

TAC 2004 SUSTAINABLE URBAN TRANSPORTATION AWARD SUBMISSION

ACHIEVING GREENHOUSE GAS REDUCTIONS FROM PASSENGER VEHICLES



**City of Vancouver
Engineering Services and
Sustainability Office**

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SUMMARY

TAC's New Vision for Urban Transportation calls for land use that reduces travel demand and supports transportation alternatives, travel choices that reduce dependence on single occupant automobiles and user pay financing methods that dedicate revenues to transportation system improvements. Vancouver has supported these directions in its transportation and land use plans, which strive to build compact and complete communities that support transit, walking and cycling and other alternatives to driving alone. Recent data has shown successes in implementing these plans – while significant population growth has occurred, auto driver mode shares have decreasing slightly, and transit, walking and cycling modes have shown substantial increases. In 2003, the City approved another measure that will further support these initiatives, with a new development cost levy that includes transportation alternative projects.

During 2004, the City developed a Community Climate Change Action Plan, for reducing greenhouse gas emissions generated by Vancouver residents and businesses, in order to comply with the Kyoto Protocol. This Plan responds to the call by the Federation of Canadian Municipalities (FCM) for municipalities to support the federal government's ratification of the Kyoto Protocol. In Vancouver, buildings and vehicles were found to contribute to the majority of the community's greenhouse gas emissions (industry accounted for only about 7% of the total emissions).

Vancouver passenger vehicles (i.e. cars, vans, pick-up trucks and SUVs) account for over one-quarter of the community's greenhouse gas emissions. Vehicle emissions were estimated using regional fuel sales, and allocating Vancouver's share based on the actual miles driven by Vancouver registered vehicles. This involved considerable effort, in matching odometer readings from a very large (8 million record) database that was provided from the region's Common Air Contaminant monitoring program. Analysis showed that although average distances travelled per vehicle went down between 1990 and 2000, total emissions increased due to the consumer preferences towards heavier vehicles.



Public workshop for feedback on draft plan

The Climate Change Action Plan recognizes that the best opportunities to reduce the City's greenhouse gas emissions are related to passenger vehicles. Accordingly, over 60% of the Plan's emission reduction target for 2012 is to come from passenger vehicle initiatives. The Plan provides a new framework that builds on existing sustainable urban transportation initiatives, and outlines new actions to achieve a substantial reduction in vehicle use and gasoline consumption. Fundamental to the Plan are new and expanded City roles in Transportation Demand Management, working with regional, provincial and federal partners, and new initiatives to promote efficient vehicles and fuels.

Plan strategies and actions for providing facilities and services that encourage increased use of transportation alternatives (walking, cycling, transit, etc.), and promoting more efficient vehicles and fuels are summarised below:

Transportation Alternatives (Reduction Target – 90,000 tonnes CO₂ / year)

A target to reduce passenger vehicle use by 10% from the 2012 “business as usual” total is proposed. This is felt to be an aggressive but achievable target, and is in addition to reductions from more efficient vehicles and fuels.

An integrated bundle of measures is proposed, to reduce single occupant vehicle use by shifting trips to alternative modes and eliminating unnecessary trips. New measures planned to help meet the reduction target include:

- Defining a new role for the City in supporting TDM, that includes using marketing to empower individuals to choose more sustainable travel behaviours,
- Enhancing existing elementary and high school programs that encourage students to walk or cycle,
- Using parking supply, pricing and convenience to support transportation alternatives,
- Improving safety education and enforcement,
- Supporting regional initiatives to reduce automobile use, including upcoming reviews of regional tolling and parking strategies, and
- Encouraging a provincial pilot project to examine distance-based automobile insurance.

Vehicle and Fuel Efficiency (Reduction Target – 160,000 tonnes CO₂ / year)

Although increasing support of Transportation Alternatives is fundamental part of the Climate Change and City transportation plans, the Climate Change Plan recognizes that the automobile will remain the main mode for many trips. Supporting improved vehicle and fuel efficiency is the largest and most cost effective emission reduction in the Plan.

New measures planned to help meet the reduction target include:

- Advocating in cooperation with NGO’s, the Union of British Columbian Municipalities, the Federation of Canadian Municipalities, and other partners for timely and meaningful federal action on improved fuel efficiency standards for vehicles along with tax incentives/disincentives measures.
- Incorporating approaches to support very fuel efficient vehicles, in the parking strategy for Transportation Alternatives.
- Implementing an idle-free awareness campaign and bylaw.
- Participating in and supporting regional and national partnerships to promote more efficient vehicles, vehicle operations, and renewable fuels such as the development of a fleet environmental performance standard, a tire inflation awareness campaign, a hybrid taxi initiative, and a Bio-diesel Market Transformation Project.

Although the focus of the Climate Change Plan actions is on reducing greenhouse gas emissions, it is recognized that these steps will result in a wide range of co-benefits, included reducing Common Air Contaminants responsible for smog and respiratory problems, improving public health through greater use of active transportation, and helping to maintain the safety and effectiveness of the limited supply of road capacity.

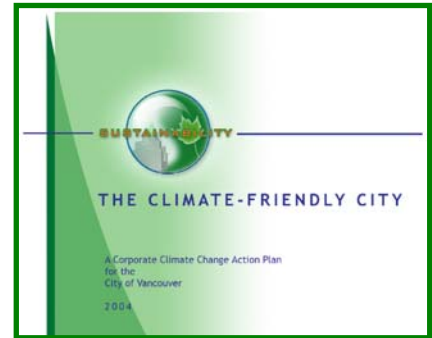
BACKGROUND

Change in the earth's climate, recognized as resulting largely from the greenhouse gases emitted when fossil fuels are burned, is one of our planet's most significant environmental challenges. The Kyoto Protocol was established in 1997 and came into effect on February 16th this year, obligating Canada to meet its greenhouse gas reduction commitments. The Protocol calls for reducing overall greenhouse gas emissions by a global average of 5.2 per cent below 1990 levels in the commitment period of 2008 to 2012. The Federation of Canadian Municipalities (FCM) has encouraged cities to support the Kyoto Protocol. Although the federal government is bound to meeting the Protocol, participation by municipalities is voluntary.

As a first step in addressing Vancouver's impacts on climate change, the City and its Cool Vancouver Task Force, in December 2003, completed a Corporate Climate Change Action Plan, for reducing emissions from municipal operations. Over half of Vancouver's corporate greenhouse gas emissions were estimated to be from energy use in civic facilities; just over 35 per cent were from vehicle fleet operations; and almost 10 per cent were landfill emissions associated with the waste generated by City operations. Fleet emission estimates were based on City fuel use records.

Transportation related actions noted in the Corporate Action Plan include:

- Reducing the size of vehicles in the City's fleet,
- Shifting to "clean diesel" engine technology (new 2007 EPA standards),
- Increasing use of alternative fuels such as biodiesel and ethanol,
- Conducting a trial program for fuel-efficient driver training,
- Evaluating and using new vehicle technologies, and
- Implementing additional employee trip-reduction measures.



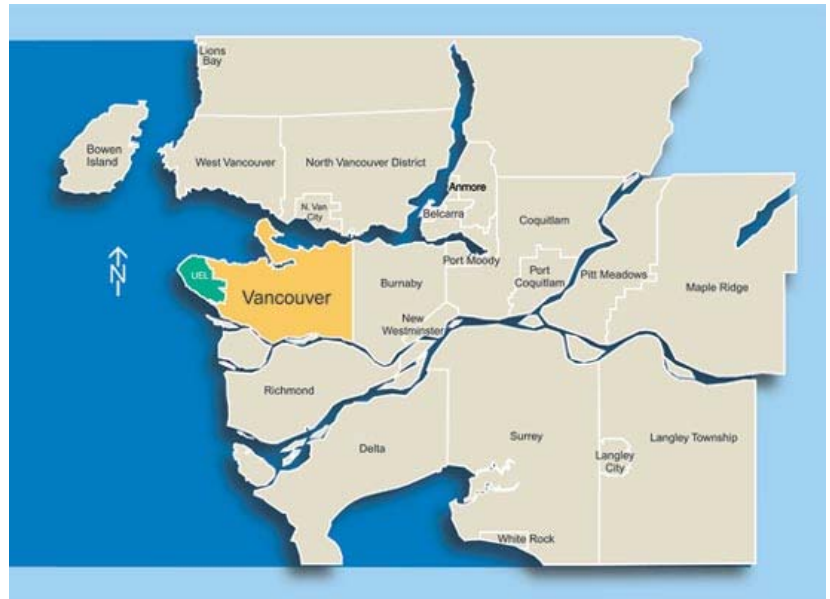
Corporate Climate Change Action Plan

With the above measures in place to address impacts from its own operations, the City and the Cool Vancouver Task Force began work on addressing the larger challenge of preparing a Community Climate Change Action Plan to reduce emissions generated from residents and businesses in Vancouver. Up until this point, the City had not been directly involved in vehicle emission reduction or monitoring initiatives. Although Vancouver's transportation plans (1997 Vancouver Transportation Plan, and 2002 Downtown Transportation Plan) support greater use of less polluting modes such as walking, cycling and transit, they do not contain any specific actions relating to vehicle emissions, other than endorsing initiatives at the regional level.

REGIONAL INFORMATION ON EMISSIONS

To provide a context for assessing Vancouver's greenhouse gas emissions, the region's long range transportation plan and emissions data were referenced. Greater Vancouver's long range transportation plan, Transport 2021 (1993), includes projections of vehicle greenhouse gas emissions for the 2021 planning horizon. If all of Transport 2021's transportation supply and demand management measures are implemented, the plan forecasts that transportation CO₂ emissions would likely climb 15% to 20% in 2021. If its measures were not implemented (i.e. current trends continued), the increase in CO₂ emissions was estimated to be 25% to 30%. Although there has been progress in implementing many of the measures in Transport 2021, overall implementation is lagging behind what the plan originally envisioned.

In 2003, the Greater Vancouver Regional (GVRD) published the report “Forecast and Backcast of 2000 Emission Inventory for the Lower Fraser Valley Airshed 1985-2025”. Emissions in the report were calculated using an emissions model. GVRD greenhouse gas emissions from vehicles are estimated to have increased 28% between 1990 and 2000. By 2010, regional vehicle emissions are estimated to increase by 50% over 1990 levels. Estimated emissions increase to 73% over 1990 levels by 2020, well above the highest estimate in Transport 2021.



Vancouver in relation to the rest of the Greater Vancouver region

If Vancouver travel characteristics were similar to the Greater Vancouver region, pro-rating Vancouver portion of the estimated regional greenhouse gas emissions would have been relatively straight forward. However, as shown in the following section, Vancouver mode patterns vary significantly from the region as a whole.

EXISTING MODE PATTERNS

Vancouver residents use transit more, and cycle and walk more than the region as a whole. The most recent published data on travel habits in the region is the 1999 Trip Diary Survey that was collected by TransLink (Greater Vancouver Transportation Authority). As shown in Table 1. below, in Vancouver only 46% of trips are by Auto Driver. This contrasts with the region as a whole, where 57% of trips are by Auto Driver. Also, in Vancouver, Auto Driver trips decreased slightly between 1994 and 1999, while Walking and Biking Trips increased substantially.

TABLE 1. Vancouver 24-hour Trips by Mode (1999 TransLink Trip Diary Study)

Mode	1994		1999		% Change Trips
	Trips	Share	Trips	Share	
Auto Driver	780,000	50%	762,000	46%	- 2%
<i>Transportation Alternatives:</i>					
Auto Passenger	239,000	15%	211,000	13%	- 12%
Transit	277,000	18%	311,000	19%	+ 12%
Walk	232,000	15%	312,000	19%	+ 34%
Bike	20,000	1.3%	44,000	2.7%	+ 127%

Accordingly, this suggested that the City would need to determine an alternative to simply allocating regional emissions by the proportion of Vancouver registered vehicles, to accurately estimate the City’s greenhouse gas emissions from passenger vehicles.

VANCOUVER'S VEHICLE EMISSION INVENTORY

Vancouver's transportation sector was split into two main categories – Light Duty Vehicles (GVW of 5000 kg or less) and Heavy Duty Vehicles (over 5000 kg). This criteria for Light Duty Vehicle (LDV) weight was adopted from the region's AirCare program, which currently requires mandatory testing of all passenger vehicles (for Common Air Contaminants).

Emission sources such as marine, air traffic, and rail freight transportation are not included in Vancouver's transportation sector emission inventory. This exclusion is consistent with national and international protocols for determining municipal emissions profiles, and reflects that these sources are largely outside of the regulatory jurisdiction of local governments.

A. Light Duty Vehicles

Greenhouse gas emission estimates for Light Duty Vehicles (cars, pickup trucks, vans, SUVs, etc.) are based on Vancouver's share of regional fuel sales, converted to tonnes of CO₂. Vancouver's allocation of gasoline consumed in Greater Vancouver was determined from the ratio of the mileage of vehicles registered and insured in Vancouver, compared to the total mileage of all vehicles registered and insured in the GVRD. Although the concept is straightforward, compiling and analyzing data from AirCare required a significant amount of work by City staff, to classify and match odometer readings in an 8 million record database. This approach offered the advantage of providing greenhouse gas emission estimates based on hard data (actual fuel consumed and odometer readings), compared to modeling.

This fuel sales method more closely reflects the ability of a municipality to control or influence vehicle emissions, compared to being responsible for all emissions within a municipality's geographic boundary. This means that the City is responsible for emissions from Vancouver based vehicles (owners live or work in Vancouver), regardless of whether they travel only in Vancouver or in other municipalities. On the other hand, emissions from vehicles that are only passing through Vancouver, with external origins and destinations, are not counted in the City's LDV emissions.

Some key results from the AirCare data are shown in Table 2. below.

TABLE 2. – Vancouver LDV Ownership and Estimated Annual GHG Emissions

	1990	2000	% Change
Insured Vehicles:			
Number	267,000	287,000	+ 8%
Per capita	0.56	0.51	- 9%
Emissions (tonnes of CO₂):			
Number	822,000	873,000	+ 6%
Per capita	1.7	1.6	- 6%

The number of vehicles in Vancouver rose by about 8%, between 1990 and 2000, although vehicle ownership on a per capita basis decreased about 9%. Similarly, total estimated emissions from these vehicles increased by about 6%, while on a per capita basis they decreased about 6%. Analysis also showed that the average distance per year Vancouver vehicles were driven also decreased during this time period. The fact that there was still an increase in total emissions can be attributed to consumer purchases of heavier and less fuel-efficient vehicles.

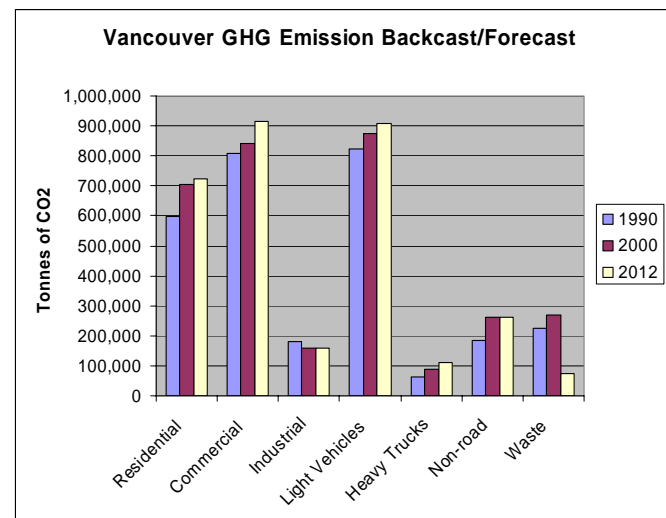
Vancouver’s relatively low growth in passenger vehicle emissions can be attributed largely to the success of existing City and regional transportation and land use plans. These plans strive to achieve Smart Growth through compact and complete communities where walking, cycling and transit are viable alternatives to the single occupant vehicle. Mixed land use at higher densities has helped support “access by proximity” and efficient transit services, making trips by walking, cycling and transit more viable.

B. Heavy Duty Vehicles

HDV estimates were based on GVRD emission modeling, since AirCare data was not available for these vehicles, and there was no data available that suggested that Vancouver HDV travel patterns were significantly different than the rest of the region. Between 1990 and 2000, Vancouver HDV emissions were estimated to increase from 64,000 tonnes to 89,000 tonnes.

C. Comparison to Other Emission Sources

As shown in the figure to the right, passenger vehicles were responsible for about one-quarter of Vancouver’s community greenhouse gas emissions, and are the second largest source of emissions, following closely behind commercial buildings.



APPROACH

The Community Climate Change Action Plan contains two main approaches to reducing greenhouse gas emissions from light duty vehicles:

Transportation Alternatives – Supporting a decrease in the amount of driving by Vancouver residents and employees, and

Vehicle and Fuel Efficiency - Improving vehicle and fuel efficiency for those trips that require the use of a car.

Driving less will mean switching some trips to alternatives (e.g., walking, cycling, transit and car-pooling) and eliminating or linking some automobile trips.

Transportation policies and actions in Vancouver are guided by the Vancouver Transportation Plan, the Downtown Transportation Plan, and Transport 2021 (region's long range transportation plan). Increasing

support of transportation alternatives, including a large increase in transit service, is a fundamental strategy in all of these plans and the approaches they propose are consistent with those described in the Community

Climate Change Action Plan. The Climate Change Plan is intended to complement existing transportation plans by:

- providing greenhouse gas reduction targets for Vancouver,
- detailing specific actions that the City can undertake to expedite vehicle trip reductions, and
- including new approaches that have been demonstrated as effective since the completion of the transportation plans.

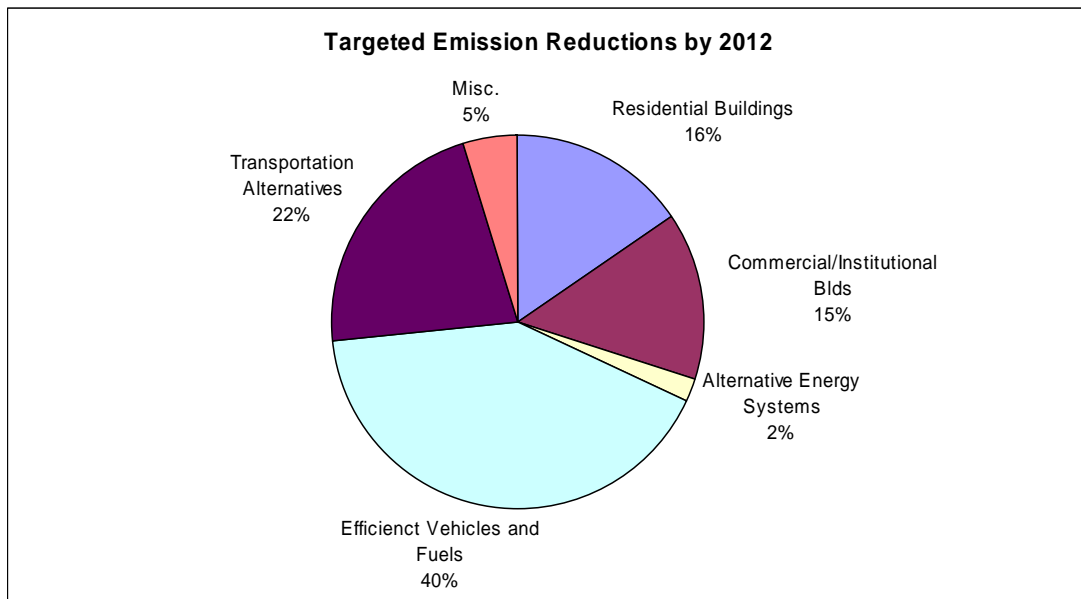
CO-BENEFITS

Although the Climate Change Plan's focus is reducing greenhouse gas emissions, reducing the amount that Vancouver vehicles are driven has a number of significant concomitant benefits that include:

- Reducing other types of vehicle related emissions (Common Air Contaminants) that contribute to health problems and environmental damage
- Reducing the need for expanding road and bridge capacity
- Helping to reduce the number of vehicle collisions
- Reducing impacts of automobiles on community livability (e.g. noise, short-cutting, etc.)
- Helping to improve health of children and adults (by further supporting active transportation modes such as walking and cycling)
- Improving goods movement (by reducing the number of vehicles on truck routes)
- Helping some individuals to save money (by reducing the number of vehicles owned)

EMISSION REDUCTION TARGET

The Cool Vancouver Task Force recommended that Vancouver adopt a 6% reduction target for greenhouse gas emissions from 1990 by 2012. This recognized the importance of setting a target that would challenge the entire community to make real emission reductions. At the same time, the target had to be one that could be achieved through concerted and coordinated efforts. The percentage allocations of the emission reductions between main categories of actions is shown in the chart below. Transportation Alternatives and Efficient Vehicles and Fuels make up the largest part of planned emission reductions (62%).



The Transportation Alternatives Target is equivalent to a 10% (90,000 tonnes / year) reduction in vehicle emissions from the 2012 “business-as-usual” forecast. This level of reduction within a seven year time frame is quite ambitious when compared to transportation plans from other jurisdictions in Canada and the United States. While this is an aggressive target, a number of factors provide optimism to believe that it is achievable with adequate implementation resources and community engagement.

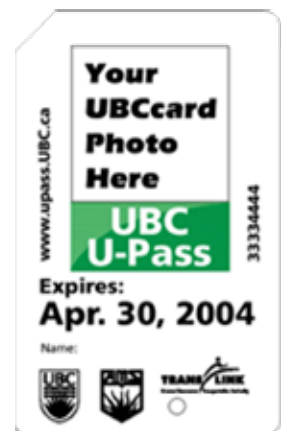
As noted earlier in the section on Emissions Inventory, key factors supporting the viability of decreased automobile use include:

- Vancouver is already a fairly dense city with numerous neighbourhood “mixed use” hubs - new growth is almost entirely occurring in parts of the city where people can live very close to employment, shopping, services, and recreational opportunities.
- The number of Vancouver trips made each day by automobile has already started to decrease slightly (2% reduction between 1994 and 1999).
- AirCare data has shown that the average annual distances Vancouver vehicles are being driven is decreasing.

Complementing these trends are significant increases in resources planned or allocated toward supporting alternatives including:

- TransLink’s 10-year Outlook, covering roughly the same time period as this Plan, targets the largest expansion of transit services ever in this region;
- Vancouver’s new Development Cost Levy makes significant new resources available to support transportation alternatives;
- Federal Government funding for transportation alternatives is increasing as demonstrated by Transport Canada’s Urban Transportation Showcase program (awarded in 2003) that includes \$8.8 million in transit and related improvements in Greater Vancouver,
- The growing toolkit of innovative but proven approaches for supporting transportation alternatives such as targeted marketing, car sharing, innovative use of parking, etc.; and
- The integrated approach proposed in the Climate Change Plan that clearly identifies concrete actions that the City can take and the resources required to do so.

While these trends and new resources all provide convincing reasons for optimism, they must be tempered by an awareness of the real challenges that must be overcome to achieve the target. Services such as U-Pass, Sky Train expansion, B-Line and Community Shuttle bus service have been very successful in shifting drivers to transit. The success of these programs, the conduciveness of Vancouver’s layout to transit usage, and our rapidly expanding population have lead to transit demand being at or exceeding capacity for much of the day. Overcrowding can result in passengers being passed by, and longer and less comfortable transit trips, which can be a deterrent to retaining existing transit users or attracting new ones. Although TransLink’s 2005-2007 Three Year Plan calls for increasing transit funding, most resources will need to go towards meeting existing service needs. As a result, early implementation actions in the Climate Change Plan focus on other alternatives, especially active transportation.



Popular UBC U-Pass

Other challenges to increasing the use of transportation alternatives include:

- fixed costs of automobile ownership

- inconvenience (real or perceived) - including time, inclement weather, “cargo” capacity, etc.
- flexibility, such as requiring a car for work purposes or needing to respond to unforeseen circumstances
- safety concerns (real or perceived) – including driver behaviour, lack of dedicated routes, street crossings, and personal security on the street or at transit stops
- lack of secure and convenient end-of-trip facilities including bicycle parking, showers, lockers, etc.
- lack of awareness of alternatives and their associated benefits

The strategies and actions recommended in the Community Climate Change Action Plan have been developed to address these types of barriers and make the use of transportation alternatives as easy and desirable as possible.

PLANNED EMISSION REDUCTION MEASURES

Key actions in the Climate Change Plan for reducing passenger vehicle emissions are summarized below:

1) Transportation Alternatives (Reduction Target – 90,000 tonnes CO₂ / year)

Strategies and initial actions by the City to provide improved transportation alternatives and to promote the use of those alternatives include:

- Increasing funding in future Capital Plans for pedestrian, cycling, and transit priority infrastructure improvements.
- Developing a cycling end-of-trip and bike parking facility plan for downtown and other major destinations.
- Including the marketing of transportation alternatives in the City’s community engagement program for the Plan (community events, recognition and awards, community grants, etc.).
- Implementing a Green Trips to School Program that includes increased program outreach and school support staffing, visible Council and School Board support, partnerships with health promotion and pedestrian safety programs, and a school grant program.
- Developing a comprehensive parking strategy that uses both on- and off-street parking supply, priority access, and pricing to promote the increased use of transportation alternatives.
- Developing a pedestrian and cyclist safety program that includes increased enforcement as well as education.
- Implementing a widely accessible safe cycling skills course in partnership with schools and community centres.
- Updating of Vancouver’s Transportation Plan mode share targets to reflect the objective of reducing total travel by passenger vehicles by 10% by 2012.
- Requesting that TransLink and the Greater Vancouver Regional District complete the Regional Parking Strategy and the Regional Tolling Policy outlined in TransLink’s 2005-2007 Three Year Plan and 10-Year Outlook by the end of 2006.
- Having the City and TransLink include reviews of GHG emission impacts/reductions in all major transportation plans, including the Vancouver Transit Area Plan.



2) Vehicle and Fuel Efficiency (Reduction Target – 160,000 tonnes CO₂ / year)

Strategies and initial actions to support and promote improved vehicle and fuel efficiency include:

- Advocating in cooperation with NGO's, the Union of British Columbian Municipalities, the Federation of Canadian Municipalities, and other partners for timely and meaningful federal action on improved fuel efficiency standards for vehicles along with tax incentives/disincentives measures.
- Incorporating approaches to support very fuel efficient vehicles in the parking strategy for Transportation Alternatives.
- Implementing an idle-free awareness campaign and bylaw.
- Participating in and supporting regional and national partnerships to promote more efficient vehicles, vehicle operations, and renewable fuels such as the development of a fleet environmental performance standard, a tire inflation awareness campaign, a hybrid taxi initiative, and a Bio-diesel Market Transformation Project.



A full description of emission reduction measures to address greenhouse gases generated by passenger vehicles is contained in Sections 8 and 9 of the Community Climate Change Action Plan - to download a copy of the Plan, follow the link at <http://www.city.vancouver.bc.ca/sustainability/coolvancouver/>.

CONCLUSIONS

Passenger vehicles are the second largest source of greenhouse gas emissions in Vancouver. Two main strategies are planned to tackle the challenge of reducing these emissions:

- Increased use of transportation alternatives, for savings of 90,000 tonnes per year
- Improved vehicle and fuel efficiency, for savings of 160,000 tonnes per year

Together, these savings will meet over 60% of the City's overall greenhouse gas emission reduction target. The remaining contributions for meeting the City's Kyoto Protocol goals will come from other sectors such as residential and commercial buildings efficiency improvements, alternative energy systems, etc. Although the vehicle emission measures proposed in Vancouver's Community Climate Change Action Plan are intended to address greenhouse gases, they will also offer a number of significant co-benefits, ranging from reductions in other air contaminants to helping to improve community health.