimensions, as noted by transportation researcher Todd Litman:

Current road design and management practices result in transit and rideshare passengers being delayed by traffic congestion equally with single occupant automobile passengers, although they require less road space per passenger-mile and so impose less congestion on other road users. ... Road Space Reallocation that favours non-motorized modes can increase horizontal equity by allowing people who impose lower costs (road space, parking requirements, crash risk and environmental impacts) to have a greater share of public resources than they do now.²⁷

Traffic congestion for private automobiles, accompanied with exclusive lanes and signal priority for transit, can reverse the existing hierarchy—bus riders get to zoom past drivers of single passenger automobiles. Thus, the reward for more environmentally responsible behaviour is both time savings and an elevated quality of experience.

The same is true of bicycles: good cycling infrastructure, such as separated bike lanes, can create faster and safer pathways for riders, making cycling an attractive option for more people. This phenomenon is already demonstrably the case in downtown Vancouver, where relatively modest re-allocation of road space to bikes has been followed by significant and immediate increase in bike use. Improved pedestrian and cycling facilities also improve accessibility for people who use wheelchairs and electric mobility scooters.



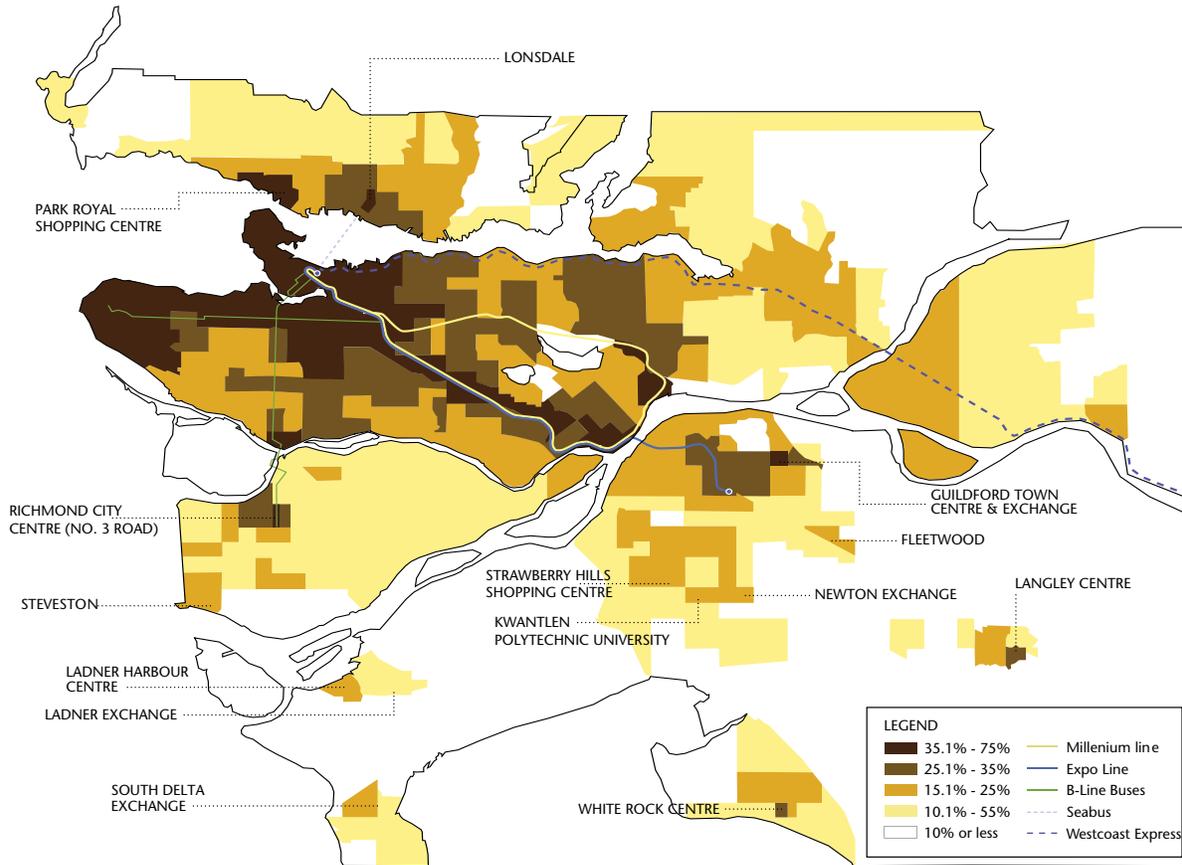
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26 Metro Vancouver, *Metro Vancouver's 2006 Generalized Land Use by Municipality*, August 28, 2008, www.metrovancouver.org/about/publications/Publications/KeyFacts-LandusebyMunicipality-2006.pdf

27 T. Litman, *Road Space Reallocation: Roadway Design and Management To Support Transportation Alternatives*, *TDM Encyclopedia* (Victoria Transport Policy Institute, updated February 22, 2010) www.vtpi.org/tdm/tm56.htm

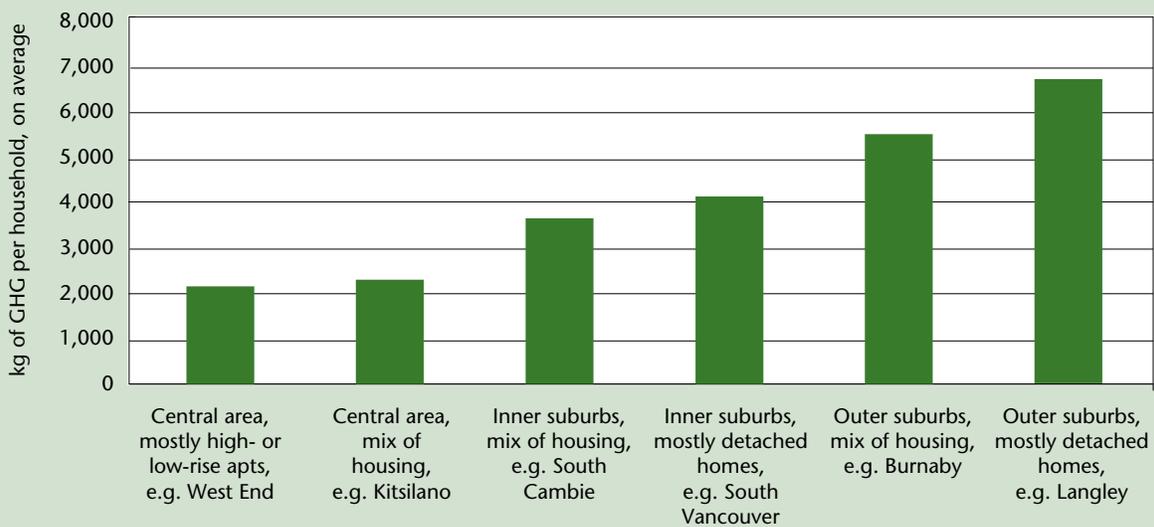
Alternative Transportation in Metro Vancouver

Getting to Work in Metro Vancouver: Commuting by Transit, Walking and Biking, 2006



Source: Statistics Canada (2006 Census), Metro Vancouver, and Translink. INFOGRAPHIC COURTESY ERICK VILLAGOMEZ

Estimated Annual Greenhouse Gas Emissions From Weekday Urban Car Trips



Source: Canada Mortgage and Housing Corporation, Comparing Neighbourhoods—Vancouver
www.cmhc-schl.gc.ca/en/co/buho/sune/sune_007.cfm

The reality is that automobile traffic volumes are very elastic in relation to available road space, rapidly expanding to fill any expanded roadway, particularly urban freeways. But just as traffic volumes expand to fill expanded road space, traffic volumes also shrink when road space shrinks. This happens even when transit, walking and cycling facilities are not improved: automobile traffic “just disappears.”²⁸

Parking spaces are likewise a huge subsidy to motorists (even when parking is not free). Steadily reducing available parking space would greatly affect choice of travel mode (if other options are readily available) by increasing the time cost of finding a parking spot and walking to the final destination. This strategy may be more equitable than charging more for parking, as all vehicles would be affected equally, whereas a pricing strategy privileges parking for the affluent. Converting more parking spaces to use by electric vehicles and car-sharing arrangements would also reinforce GHG reductions.

STRATEGY 3: MAKE DRIVING MORE EXPENSIVE AND TRANSIT MORE AFFORDABLE

Measures to change urban form and reallocate space away from cars can be reinforced by pricing strategies, although pricing policies alone risk putting the onus of change on low- to modest-income households. The most effective way to reduce automobile use in urban areas is to make the alternatives more advantageous, steadily expanding the proportion of households that have ready access to alternative modes.²⁹

To this end, more emphasis should be placed on increasing the variable (direct, out-of-pocket) costs of taking a trip, and less on annual costs like insurance. The current situation encourages more driving because once fixed costs of driving (purchase, maintenance and insurance) are covered, the cost of getting behind the wheel for any particular trip is relatively low (the cost of gas and parking). In alternative formulations, like car-sharing companies and cooperatives, users are charged a fee per kilometre that builds in these fixed costs. This discourages usage, but importantly can increase accessibility for low-income people when short trips are required, and even provides additional choice in suitable vehicle type.

Another way to shift to variable cost pricing for private vehicles is pay-as-you-drive auto insurance, which directly links insurance to number of kilometres driven.³⁰ Although pay as you drive insurance may have application across the province, large urban centres are the logical place to start (rural areas may require different policies due to much higher levels of auto dependence). BC has an ideal mechanism, the Insurance Corporation of BC, to pilot and develop distance-based insurance options and assess their effectiveness as part of a GHG emission reduction strategy.



The most effective way to reduce automobile use in urban areas is to make the alternatives more advantageous.

28 S. Cairns, S. Akins and P. Goodwin, *Disappearing Traffic: The Story So Far* (Centre for Transport Studies, University College London, 2001) www.ucl.ac.uk/transport-studies/tsu/disapp.pdf. Also, Phil Goodwin, Carmen Lass-Klau and Sally Cairns, *Evidence on the Effects of Road Capacity Reduction on Traffic Levels* (London: Landor Publishing, 1998).

29 Richard Gilbert argues that “Every part of every urban region should be developed and organized so that the advantages of not owning a car are at least equal to the advantages of owning a car. This principle can be known as the EANO principle (Equal Advantage for Non-Ownership).” Richard Gilbert, *Sustainable Mobility in the City* (Toronto: Centre for Sustainable Transportation, 2007), page 7, www.cremtl.qc.ca/fichiers-cre/memoires/sustainabletransport.pdf emphasis in original.

30 Todd Litman, *Pay-As-You-Drive Insurance* (Victoria Transport Policy Institute, 2009) www.vtppi.org/payd_rec.pdf

A rising carbon tax will also help to shift the balance toward less-GHG-intensive modes of transportation. A recent study of consumption patterns in the Pacific Northwest shows that in BC per capita fuel consumption is 25% less than in other jurisdictions, whereas fuel prices are about 50% higher.³¹ Price is not the whole story here: urban planning and public transit in BC are more conducive to reduced fuel consumption. A key advantage of carbon taxes is that they can raise substantial revenues for building out a better transit network. Compensating low- to moderate-income households who would otherwise be disproportionately affected by higher prices should also be a priority for revenues.



People without cars often pay for parking they do not use. Eliminating this cost would enhance social justice, while reducing GHG emissions.

PHOTO COURTESY
JEREMY BROOKS/FLICKR

Like an increased carbon tax, charging for parking can provide funds for low-carbon transportation while giving people an incentive to drive less (although as noted above, removing space is likely to be more effective and equitable). Charging for parking in transit accessible areas is one of the strongest incentives for people to switch to transit, cycling or walking, particularly when parking is charged on an hourly or daily basis.³² In his seminal work, *The High Price of Free Parking*, Donald Shoup suggests that municipalities charge for on-street parking where parking is scarce and use the revenue for public purposes, but that an incentive is needed to get residents to support such a change. Shoup recommends a “parking benefit district” where all or part of the net revenue from parking fees would go to improvements in the neighbourhood, giving residents an incentive to support parking fees.³³

Eliminating the cost people without cars often pay for parking they do not use would also enhance social justice, while reducing GHG emissions. As most municipalities in BC have high minimum parking requirements, most apartment owners include the parking cost in the rent and most condominium developers include parking spaces as part of the “bundle” buyers purchase. Shoup estimates the minimum cost of a parking space in a parking structure at \$127 US per month, but suggests that rents for newly constructed unbundled parking would likely be closer to \$200 per month. It is reasonable to expect that a significant proportion of low- and middle-income renters and condominium buyers would choose fewer, or no, parking spaces if they had the choice of paying for parking separately and good public transit and car-share services were available.

Keeping a lid on the cost of transit fares should also be a top priority. Over time this would lower the relative cost of transit as inflation and incomes continue to grow. A CCPA study looked at how much people in the Lower Mainland spend to take public transit. For the high-income households, transit fares are a small proportion of income, but for two-to-four person families living at the poverty line (Statistics Canada Low Income Cut-Off), two-zone transit passes take up over 10% of income, and three-zone passes cost up to 15% of income.³⁴ Families living well below the poverty line are forced to spend a much higher percentage of their incomes on transit (or walk). High transit fares limit the mobility and strain the finances of lower income people, particularly youth, women, urban aboriginal people, and recent immigrants.

31 See post by Marc Lee, *Gas Prices vs Consumption: BC vs the Pacific Northwest*, July 12, 2010, www.policynote.ca/gas-prices-and-consumption-bc-vs-pacific-northwest/

32 Victoria Transport Policy Institute, *TDM Encyclopedia—Parking Pricing* (2010) www.vtpi.org/tdm/tdm26.htm

33 D. Shoup, *The High Cost of Free Parking* (APA Planners Press, 2005), p. 599.

34 National Round Table on Environment and Economy, *Getting to 2050: Canada’s Transition to a Low-Emission Future*, Final Report (Ottawa: National Round Table on Environment and Economy, 2008).

STRATEGY 4: DEVELOP AFFORDABLE HOUSING AS PART OF COMPLETE COMMUNITIES

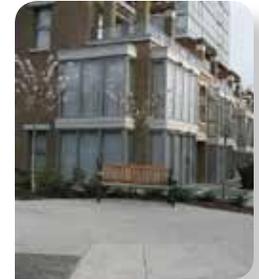
If we want to reduce distances travelled, a key social justice consideration is the need for affordable housing to be woven into the fabric of urban spaces. Higher densities in traditional single-family neighbourhoods—through secondary suites, duplexes/triplexes, and laneway housing—increase the supply of smaller footprint housing, but do not guarantee affordability. Tools like inclusionary zoning that ensure certain percentage of new units are in fact affordable are essential.³⁵

Direct public investment is also needed to provide affordable housing with good access to transit. The BC and federal governments have moved away from the construction of new social housing, but prior to cutbacks starting in the 1990s, BC built about 2,000 units of new social housing per year. Returning to that pace would cost about \$500 million annually, and could be done in a way that reinforces the development of complete communities.

Accompanying reasonable population density with good sidewalks, safe pedestrian crossings, and good cycling routes, can be done quickly and at a reasonable cost, especially when these costs are combined with proposed new developments. Greater densities in turn support local businesses that reinforce walking and cycling options. Businesses and services clustered around transit stops make life much more convenient for transit riders, but can survive in such locations only once good transit service is established and more people are riding transit.

In 2010 the population of BC was approximately 4.5 million people with just under 15% over the age of 65. By 2036, BC's population is projected to increase to over 6 million with almost one-quarter over the age of 65—more than double in absolute numbers.³⁶ The majority of this population growth will likely be in or near urban centres where there is greater access to jobs, services and healthcare facilities. The aging population and the increasing share of childless households (families with school age children will drop from 26% to 12% by 2036) will be important market drivers for housing in the province.³⁷

Both population growth and demographic market forces can be shaped to reinforce complete communities. Strategic public sector investments can also accelerate change, including social housing, residential care, libraries, and community healthcare facilities. For an aging population, a range of smaller residential homes and supported care units, close to community health centres, reduces mobility challenges. The demand for smaller housing units within short walking distance to services will increase dramatically, fueled largely by seniors with a diminishing ability or desire to drive.



The demand for smaller housing units within short walking distance to services will increase dramatically, fueled largely by seniors with a diminishing ability or desire to drive.

PHOTO COURTESY
BRUNO BORIS/FLICKR

35 See Marc Lee et al., *Affordable EcoDensity* (Vancouver: CCPA, 2008).

36 BC Stats, *British Columbia Level Population Projections: 1971–2009 Projections 2010–2036* (Government of British Columbia, 2010) www.bcstats.gov.bc.ca/data/pop/pop/popproj.asp

37 P.E.O.P.L.E., *British Columbia Population Projections—P.E.O.P.L.E. 34* (BC Stats and BC Ministry of Citizens' Services, July 2009) bcstats.gov.bc.ca/DATA/POP/pop/Project/P34BCIntro.pdf

Retrofitting the Suburbs



A key challenge in retrofitting the suburbs is overcoming perceptions that families are being punished after just “playing by the rules.” BC’s carbon tax was resented in suburban and other auto-dependent areas as an unfair tax, a stick without any carrots in the form of transit alternatives.

IN THE CURRENT SUBURBAN ENVIRONMENT, DRIVING IS NOT NECESSARILY A CHOICE, given the relative advantages of speed, comfort and convenience relative to any other available option. This is the inevitable outcome of the context within which people live—the infrastructure of roads, residential areas, workplaces, commercial zones, and other public services and amenities that in the aggregate constitute an auto-dependant pattern. In extremely auto-oriented areas, “doing the right thing” may be virtually impossible.

Transportation transformation in the geographically large suburban areas of Metro Vancouver and Greater Victoria, but also mid-sized cities from Cranbrook to Kelowna that have suburban-like development patterns, will require more than just expanded public transit in order to be sustainable. In areas of freeway-oriented sprawl and business parks, providing public transit alternatives to the automobile under existing conditions would be prohibitively expensive—and environmentally unsound, as having few passengers in a bus can lead to emissions that are higher per person than if each passenger drove their own car. Instead, offices and other jobs need to move closer to where people live, so that local businesses reinforce economically vibrant town centres.

A key challenge in retrofitting the suburbs is overcoming perceptions that families are being punished after just “playing by the rules.” BC’s carbon tax was resented in suburban and other auto-dependent areas as an unfair tax, a stick without any carrots in the form of transit alternatives. Planners must actively engage the public to ensure a smooth transition that creates alternative mobility options and an urban form conducive to improved quality of life *as perceived by* residents. Done properly, there are substantial win-win opportunities available to reduce auto dependence, reduce time spent commuting, and improve health outcomes while developing a more just transportation system.



Typical suburban development patterns separated people from work, schools, shopping and services, forcing them to use cars for almost everything. New developments should emphasize getting more people living in closer proximity to main streets and transit hubs, accompanied by a greater mix of nearby services, retail and office spaces.

LANGLEY VISUALIZATION COURTESY UBC DESIGN CENTRE FOR SUSTAINABILITY

STRATEGY 1: REDEVELOP MAIN STREETS AND NEIGHBOURHOOD/CITY CENTRES

Automobile-dominated suburbs can and should evolve to become more complete neighbourhoods and city centres. To get there, zoning for higher population densities in close proximity to arterial roads and transit hubs is needed, accompanied by a greater mix of nearby uses, such as restaurants and cafes, public services, retail spaces at ground level, and office spaces on upper floors—all of which would greatly enhance the range of jobs close to where people live. This would steadily reverse the typical pattern of suburbs that deliberately separates residential areas from retail strip-malls and office parks.

Both population growth and the aging of BC's population offer opportunities for new investments that locate housing and services on or near main streets or city centres. Public services like libraries, community health centres and community centres likewise present opportunities for strategic public investments that shape redevelopment. Improving sidewalks and creating more direct walking routes to these new main streets will be a challenge, but not an insurmountable one. Main streets can become walkable and transit-friendly high-intensity corridors rather than just auto-oriented highways. Much of Metro Vancouver's success at increasing density has come from just such a strategy.³⁸

38 A recent study found that while Calgary, Vancouver and Toronto's housing stock grew by 26%, 24% and 22% respectively, their increase in urban land use differed significantly. Calgary's urban land increased by 43%, Toronto's by 28% and Vancouver's by a mere 16%. Zack Taylor and March Burchfield with Byron Moldofsky and Jo Ashley *Growing Cities: Comparing urban growth patterns and regional growth policies in Calgary, Toronto and Vancouver* (Neptis Foundation, 2010).



An aggressive planning framework to retrofit major arterial roads, now occupied by ubiquitous commercial strip malls, into new main streets would dramatically increase walking and bicycling options, and gradually reduce average trip lengths. This would include places like Surrey’s King George Highway, Metro Vancouver’s Lougheed Highway, and Coquitlam Town Centre (indeed, some of this is already underway). Such a transition is facilitated by a robust grid of arterial roads located within 400 meters of most residents. This is also the case for mid-sized cities; in addition, downtown cores can be revitalized through the addition of new housing options.



The redevelopment of shopping malls also presents a tremendous opportunity to create new attractive town centres. Replacing a vast sea of mall parking with housing, offices and other services would greatly increase opportunities for people to live closer to where they work and play, and to transit hubs. Consistently pursued, this change will, over time, reduce the need for long commutes and auto-dependency, transforming suburbs into sustainable and complete communities.

Replacing a vast sea of mall parking with housing, offices and other services would greatly increase opportunities for people to live closer to where they work and play, and to transit hubs.

Retrofitting the suburbs cannot happen overnight; it represents a substantial project to be undertaken over a couple of decades. Beyond large changes to urban form, shifting transportation behaviour away from auto-dependence in suburban areas will require new infrastructure to support alternative modes of travel—bike lanes, sidewalks and public spaces, taxis and car-sharing services, transit stations, even tele-commuting options—that reduce the need to travel at all. Increasing the number of choices available to people across these different modes is critical, but requires new infrastructure to be integrated into major redevelopments and changes to land use policies.

CAVENDISH MALL REDEVELOPMENT
ILLUSTRATION COURTESY OF CITY
OF CÔTE SAINT-LUC, QUEBEC

STRATEGY 2: CREATE TRANSIT NETWORKS

Increases in density create a rationale for better transit, and more optimized public transit options justify increased density. Whatever the specific modes of transportation—such as metros, light rail trams, or trolley buses—technology deployed in effective networks can greatly enhance service quality and efficiency. Efforts to enhance the intensity and utility of regional arterial roads must be re-enforced by transit investments to create a *frequent transit network* that provides ease of movement for short- and medium-distance trips (rather than primarily for feeding long-distance trips). In this vision, shorter trips become increasingly common over time, a fundamental indicator of sustainable regions.

Transit operators in BC now recognize the importance of frequent transit networks for convenient transfers to allow for direct trips throughout the network and across the region, rather than just along a few major transit corridors. Translink’s *Transit Service Guidelines* recommend a frequency of 15 minutes or less for routes where there are not timed connections at stations.³⁹ However, reliable frequencies of eight minutes or less make people much more likely to take transit trips that require transfers.⁴⁰ Frequent service also allows transit vehicles to run a certain amount of time after the previous vehicle rather than attempting to be “on time” with a schedule (which often leads to bunching of vehicles). These operations increase efficiency and improve service quality.

39 TransLink, *Transit Service Guidelines: Public Summary Report* (June 2004).

40 Paul Mees, *A Very Public Solution: Transport in the Dispersed City* (Melbourne University Press, 2000).

In any region there are areas that do not have enough transit riders to support frequent service transit. In *pulse service* arrangements, transit vehicles converge on a transfer point at a set time, such as every hour, half hour or fifteen minutes, allowing passengers to transfer without long waits. Translink currently runs much of its transit system on the pulse system. For example, many buses are timed to arrive and leave Lonsdale in North Vancouver so that Sea Bus passengers have only short waits. BC Transit does the same with buses that meet ferries on the Sunshine Coast.

Transit vehicles must be reliably on time for the system to work. This is one of the things that make pulse service less efficient than frequent service transit; significant amounts of slack time must be built into schedules to ensure that passengers arrive at transfer points on time.⁴¹ In addition, pulse systems that only run during peak commuting hours operate from the presumption that most riders are living in suburbs and working in centre cities. With “reverse commuting” and “suburb-to-suburb” commuting, this is increasingly not the case. These limitations of transit in areas of low population density underline the need for a transition to more complete communities.

STRATEGY 3: GIVE PRIORITY TO MORE EFFICIENT, LOW-CARBON MODES

In suburban areas, there is great scope for repurposing of road and parking space to support other travel modes. Transit lanes and signal priority combined with bike lanes and sidewalks can make these low-carbon modes safer, faster and therefore more attractive. And as noted above, the conversion of parking space into residential and commercial space is a major ingredient in support of new complete communities. If accompanied by affordable transit fares and increases in transit capacity, such moves can lower the relative cost of alternative options compared to using a car.

The U-Pass system now in place at many universities could be introduced anywhere a reasonably large community of users exists. The U-Pass converts the per-trip cost normally associated with public transit into a single annual fixed cost that is spread across all students (whether they use it or not). This makes the cost of any transit trip “free.” After the U-Pass was introduced at UBC, traffic congestion near the campus virtually disappeared, GHG emissions were reduced by about 16,000 tonnes per year, and demand for parking on campus was greatly reduced.⁴²

New U-Pass arrangements recently announced for colleges and universities across the province are an important step toward creating the transit ridership needed to support a frequent service transit network, if funding is increased to improve transit service. U-Pass provisions could easily be extended within colleges and universities to staff, and beyond them to other public and private sector workplaces. Anywhere there is a critical mass for a U-Pass type program, this financing arrangement could spur a reinforcing cycle of greater ridership and better service.

Pricing policies should be implemented in a way that does not adversely affect the existing low-income population, but that also steadily attracts new users of public transit.

To get there, communities will need to be engaged in setting priorities and developing plans and tools to customize this vision to their own particular circumstances. As the 2010 Winter Olympics demonstrated (see page 21), broad-based change can occur rapidly if the political will exists.



After the U-Pass was introduced at UBC, traffic congestion near the campus virtually disappeared, GHG emissions were reduced by about 16,000 tonnes per year, and demand for parking on campus was greatly reduced.

PHOTO COURTESY THE UBYSSY

41 Ibid.

42 Nathan Cato, *Social Sustainability of Alternate Transportation Modes at The University of British Columbia* (2006) www.trek.ubc.ca/research/pdf/social%20sustainability%20of%20alternative%20transportation.pdf

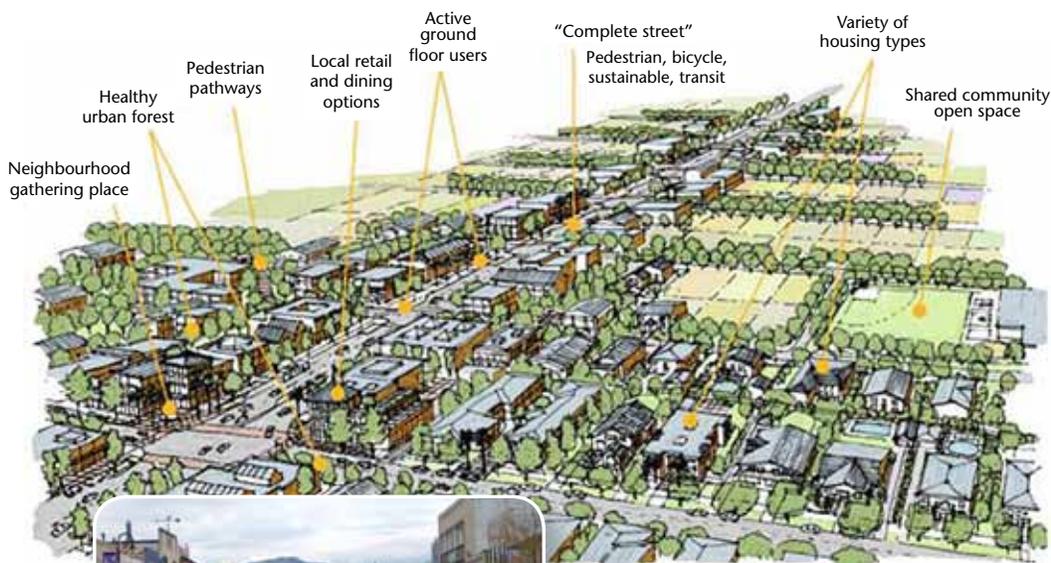
Smaller Communities and Rural Areas

Rural areas and small towns are challenged in reducing emissions and oil dependency due to a highly dispersed residential population, making them extremely difficult to serve with conventional transit.

ALTHOUGH OVER 80% OF PEOPLE IN BC LIVE IN urban and suburban areas, rural areas and small communities face the greatest challenges in eliminating fossil fuels from transportation. Rural areas and small towns are challenged in reducing emissions and oil dependency due to a highly dispersed residential population, making them extremely difficult to serve with conventional transit. Nor do rural communities typically exhibit the kind of population growth common to metropolitan areas, and thus cannot use population growth as an engine to make communities more complete through increased residential densities.

Many of the lowest-income households in BC live in rural areas, including First Nations people living on reserves. Low income is typically accompanied by greater automobile dependency than in urban areas, and thus more vulnerability to oil price shocks. The ability to live well without a car is much more limited in smaller communities than in urban areas. Therefore great care will need to be taken to ensure that efforts to reduce GHG emissions do not result in social isolation for people in smaller communities.

Below, we point to policies that can support a fair distribution of the burden of reducing emissions, a long-term expansion of access to alternative transportation modes, and protection of vulnerable populations from price shocks. Some of the strategies outlined above for urban and suburban areas also apply at a smaller scale, but others need to be customized, ideally in collaboration with local residents, to meet the unique needs of BC's diverse communities.



Innovative ways to recreate town centres and provide lower emission transportation are needed to reflect the unique situation of each community, and to a large extent these ideas must come from local residents themselves.

STRATEGY 1: REDEVELOP NEW MAIN STREETS AND TOWN CENTRES

Towns emerged historically as central areas where nearby residents could access the goods and services they needed. This is still the case today, and development strategies should aim to recreate town centres that reduce the distance between housing, services, and jobs. Shifts in the land use mix accompanied by higher densities along the principal axes into town centres could replace, over time, what currently tends to be highway-oriented commercial uses.

Unlike urban and suburban areas, population growth is not likely to be a driver of such development. However, rural areas already have a higher proportion of seniors than urban areas,⁴³ and in many smaller BC rural communities an aging population means increasing numbers of people who may no longer be able to drive but would benefit from a greater concentration of public services, retail outlets and other amenities nearby. Walkable communities with appropriate services for the increasingly elderly population, from simple things like cafes and clinics within walking distance, will become increasingly crucial. Appropriately provided, walkable rural communities can provide a high quality of life for an aging demographic that might otherwise require more expensive residential care.

Public sector investments could serve to anchor residential, public, and commercial services in the centre of small towns. This could reverse the recent trends of closing hospitals and other public services in smaller centres. Provincial downsizing has created an increased need for mobility across regional areas in order to gain access to crucial health and other services. Ensuring more public offices and medical services are available closer to populations served would reduce the need to drive long distances.

43 For example, Statistics Canada, *2006 Census: Portrait of the Canadian Population in 2006, by Age and Sex: Subprovincial population dynamics* (2009) www12.statcan.ca/census-recensement/2006/as-sa/97-551/p17-eng.cfm

STRATEGY 2: EXPAND REGIONAL TRANSIT OPTIONS

In Canada, people tend to think of public transportation as being applicable only to urban areas, with the public role in rural areas mainly being to build roads for private automobiles, with some limited private sector bus options such as Greyhound. Private electric vehicles will constitute a major strategy for lowering GHG emissions attributable to rural residents, as dramatically lower population density make these lands difficult to serve by conventional public transit.

However, investments in alternative mobility options should not be discarded altogether. On a per capita basis, infrastructure investments for cycling and walking may be even more cost-effective in rural areas than in cities. Revived and more affordable passenger rail and bus services would facilitate reduced automobile ownership and use. For rural residents the advantages would include better access to health and other services for those who do not drive, and for some the option of saving money by choosing to reduce the number of cars a household owns. Many urban residents also make occasional visits to smaller communities to visit family or go on vacation, and these measures would benefit them as well.

New investments in alternative transportation service could reverse an adverse trend of cuts to public transit. The BC Transportation Board has been approving cuts to rural bus service, such as the December 2009 decision to cut Greyhound service through the West Kootenay region. Fares to and from smaller BC communities are high, with discounted fares more available between major centres. The government also (infamously) privatized BC Rail, which has eliminated almost all of its passenger train service. Major improvements to passenger train travel will also require that passenger trains have priority over freight trains, along with improvements to railway control and signalling systems, as is normal in most of continental Europe.

Improved public transport options in rural areas would also have significant safety benefits, both in reduced crash injuries and deaths and by providing a safer option to hitchhiking. For example, after numerous young First Nations women were murdered or disappeared on Highway 16, the first recommendation of the *Highway of Tears Symposium Recommendation Report* was to establish an affordable bus service so low-income people would not have to hitchhike to travel.⁴⁴



Since the 1960s, there has been a series of unsolved murders and disappearances of young women along Highway 16 in Northern BC, most of them First Nations.

The first recommendation of the *Highway of Tears Symposium Recommendation Report* was to establish an affordable bus service so low-income people would not have to hitchhike to travel.

44 Lheidli T'enneh First Nation et al., *Highway of Tears Symposium Recommendation Report* (2006) www.highwayoftears.ca/symposiumrecommendations.pdf

STRATEGY 3: SEEK INNOVATIVE ALTERNATIVES

Smaller communities around BC are diverse and not necessarily amenable to one-size-fits-all solutions. Innovative ways to provide lower emission transportation are needed to reflect the unique situation of each community, and to a large extent these must come from local residents themselves. Local adaptation to higher fuel prices is a key point where communities can be engaged to develop plans that increase resilience to external shocks.

People in every community and region will need to be involved in developing transportation solutions that work for their local circumstances. This could include collective transports without specific schedule/stops, workplace pick-ups, but also telecommuting options. Some large employers already provide bus or van transportation for their workers from nearby communities and more could do so. Combining postal or other types of delivery and bus service could also be a viable option in some areas. In other areas the risk of violent crime may be low enough to allow for informal ride sharing, as on Pender Island in BC's southern Gulf Islands where "Car Stops" are already in place.⁴⁵

There is an opportunity for pilot projects that implement a package of new transportation investments to give real-world tests to what might be possible. Such was the case in the UK's "Sustainable Travel Towns" initiative, which provided five years of funding in three towns. Early results found that, on average, the initiative led to increases in walking (13%) and transit use (16%), and a large increase in cycling (50%) accompanied by a drop in trips by car (down 8%).⁴⁶

Investments in improving low-carbon mobility options, including affordable electric passenger rail and bus services, would facilitate reduced automobile use for longer trips by both urban and rural residents.



Internet Access to Reduce Trips

Indirectly related to the transportation transformation for BC is using Internet technology to reduce trips. Many British Columbians already use the Internet in place of jumping in the car, for everything from telecommuting to sourcing or ordering products online.

Rural and remote areas have the greatest potential to reduce GHGs using Internet technology—but also the greatest challenges. While BC has made some steps to improve high-speed Internet access in rural BC, more initiatives are needed.

This solution also has a justice component: affordable, stable, high-speed Internet provides equitable access to jobs, education, business development, and a growing array of public services.



45 Shannon Gibson, *Casual Carpooling: A Background Guide* (University of Victoria Environmental Law Centre, 2008) www.elc.uvic.ca/press/car-stops.html

46 Centre for Alternative Technology, Chapter 5: Transport in *Zero Carbon Britain 2030*, (2010) www.zero-carbon-britain.com

Moving Freight

Growth in freight emissions is the outcome of an economic model that stresses continual growth in consumption, and in BC's case, resources extracted and exported to pay for imports.

COMPARED TO PASSENGER TRANSPORTATION, less is known about freight movement, particularly in urban regions.⁴⁷ GHG emissions from freight transportation are estimated at anywhere from 35% to 50% of total transportation emissions.⁴⁸ There is an important difference in trends, however, with freight emissions rising more quickly than from passenger transportation.

Between 1990 and 2005, there was an estimated 134% increase in tonne kilometres of freight moved by truck in BC; in contrast, rail freight movement increased by only 55%.⁴⁹ Increases in the volume of exported raw materials, “just in time” delivery systems using long distance trucking instead of regional warehouses, growth in international trade, and the shift of manufacturing to Asia could all be important factors in this increase in emissions. Growth in freight emissions is the outcome of an economic model that stresses continual growth in consumption, and in BC's case, resources extracted and exported to pay for imports.

STRATEGY 1: REDUCE, REUSE, RECYCLE AND RE-LOCALIZE

While the peaking of conventional oil supplies threatens to dramatically increase transportation costs, a deeper challenge is to outline a vision of the “good life” that does not rely so much on the wasteful production and consumption of disposable products. Literature on life satisfaction

47 Richard Gilbert and Anthony Perl, *Transport Revolutions: Moving People and Freight without Oil* (first edition, Earthscan, 2007), 98.

48 Natural Resources Canada, *Comprehensive Energy Use Database Tables*, www.oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_tran_bct.cfm. This estimate of approximately half of emissions from freight includes both BC and the territories, which arguably increases the freight share dramatically. For Canada as a whole, freight comprises 42% of emissions. An older estimate puts freight's share closer to one-third: J. Caceres and D. Richards, *Greenhouse Gas Reduction Opportunities for the Freight Transportation Sector*, prepared by AgriTrade and Transport for the David Suzuki Foundation, 2000.

49 Pacific Institute for Climate Solutions, *An Integrated Approach to Transportation Policy in BC*, 2008.



Switching to clean energy sources may be quicker and more cost-effective for freight than passenger transport since electric trains are less expensive to buy and operate than diesel, and many countries are rapidly electrifying their rail networks.

points to a plateau in “happiness” beyond minimum levels of income and consumption; beyond that minimum, factors such as education, health, community and personal relationships, and democratic participation are more important to improvements in quality of life.⁵⁰

Existing patterns of consumption could be much less wasteful if moved to closed-loop production systems that re-use, re-manufacture and recycle waste products. Consistent with the concept of “zero waste,” recycling of materials leads to a dramatic reduction in energy use (and thus GHG emissions) compared to raw (virgin) materials. And if more manufacturing was done in BC instead of Asia, transportation emissions would also come down.

On the export side, measures to wind down extractive activities in BC, such as coal mining, would reduce transportation emissions, as well as emissions originating in BC but combusted in other jurisdictions. Some 25 million tonnes of coal left BC via railways and ports in 2008; BC coal combusted in export markets leads to emissions that are greater than fossil fuel combustion within BC.⁵¹

50 R. Layard, *Happiness: Lessons from a New Science* (New York: Penguin Press, 2005).

51 Marc Lee, *Peddling GHGs: What is the Carbon Footprint of BC's Fossil Fuel Exports?* (CCPA-BC, July 2010).

STRATEGY 2: PURSUE CLEAN ENERGY AND MORE EFFICIENT ALTERNATIVES

Similar to passenger transportation, shifting freight transportation to more efficient and low-emission modes would reduce emissions.⁵² If low-emissions transportation modes such as rail and short sea shipping with tug and barge become less expensive than trucking (due to a carbon tax, for example) and is just as convenient, companies will use these modes. If, on the other hand, the public continues to subsidize trucking by building highways and not charging companies for the damage their heavy vehicles do to roads, companies will move more goods by road.



Electrifying rail transport in BC—drawing on existing clean hydroelectric power—is an obvious candidate, although it would require parallel moves in other jurisdictions.

PHOTO COURTESY V. IVAN/FLICKR

Switching to clean energy sources may be easier and more cost-effective for freight than passenger transport. Electrifying rail transport in BC—drawing on existing clean hydroelectric power—is an obvious candidate, although it would require parallel moves in other jurisdictions. Electric trains are less expensive to buy and operate than diesel, and many countries are rapidly electrifying their rail networks.⁵³ On busy routes, this cost savings can outweigh the cost of maintaining the electrical infrastructure.⁵⁴

The actions proposed above to create complete communities should contribute to reducing the need for regional goods movement. Computer modelling suggests that compact development reduces distances travelled by trucks, just as it does for personal transportation.⁵⁵ Local goods movement is where plug-in hybrid and battery electric vehicles may have a big role to play. Many trucks used for local delivery spend hours in stop and go traffic each day, exactly the kind of use where hybrid vehicles reduce lifecycle emissions; electric vehicles may also be cost-effective. A new generation of battery electric trucks, short-haul ships and ferries also seems feasible,⁵⁶ and could be amenable to some form of strategic venture/partnership to develop this new sector.

Intermodal freight systems (using standardized containers across different transportation modes) have a long history in BC. However, these systems have not been optimized to ensure that goods move by low-carbon modes such as rail and short sea shipping until near their final destination. Inland intermodal rail/truck terminals are sometimes referred to as “inland ports,” and could play a major role in reducing truck traffic and GHG emissions. These systems must be made seamless so it is just as easy, and less expensive, to ship by efficient modes as to hire or own a long-haul truck to take goods door to door.

52 For data on the energy consumption of different freight transportation modes, see Gilbert and Perl, *supra* note 6.

53 Department for Transport, *Britain's Transport Infrastructure: Rail Electrification (2009)* <http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/rail/pi/rail-electrification.pdf>

54 *Ibid.*

55 Stuart Ramsey, “Of Mice and Elephants” *ITE Journal*, September 2005.

56 For more on the potential of grid tied road transport see Gilbert and Perl, *supra* note 6. For information on battery/trolley hybrid propulsion see <http://citytransport.info/Electbus.htm#Duo>

Moving Forward: Dialogue and Dollars

ANY VISION RISKS BEING DASHED AGAINST THE SHOALS OF POLITICS AND PUBLIC OPINION. Our hope is that the imperative of climate change and the need for more equitable communities and mobility options provide compelling reasons for a bold transportation transformation that would improve quality of life for all British Columbians.

There is good reason to believe that this vision already resonates with regional planning initiatives, particularly in Metro Vancouver. The recent approval of a *Regional Growth Strategy* for Metro Vancouver points to the fact that broad-based public consultation can lead to the development of a vision for more sustainable growth. And Translink's *Transport 2040* vision is also largely consistent with our objectives—although we argue that both plans can and should be much more aggressive given the challenges we face, and that there is a gap between medium- and long-run goals and short-term decision-making.

Making this transportation plan happen will ultimately come down to two things: political will and leadership, backed by commitments to greatly increase the funding of transit and transportation infrastructure; and, public acceptance and buy-in to the details of plans at a very local level. Getting to a vision also requires plausible pathways with interim futures along the route.

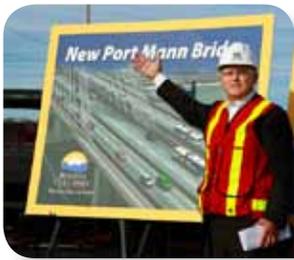


Public participation in decision-making will be essential to making the transition toward a zero-emission transportation system.

STRATEGY 1: INVOLVE THE PUBLIC IN CREATING SOLUTIONS

Public participation in decision-making will be essential to making the transition toward a zero-emission transportation system. And meaningful participation is impossible without an informed citizenry with a basic understanding of the options available.⁵⁷ One of the objectives of this report is to enhance the already active public dialogue about the most appropriate ways to spend public funds on transportation in BC, and how these expenditures for transit must be tied to changes in land use.

Going beyond standard consultation exercises could include the use of charrettes and visualization tools as part of public processes. BC already has substantial experience in developing good public processes; extending best practices should include efforts to involve low- and moderate-income people, immigrant groups, First Nations, and those who live in automobile dominated areas.



Spending public funds on highway expansion and low carbon transportation is analogous to applying a car's accelerator and brake at the same time.

PHOTO COURTESY GOV.BC.CA

STRATEGY 2: REALLOCATE FUNDS

Government expenditures on roads and bridges in BC rose from \$1.7 billion in 2001/2002 to over \$3 billion in 2008/2009.⁵⁸ Much of this was spent on roadway expansions. In contrast, governments reported spending \$881 million on transit and nothing on BC railways in 2008/2009.⁵⁹ Similarly, the BC transportation investment plan, outlined in Budget 2011, will spend \$7.5 billion over four years (operating and capital spending; not including local government expenditures), but allocates two dollars on roads and bridges for every dollar on transit (and almost nothing on cycling infrastructure).

An aggressive approach to the transportation transformation should include a rapid start: \$2 billion per year—about 1% of BC's GDP—in new investment for 10 years to expand low-carbon transportation infrastructure. A substantial proportion of this would be money reallocated from highway, bridge, deep sea port and airport expansions, likely well over \$1 billion per year.⁶⁰ Canadian transportation authors Richard Gilbert and Anthony Perl suggest that the reduction in spending on highway and airport expansion is as important as increasing spending on low carbon transportation, noting that spending on both at the same time is “analogous to applying a car's accelerator and brake at the same time.”⁶¹

Shifting goods movement from heavy trucks to rail and short sea shipping would greatly reduce road maintenance costs, and would likely reduce overall transportation costs.⁶² In addition, more

57 An informed public is widely seen as important to sustainability. For example, Smart Growth BC, *Transportation Policy* (2005) www.smartgrowth.bc.ca/Portals/0/Downloads/SGBCTransportationPolicy.pdf

58 Transport Canada, *Transportation in Canada* (2010), Table G7, p. A55. About one-third of this amount is local government expenditure.

59 Transit spending reported to be \$660 million in gross provincial expenditures and \$221 million in local expenditures. Transport Canada, *supra* note 58, p. A53.

60 The exact proportion of spending on roadway expansion is difficult to determine; however, BC provincial expenditures on roadway operations and maintenance, as opposed to capital spending, declined from 45% to 36% between 2001/02 and 2008/09. This suggests that roadway expansions and new roads make up a large and increasing proportion of the roads budget.

61 Gilbert and Perl, *supra* note 47.

62 For example, it costs 12 times as much to move goods by road as by rail in the US (Gilbert and Perl, *supra* note 6, page 97).

compact development patterns would reduce the need for public expenditures on infrastructure such as sewers, water mains, parking structures, and electricity distribution.⁶³

Finally, it is worth noting that this is a shift from private expenditures on private automobiles to more public spending on public transit. As a society we will end up spending less on transportation as a share of total income by 2030. This is not a small consideration given that personal expenditures on transportation in BC were over \$17 billion in 2009, or \$3,895 for each man, woman and child.⁶⁴

STRATEGY 3: INNOVATIVE NEW FINANCING

In Metro Vancouver, about one-third of Translink's revenues in 2010 are from transit fares, with the remainder from property taxes (21%), 15 cents per litre of motor fuel tax (24%) and some smaller sources, like advertising revenue, parking sales tax, and a levy on BC Hydro bills.⁶⁵ However, for the conventional transit system, the average fare per passenger covers about half of operating costs. In the current planning framework, a fare increase is scheduled for 2013. While reducing fares would help to spur transit use, other revenue sources would have to be tapped to avoid funding shortfalls. Simply put, an increase in transit capacity requires either increases in funding from federal and/or provincial governments, increases in existing taxes, or new sources of revenue at the regional level.

Outside of Metro Vancouver, BC Transit provides transit service. It is funded primarily by grants from the BC government (36% of revenues in 2009/10) plus transit fares (28%) and contributions from municipalities (28%). It does not have access to the same number of revenue sources as Translink, but nonetheless faces similar challenges looking forward in terms of finding sustainable funding sources to expand services.⁶⁶

The issue of financing major transit improvements has been reinvigorated in the Metro Vancouver area due to a Memorandum of Understanding between the provincial government and Translink (Council of Mayors), signed in September 2010, to come up with a sustainable funding strategy, including a review of funding options. The MOU negotiations could lead to shifts in financing sources, including expanding existing revenue sources, as well as new sources like bridge tolls (Golden Ears bridge toll already in existence), a share of carbon tax revenues, and/or a vehicle levy (last proposed in 2000, but rejected by the provincial government after protests by car owners).⁶⁷

BC's carbon tax would appear to be an ideal revenue source, although currently a large share of carbon tax revenues has been allocated to corporate income tax cuts, and none to sustainable transportation. If half of the BC budget's 2011/12 carbon tax revenue was allocated to transportation, this would amount to \$500 million.⁶⁸ A recent Climate Justice Project report on

An aggressive approach to the transportation transformation should include a rapid start: \$2 billion per year—about 1% of BC's GDP—in new investment for 10 years to expand low-carbon transportation infrastructure.



63 Todd Litman, *Understanding Smart Growth Savings* (Victoria Transport Policy Institute, 2010) www.vtppi.org/sg_save.pdf

64 Transport Canada, *supra* note 58, Table EC75, p. A44. Canada wide, over 80% of personal transportation expenditures go to owning and operating motor vehicles (Table EC76).

65 Translink, *Translink 2009 Annual Report* (South Coast British Columbia Transportation Authority, 2010).

66 Translink was carved out of BC Transit as a separate entity in 1999.

67 Translink, *Moving Forward: Improving Metro Vancouver's Transportation Network*, Supplemental Financing Plan, November 2010.

68 Up to a point, anyway. If truly successful in reducing emissions, carbon tax revenues will eventually fall, but in the short- to medium-term they are ideally timed for a rebuild of transportation infrastructure.

carbon pricing called for an increase in the BC carbon tax to \$200 per tonne in 2020, with half of revenues going to fund climate action, including investments in public transit.⁶⁹ At that level, several billions of dollars per year would be available to build out the sustainable transportation system BC needs. Even in advance of those carbon tax increases, a plan out to 2020 would provide a basis for borrowing funds to move projects ahead sooner.

An alternative means of financing new transit infrastructure is to recognize that transit improvements increase property values. Thus, the financing model should capture some of the lift in property values arising from transit investments and up-zoning, on and near high streets and transit nodes. A similar idea is behind tax-increment financing, which uses a higher future flow of property tax income as an asset to build the infrastructure that raises property values.⁷⁰ However, these measures could also compete with municipalities' ability to raise revenue for other priorities.

The goal should be to get the revenue needed to reduce GHG emissions while also reducing economic inequality.

Fiscal reform for regions and municipalities could also include the dedicated transfer of a portion of income or consumption taxes from one or both of federal and provincial governments. Ultimately, the problem is not finding a revenue source but finding the political will for action. Even property taxes, a principal source of funding for Translink in Metro Vancouver, are low compared to other Canadian cities (an average of \$874 per capita in BC in 2008, compared to \$1,136 in Quebec, \$1,238 in Ontario, and \$1,251 in Alberta).⁷¹

Whatever the choice of revenue source, there will be equity considerations that must be addressed, whether for individuals and families, or on a regional basis. The goal should be to get the revenue needed to reduce GHG emissions while also reducing economic inequality.⁷² A distributional analysis should be completed to identify differences spanning different regions of the province and specific groups, such as lower income families living in outlying suburbs far from town centres. This research should include the active participation of lower- and moderate-income people who live in automobile dominated areas.

69 Marc Lee, *Fair and Effective Carbon Pricing: Lessons from BC* (CCPA-BC, 2011).

70 R. Valdez from the Seattle-based Sightline Institute reviews US experience with Tax Increment Financing here: http://daily.sightline.org/daily_score/archive/2010/09/22/incrementally-yours

71 Harry Kitchen, *Principles and Best Practices for Funding, Financing and Cost-Sharing Metro Vancouver Municipal Services*, discussion paper prepared for Metro Vancouver, May 16, 2010.

72 For example, Richard Wildinson and Karte Pickett, *The Spirit Level: Why Equality is Better for Everyone* (Penguin, 2010).

Conclusion

THE WORLD'S INDUSTRIAL NATIONS NEED TO AGGRESSIVELY REDUCE GHG EMISSIONS over the coming decades. The BC government has taken some actions toward this objective, including a law requiring municipalities and planning regions to align planning policies toward GHG emission reductions. But while some progress is being made, the signs are not all positive.

Car ownership in BC is still growing faster than population, and, tragically, citizens of modest means, who struggle the hardest to raise families and create a good quality of life for their children, are the most vulnerable to disruptions in the present system. And it is this group that, due to rising housing costs, is presently being pushed out of walkable central areas with decent transit to outlying areas that are auto dependent. Add to this the burgeoning demographic time bomb, the expected large increase in the number of British Columbians over age 65 within the next 40 years. These elderly citizens will find it increasingly difficult to maintain their current auto dependence, for both health and financial reasons.

With this in mind it seems clear that simply switching fuels, as some recommend, can only be part of, not the entire, solution. More important than gradually switching over the car and truck fleet to low- and zero-emission fuels—a process that will itself take over 20 years—would be gradually transforming our urban landscape from automobile-dependent areas to places where walking, cycling and transit dominate.

While such a prospect may seem daunting to some, happily there is a precedent. It took us a mere 40 years to utterly transform the “streetcar city” urban form common to all Canadian cities prior to 1940 into an automobile-dominated form. The emergence of automobile-dependent communities was not an inevitability, but was provoked by a confluence of technological opportunity, economic development policies, and transportation infrastructure investment decisions—investment decisions made absent a recognition of long-term unsustainability, and the trap it eventually created for our most vulnerable families.

While such a prospect may seem daunting to some, happily there is a precedent. It took us a mere 40 years to utterly transform the “streetcar city” urban form common to all Canadian cities prior to 1940 into an automobile-dominated form.

Time will not be wasted here on bemoaning this transformation for what some see as its tragic waste of resources. Rather we choose to embrace this example as proof that dramatic change to the very structure of cities and communities can happen fairly quickly, and that public policy, as an embodiment of political will, can succeed in this mission. We also take this example as strong evidence that the market can align with public policy in a way that meets perceived or real public good. Clearly the public good now requires an acknowledgement that business as usual is not an option. Greenhouse gases must be cut—radically, and fast. And we must break our addiction to oil. But the new way forward must acknowledge the circumstances of the millions of people that collectively constitute our province.

Responsibility for reductions in GHG emissions cannot, for both moral and political reasons, fall inappropriately on the poor, on the old, and on working families. The emergence of automobile-dominated communities and regions has created unanticipated but nonetheless still crushing burdens for these groups. Strategies must be found that reduce, not increase, these burdens, which include social exclusion and the negative health outcomes that follow. Thus, we recommend a 30-year initiative aimed at transforming communities of all sizes, and how people and goods move across the province. This rapid evolution must increase affordable housing choices, availability of jobs, transportation options, and, ultimately, community quality.

A zero-emission transportation system is a plausible and achievable contribution to a low-carbon future.

The strategies listed in this document provide a realistic framework for such an initiative. But people from across the province must drive and control how it happens in their communities. A zero-emission transportation system is a plausible and achievable contribution to a low-carbon future. And if we start right away, and others do the same in other parts of the world, we might have just enough time to transform our transportation system in a way that vastly improves mobility, health, communities and social justice.



THE CLIMATE JUSTICE PROJECT

The Climate Justice Project is a multi-year initiative led by CCPA and the University of British Columbia in collaboration with a large team of academics and community groups from across BC. The project connects the two great “inconvenient truths” of our time: climate change and rising inequality. Its overarching aim is to develop a concrete policy strategy that would see BC meet its targets for reducing greenhouse gas emissions, while simultaneously ensuring that inequality is reduced, and that societal and industrial transitions are just and equitable.



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The Wilderness Committee is Canada’s largest membership-based, citizen-funded wilderness preservation organization. We work for the preservation of Canadian and international wilderness through research and grassroots education. The Wilderness Committee works on the ground to achieve ecologically sustainable communities.



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