CEEI Report Review and Comparison to Metro Municipalities

June 2009
www.cnv.org

141 West 14th Street North Vancouver BC V7M 1H9 | Tel: 604 985 7761 | Fax: 604 985 9417 | www.cnv.org

City of North Vancouver CEEI Report Review and Comparison to Metro Municipalities Introduction

The Province of British Columbia released the draft Community Energy and Greenhouse Gas Emissions Inventory (CEEI) in April 2009 to assist local governments in tracking and reporting annual community wide energy consumption and greenhouse gas (GHG) emissions. This initiative reduces burdens on local governments and data providers, supports higher-level GHG objectives and forwards the ability to make meaningful comparisons between communities.

The City of North Vancouver has undertaken this analysis of the CEEI as part of its continued efforts towards sustainability in its own community. It views this report as an initial exploration of how the CEEI will enable local governments to evaluate more accurately their current GHG contributions and support the Provincial mandate for substantial reductions over the coming decade.

Table of Contents:

Section One
CEEI Report

The first section of the *City of North Vancouver CEEI Report Review and Comparison to Metro Municipalities* summarizes recent Provincial legislation regarding greenhouse gas emissions and introduces the CEEI format, methodology and limitations.

- British Columbia has adopted aggressive targets for GHG reduction
- CEEI provides consumption data and related emissions for three primary sectors
- CEEI does not account for all emissions produced within or attributable to a community
- Building subsector data quality is a substantial limitation
- Low Provincial GHG intensity for electricity generation encourages analysis of energy consumption as well as emissions
- Vehicle kilometres travelled data quality is a substantial limitation

Section One Contents:

1.1 Community Energy and Emissions

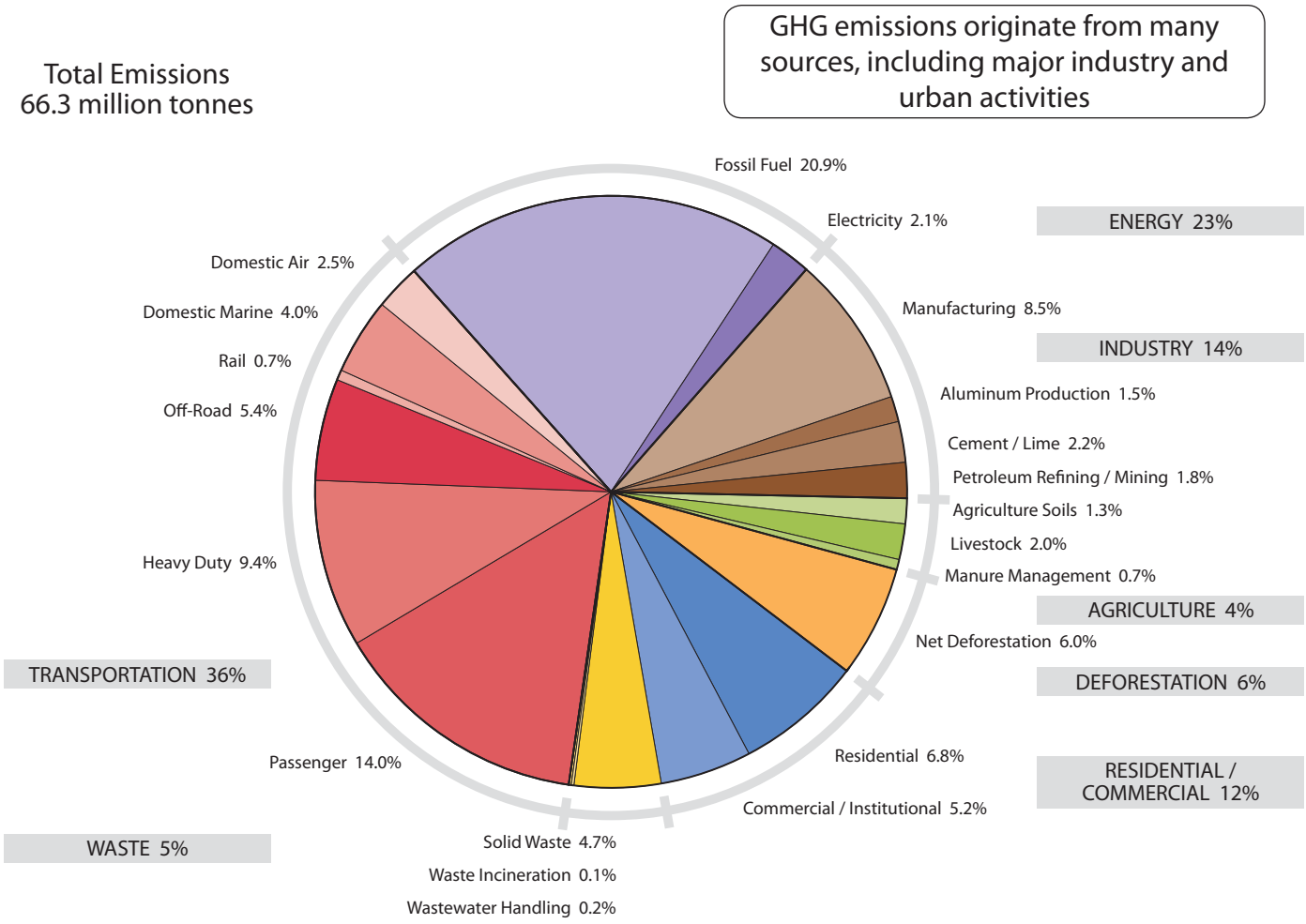

Figure 1.1: 2006 Provincial Emissions by Sector
Data source: Province of British Columbia *Climate Action Plan*

1.1.1 Provincial Emissions Planning

The 2007 Provincial enactment of the *Greenhouse Gas Reduction Targets Act* (GGRTA) identified climate change as critically important. With British Columbia's annual emissions exceeding 66 million tonnes of carbon dioxide equivalent, this legislation signalled a major step towards confronting the Province-wide contribution to global warming.

The 2006 British Columbia inventory illustrates the range of sources of greenhouse gas emissions (Figure 1.1). Some of the contributing sectors are difficult to influence at the level of local or regional governments. Others, including energy, mining and aluminum production may result in intensive emissions in remote areas, but generate products consumed in urban areas. In 2008, the Province passed legislation to monitor and regulate emission-intensive facilities in order to develop an equitable and effective means of reducing or mitigating these GHG sources.

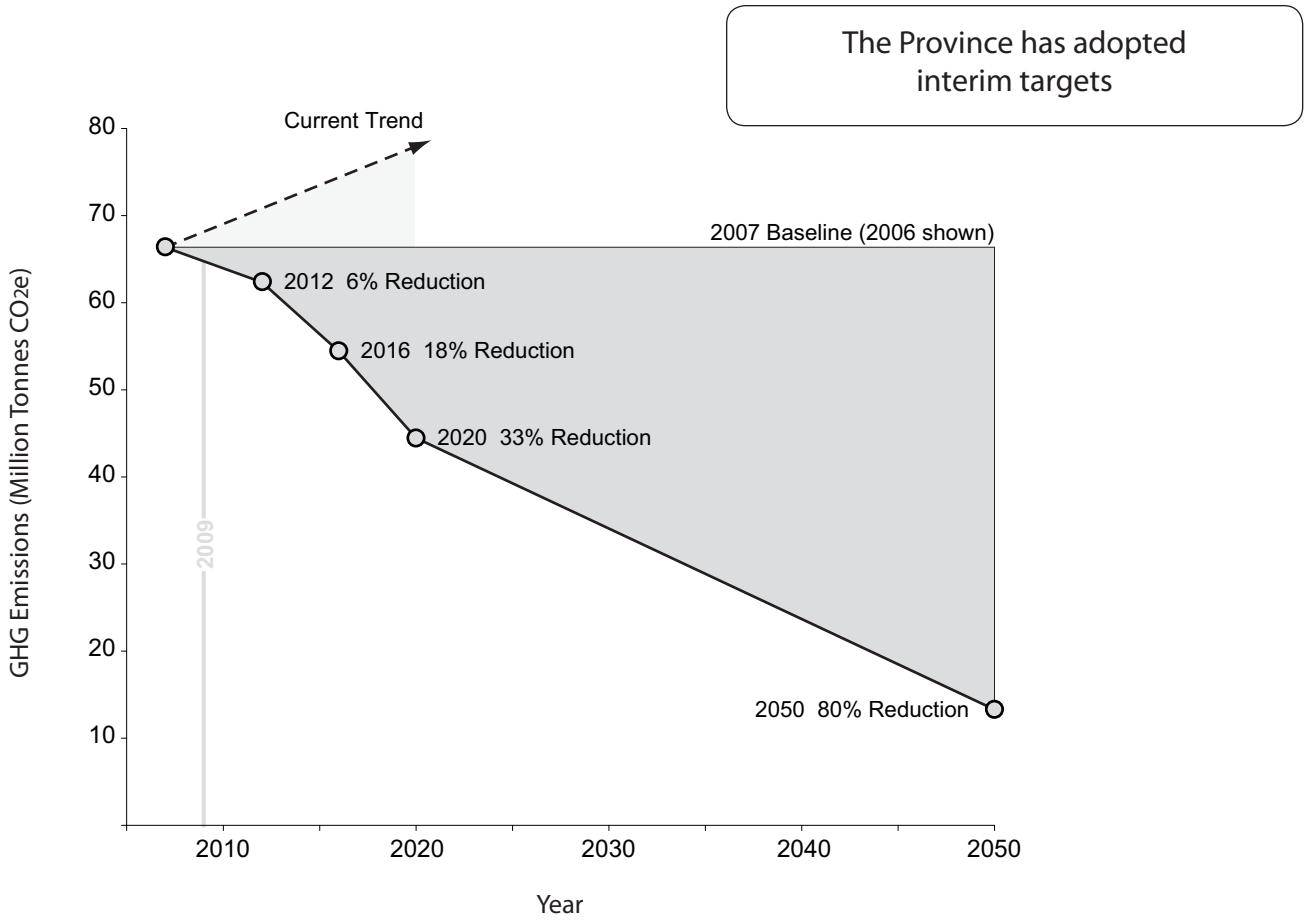

Figure 1.2: Relation of Density to Passenger Vehicle Emissions
Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

Significantly, the GGRTA established specific targets mandating that total British Columbia emissions be reduced by 33% by 2020 and 80% by 2050 (Figure 1.2). The Province subsequently set interim targets of 6% reduction by 2012 and 18% by 2016 based on realistic and economically viable strategies. Pending the release of the 2007 Provincial inventory, 2006 emissions are presented as the baseline for reductions in Figure 1.2. This total is the sum of the 2006 National Inventory Report for British Columbia and the Provincial estimate of the impact of net deforestation for the year.

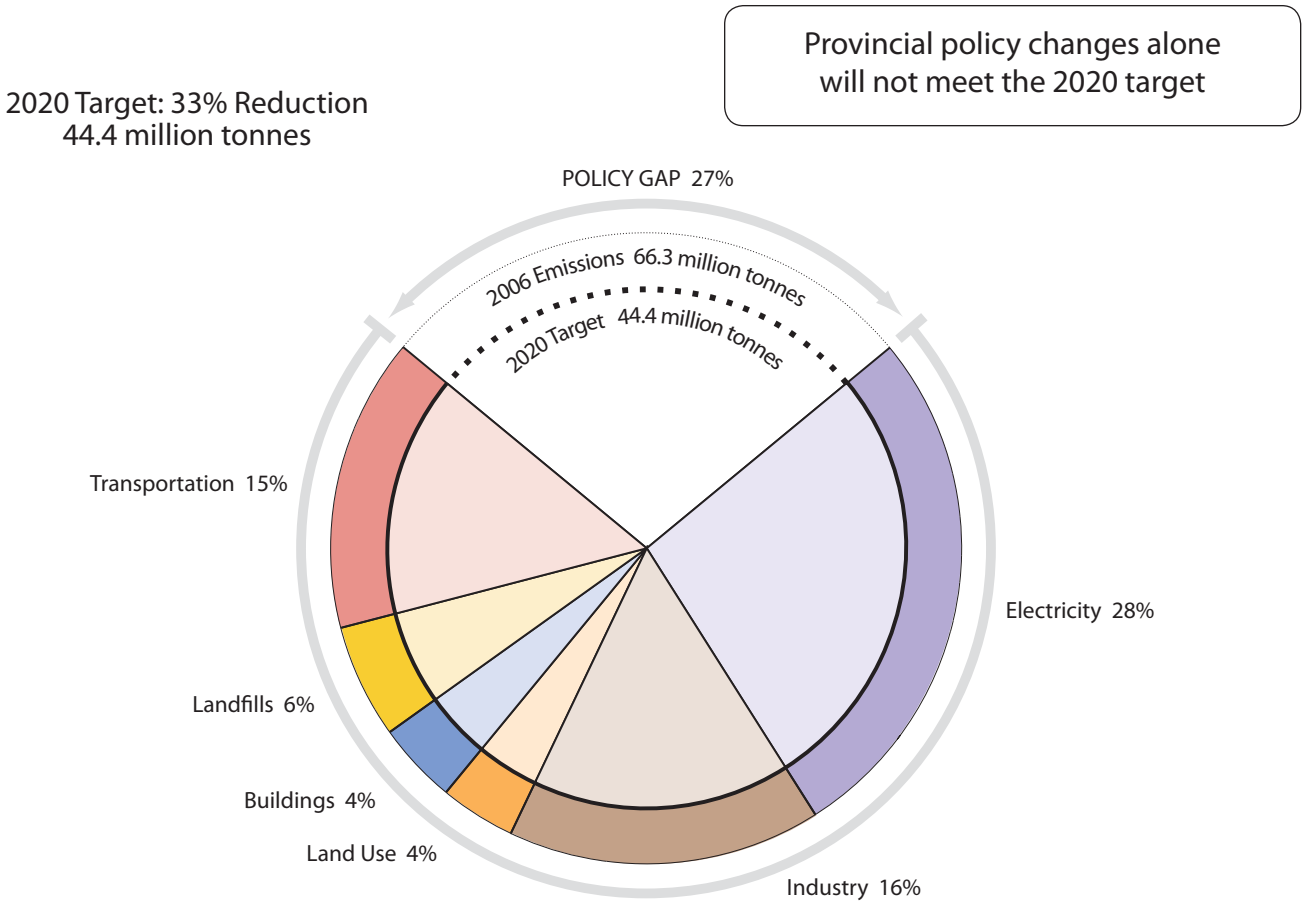

Figure 1.3: 2020 Target Reductions by Sector
Data source: Province of British Columbia *Climate Action Plan*

Without substantial action, Provincial emissions are expected to continue their upward trend, resulting in annual emissions of 78 million tonnes by 2020. In 2008, the Province identified through its *Climate Action Plan* policies to reverse this direction and narrow the distance between current emission levels and adopted targets. These changes can be implemented relatively quickly and have the potential to meaningfully reduce emissions in all major sectors. However, there remains a *policy gap* of 9 million tonnes, or 27% of the reduction necessary from projected emissions to meet the 2020 GGRTA target (Figure 1.3).

Recognizing that 43% of emissions are under the influence of regional districts and municipalities, the Province requires that all local governments identify GHG reduction targets, policies and actions in their Official Community Plans. In order to forward these efforts, the Province recently released draft Community Energy and Emissions Inventories (CEEIs) for all local governments in British Columbia.

As part of its commitment to reduce its community GHG emissions and further the goals set forth by the GGRTA, the City of North Vancouver has undertaken this analysis of the CEEI. This builds upon the City's continued efforts to foster a sustainable community, including participation in the Federation of Canadian Municipalities *Partners for Climate Protection Program*, alignment of its Official Community Plan with Metro Vancouver's *Liveable Region Strategic Plan*, completion of its 2005 *Greenhouse Gas Local Action Plan*, and undertaking the development of a *100 Year Sustainability Vision*.

Energy conservation and emissions reduction are of critical importance to any local government plan. These issues impact the economic development, efficiency, health and environment of communities. The CEEI supports the City's current work towards updating its community inventory and will assist in identifying the best means for the City to reach its GHG reduction targets.

1.1.2 Inventory Format

Many organizations participate in the significant effort to develop standards for GHG emissions accounting and encourage their universal adoption. The 2007 *Community Energy and Emissions Inventory (CEEI) Reports User Guide* documents the Province's methodology and its adherence to accepted international practice. For issues in which competing approaches remain, the reasoning behind its selection is provided.

Through Provincial efforts, a considerable expansion in accessible data has been achieved. However, there remain limitations in the availability and quality of emissions accounting. The *User Guide* notes the majority of these limitations, and the City has emphasized and clarified those issues that are most significant to the wider application of the CEEI.

In April, 2009, the Ministry of Environment released draft 2007 CEEI reports for British Columbia regional districts and municipalities. Reports provide aggregated annual energy consumption and the equivalent carbon dioxide (CO_2e) emissions for three sectors: Buildings; On Road Transportation; and Solid Waste. In addition to the inventory release, the Province provided direction for their interpretation and use in the *User Guide*. Unless otherwise noted, descriptions of the *User Guide* refer to the March 2009 draft. It is further advised that data availability and methodology may vary between Metro Vancouver and other regions of the Province.

The Ministry of Environment and its consultants utilize the 2006 *IPCC Guidelines for National Greenhouse Gas Inventories* for GHG emission factors; BC Hydro provides the 2007 emission factor for electricity. Electricity and natural gas consumption are reported by the delivering utilities. Data sources for on road transportation are ICBC, NRCan, USEPA and AirCare. Metro Vancouver provides municipal waste disposal rates and estimated methane emissions from regional disposal facilities.

1.2 Methodology

1.2.1 Scope

The CEEI is not exhaustive of all emissions produced within a local government's bounds or attributable to a community's actions. Rather, it provides reliable consumption information and the resulting emissions for specified activities in the included sectors. Many sectors and subsectors are omitted due to the technical difficulty of measuring and assigning these emissions. Descriptions follow outlining the emissions sources and metering utilized for each included sector.

1.2.2 Buildings Sector

The building sector is defined by the electricity and natural gas delivered by the four major utilities in British Columbia—BC Hydro, Fortis BC, Terasen Gas Inc., and Pacific Northern Gas Ltd.—and includes non-building uses such as streetlights, water pumping stations, and energy-based industrial processes. Actual rather than normalized energy is considered, and utility connections are assigned to the following subsectors:

- Residential (single family and multifamily homes)
- Commercial (businesses, retail outlets and institutional and government)
- Industrial

Electricity purchased by local governments is included, although electricity distributed by systems other than the major utilities above (e.g. industrial self-generation) is not. Further, emissions from heating oil, propane and wood as well as those caused by non-energy consuming processes (e.g. chemical reactions during the production of industrial goods) are not included.

1.2.3 On-Road Transportation Sector

The transportation sector is currently limited to registered, on road vehicles. Vehicles are assigned to one of the following classifications:

- Motorcycles and mopeds
- Small passenger cars (< 1400 kg e.g. Honda Civic)
- Large passenger cars (> 1400 kg e.g. Ford Crown Victoria)
- Light trucks and vans (< 3600 kg) , passenger vans and SUVs
- Motorhomes
- Buses (transit and private)
- Commercial vehicles (cargo vans, panel trucks, heavy trucks, ambulances and fire trucks)
- Tractor trailer trucks

Marine, rail and air transportation is not included. Vehicles not licensed for public roads (e.g. bulldozers, forklifts, ATVs) and licensed heavy equipment (e.g. rollers, pavers, backhoes, graders) are also omitted.

1.2.4 Solid Waste Sector

The waste sector estimates the share of methane emissions resulting from the annual mass of municipal solid waste (MSW) disposed of at regional district landfills. Emissions resulting from waste processed by Metro Vancouver's Waste-to-Energy facility are also included. However, waste disposed at regionally operated landfills (e.g. forestry landfills), some industrial waste, compostable material, green waste, waste originating from federal lands and demolition, land clearing and construction (DLC) tonnage are omitted.

Since Metro Vancouver tracks the amount of annual waste contributed by member municipalities, the CEEI utilizes a waste commitment methodology for the region. This approach estimates the total potential future landfill gas production from waste when deposited. Methane utilized or flared is subtracted from potential waste emissions when known.

1.2.5 Summary of Limitations

The CEEI data is currently released as draft reports, and the Province anticipates updates to the 2007 CEEI in conjunction with the annual release of subsequent inventories.

The *User Guide* further identifies several technical limitations that impact the quality of CEEI data. The City considers two to be significant barriers to the broader application of the inventory in urban municipalities:

- The distance that a vehicle is driven annually is assigned uniformly to all vehicles with the same registration characteristics in the region
- Many multifamily residential and mixed use buildings are assigned as commercial natural gas connections

Additionally, the atypical emissions intensity for electricity production distorts CEEI emissions in relation to energy consumption. The low emissions factor due to Provincial hydroelectric resources may bias the adoption of high-grade energy for space heating to meet reduction mandates and goals.

The inventories of many British Columbia local governments are impacted by significant boundary issues. Similar to most urban communities, the City's data set boundary issues are not presumed to have a meaningful influence on data confidence.

A full description of these issues is compiled in *Appendix A: CEEI Limitations* of this report.

Section Two
City of North Vancouver CEEI

The second section of *City of North Vancouver CEEI Report Review and Comparison to Metro Municipalities* reviews the City of North Vancouver CEEI in detail.

- Emissions are closely divided between Buildings and On-Road Transportation with the remaining 3% attributed to Solid Waste
- 31,600 passenger cars, light trucks, vans and SUVs account for 43% of total emissions
- Building energy use is closely divided between electricity and natural gas

Section Two Contents:

2.1 Emissions

The City has total emissions of 225,764 tonnes CO_2e, split evenly between the Buildings (47.9%) and On Road Transportation sectors (49.1%). Community Solid Waste accounts for the remaining 3.0%.

Within the Buildings sector (and noting the limitations of separating residential and commercial subsectors), residential connections are responsible for 34.1% of building emissions (16.3% of total emissions), commercial 52.8% (25.3% of total) and industrial 13.8% (6.6% of total). By energy source, 91.9% of Building emissions and 44.0% of total emissions are from natural gas use.

Due to limitations noted previously, it is not possible to accurately separate residential and commercial natural gas connections. Without this information, it remains unknown how many of the electrical connections utilize gas for space heating. Further, without detailed analysis of the productivity and type of industry in the City and knowledge of industry standards, it is difficult to determine the relative efficiency of the City's industrial facilities.

Small and large passenger vehicles, light trucks, vans and SUVs together account for 86.8% of on-road and 42.6% of total emissions. While some of these vehicles may be used for commercial purposes, it is likely that a significant majority can be attributed to personal driving. The impact of these 31,644 vehicles is substantial, noting that the accuracy of vehicle emissions data suffers from limited VKT quality. Although the significance of emissions from other types of vehicles—commercial, tractor trailer trucks, motorhomes, motorcycles, mopeds and buses—should not be discounted, combined they comprise a minority (13.2%) of sector emissions.

Reducing vehicle emissions is challenging at the municipal level. Improved fuel efficiency standards, continued inspections and less GHG intensive energy sources will decrease emissions per kilometre driven. Regional investment in mass transit and a widespread commitment to compact development are also likely to reduce on road emissions.

The reported fuel consumption per vehicle is relatively low in the City, indicating the use of more fuel efficient vehicles. It is not known whether this is due to a smaller and/or newer average vehicle. More detailed information about the driving stock of the City will support a better understanding of the On Road Transportation sector.

Emissions from vehicles and buildings are roughly equal

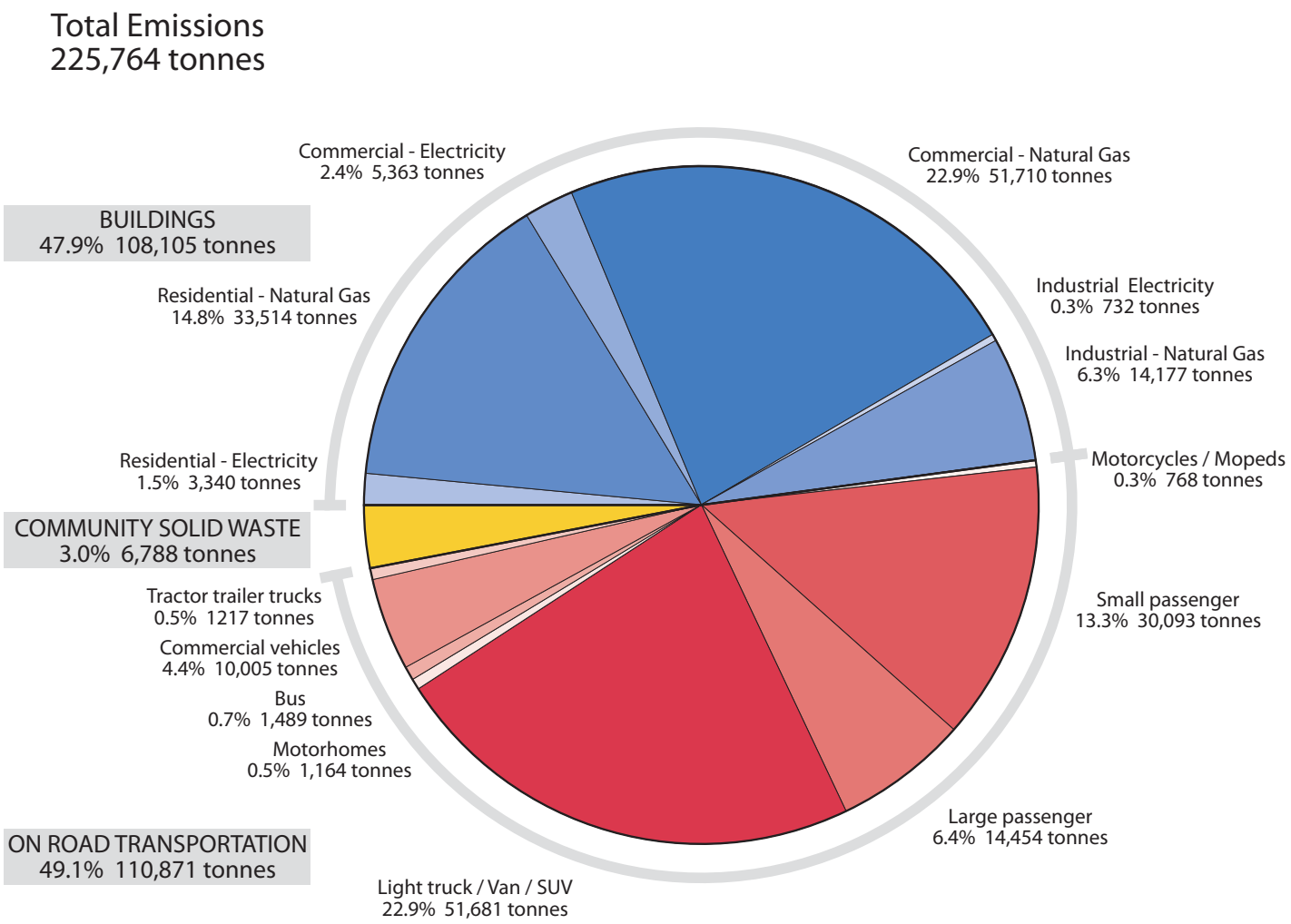

Figure 2.1: Subsector Emissions - City of North Vancouver
Data source: BC MoE *2007 North Vancouver City CEEI*

2.2 Energy Consumption

The City has total energy use of over 5 million GJ. Buildings account for 69.3% of energy use and On Road Transportation accounts for the balance (30.7%).

Residential buildings consume 34.6% of total Building energy (24% of total), commercial 54.4% (37.7% of total) and industrial 11.0% (7.6% of total). Natural gas accounts for just over half (55.5%) of Buildings sector energy use and 38.5% of total energy consumption.

Small and large passenger vehicles, light trucks, vans, and SUVs together account for 86.8% of On Road Transportation energy and 26.6% of total energy consumed.

Buildings consume the majority of the City's energy

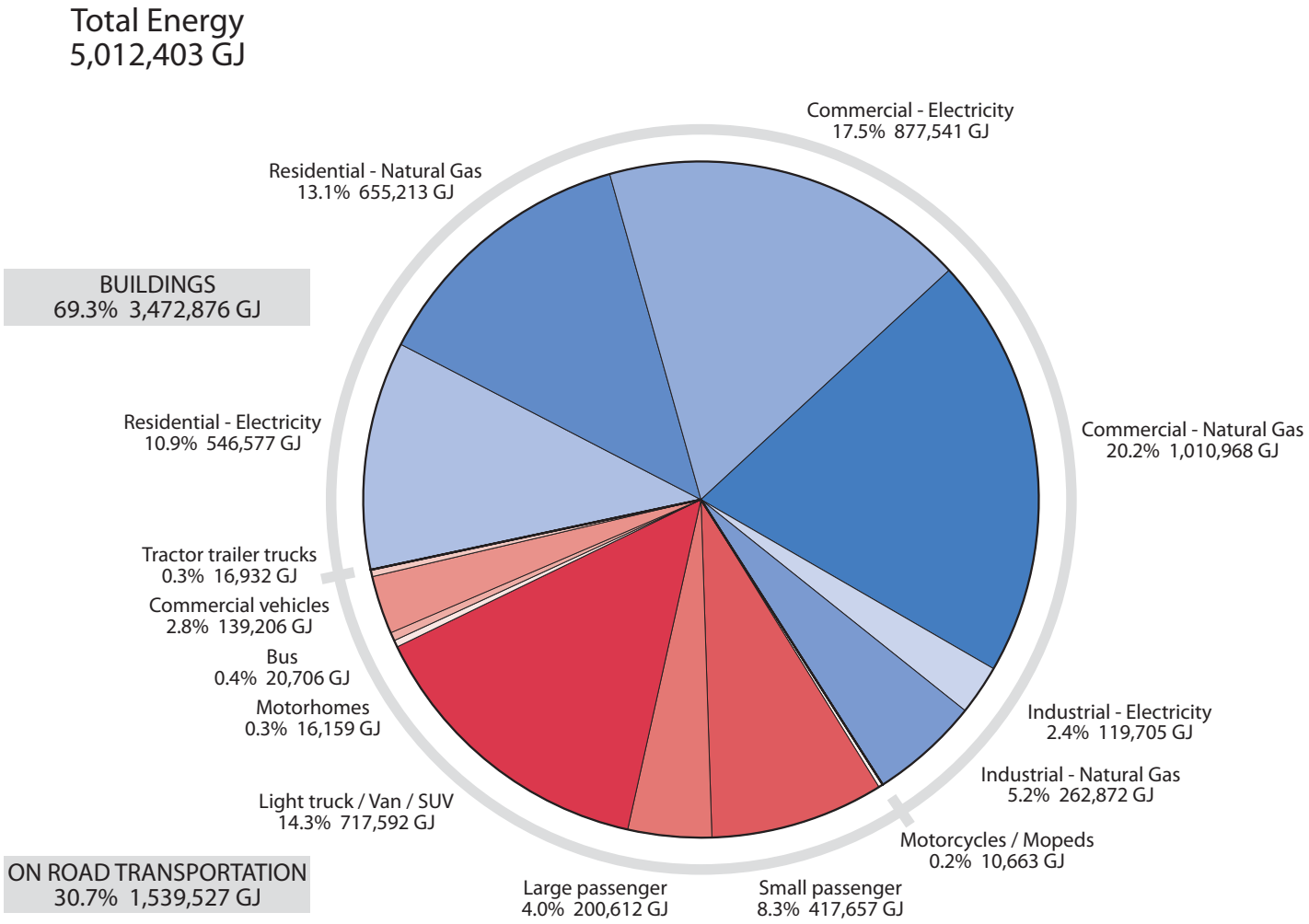

Figure 2.2: Subsector Energy Consumption - City of North Vancouver
Data source: BC MoE *2007 North Vancouver City CEEI*

Section Three
Comparison of Metro Municipalities

The third section of *City of North Vancouver CEEI Report Review and Comparison to Metro Municipalities* compares the CEEI findings of 21 Metro Vancouver municipalities to provide context to the City's specific report.

- Several municipalities are impacted by withheld data or atypical utility arrangements
- Variations between Metro community profiles correlate to relative GHG emissions
- Even the best performing municipalities are far from zero emissions
- There is a correlation between density and per capita emissions
- The City of North Vancouver and Vancouver have the lowest per capita emissions
- The City of North Vancouver ranks well in measures for non-vehicle use, but has a higher per capita vehicle registration than some other municipalities
- The City of North Vancouver is near the Metro median in per capita solid waste emissions
- There may be a correlation between jobs and waste emissions

Section Three Contents:

3.1 Value of Comparative Analysis

Figure 3.1: Metro Vancouver
Data source: StatsCan *Vancouver CMA*

3.1.1 Baselines

Attempts to inventory emissions benefit from both the continued study of greenhouse gases and increased resources to improve accounting. Advances in the employed methodology—and the accessibility of the data required—also cause inventories to become obsolete quickly.

One purpose of the CEEI is to assist local governments in developing targets, policies and actions to manage GHG emissions. Benefit is also identified in establishing a base year so that communities can track the effectiveness of their efforts. However, as refinement of the methodologies and relevant input data continues, baseline inventories are also revisited to reflect these updated assessment practices.

The City's 1995 baseline, completed in March 2001 in accordance with the *Partners for Climate Protection Program*, supported the City's community emissions reduction target. The 2010 interim target is approaching, and a review of this early effort illustrates the substantial evolution of accounting practices during the past several years. Despite these changes, the 1995 baseline was intrinsic to the later development of the City's *Greenhouse Gas Local Action Plan* and the implementation of a variety of policies and actions to manage community GHG emissions.

The increased sophistication of the 2007 CEEI demonstrates a significant improvement from previous inventories and forwards municipal efforts to support the Provincial GHG reduction targets. The availability of CEEIs for British Columbia's local governments produced under a single methodology provides even greater benefit by supporting comparative analysis. While acknowledging the range of weaknesses affecting the inventories and related concerns regarding their comparability, the CEEIs collectively represent an important resource that can assist municipalities in directing their efforts.

3.1.2 Exclusions

Different service providers, boundary issues and exclusions may limit the accuracy emissions comparison. Although some of these challenges are avoided by common utility providers in the Lower Mainland, the remaining weaknesses with the data are identified when known. Efforts to respect customer confidentiality may limit some data since utilities withhold all data within a subsector when a single account constitutes a majority of the consumption for that subsector. Exclusions impact reporting for Anmore, City of Langley, New Westminster and Port Moody as well as the Metro Vancouver inventory; these communities are omitted from comparisons that involve the withheld emissions.

Considering the twenty-one local government reports within Metro Vancouver (Figure 3.1) may indicate strengths and weaknesses in the City's approach to reducing the harmful impacts of greenhouse gas emissions. Further, this comparison provides a reference for future inventories; recognizing a sector with marked improvement in a municipality may indicate a local programme that the City should consider implementing. Due to variations in data availability, Electoral Subdivision A and First Nations are not considered.

3.2 Community Profiles

3.2.1 Census Data

The cities, villages and regional districts comprising Metro Vancouver vary widely in regards to land area and population. A review of these characteristics provides a critical foundation for the consideration of the CEEI report and supports the comparative analysis of Metro Vancouver municipalities.

The Statistics Canada *2006 Census* is used to interpret the reported emissions. Although the figures have been compiled and released by either the Province or Metro Vancouver when noted, few additional outside sources are utilized. By limiting data sources, this report delimits the range of weaknesses to those generally associated with the Census (including undercount) or previously attributed to the CEEI. Only the Census Subdivision geographic level—municipalities and their statistical reporting equivalents—is considered. Consequently, variations within a community's bounds such as town centres or rural subdivisions are not considered separately from the municipality as a whole.

Traditional density calculations
do not adequately reflect regional
development patterns

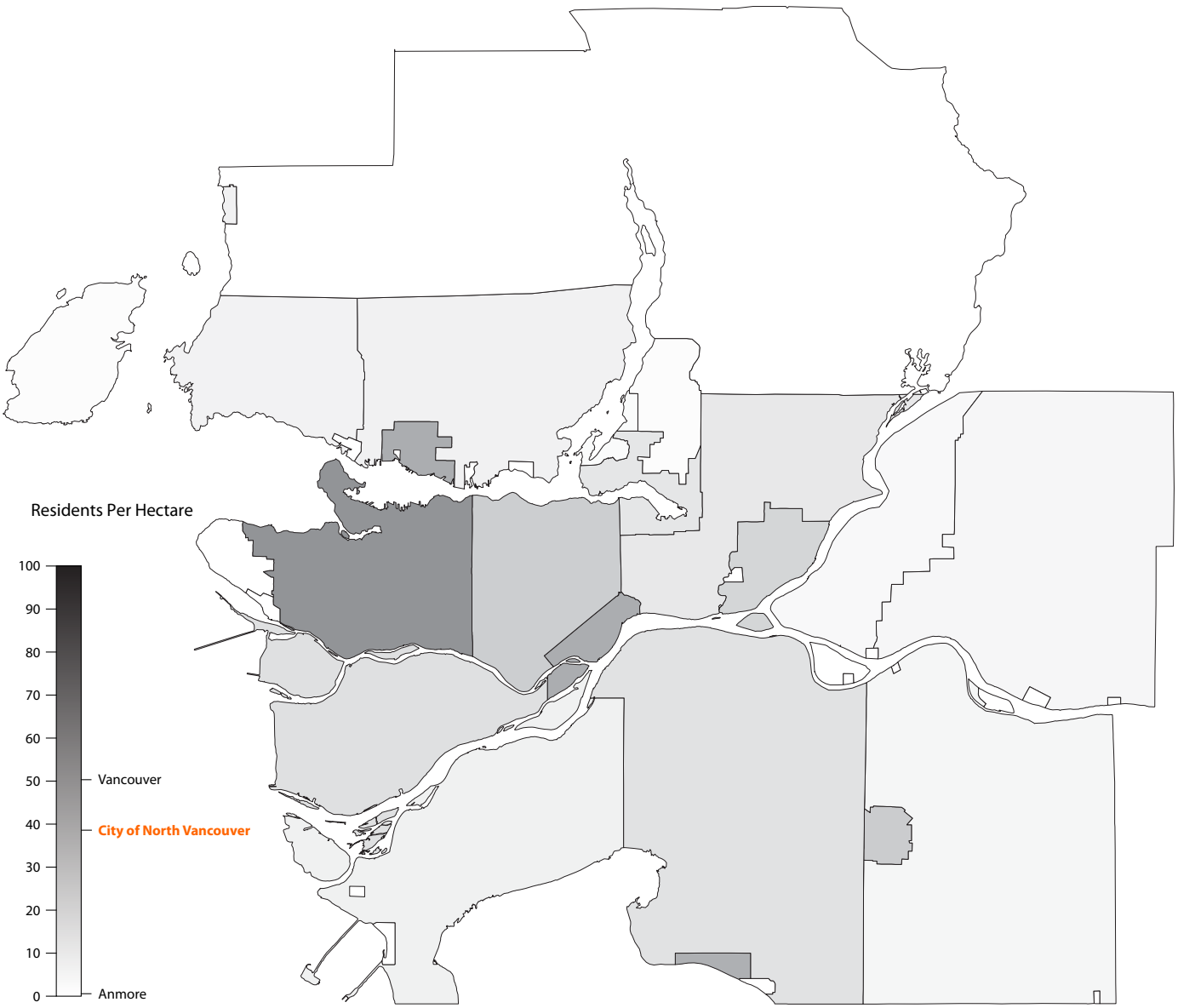

Figure 3.2: Residential Density of Metro Municipalities Not Excluding Green Zone
Data source: StatsCan *2006 Census*, *Vancouver CMA*

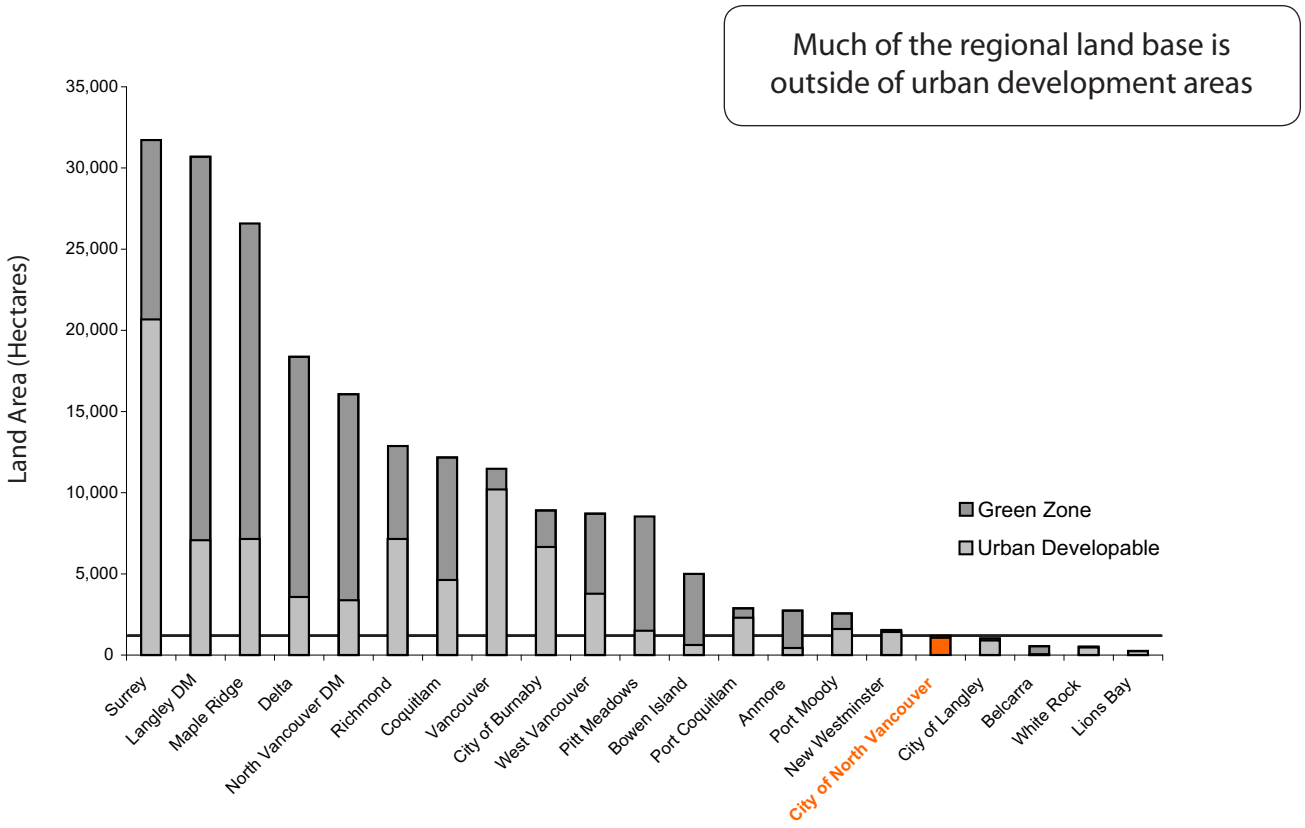

Figure 3.3: Total Municipal Land Area and Green Zone
Data source: StatsCan *2006 Census*, GVRD *Liveable Region Strategic Plan*

3.2.2 Density

The conventional measure of population density considers the residential population divided by the total land within municipal bounds (Figure 3.2). For the purpose of interpreting GHG data for Metro municipalities, this report exercises two adjustments to this figure: the inclusion of employment; and the exclusion of the Green Zone, the agricultural reserve, recreation and conservation areas designated by the regional district in 1996 (Figure 3.3).

First, job provision is a critical goal of a balanced community. Since workers as well as residents consume energy and contribute to emissions, it is more meaningful to consider population as the total of employees and residents (Figure 3.4). Second, jobs and residents are not distributed across the Green Zone at the same intensities as land assigned to urban use. There is also a regional commitment to preserve the Green Zone from inappropriate development. For the above reasons, density is more accurately considered as the sum of residents and employment divided by the net developed area of a municipality, exclusive of lands recognized within the Green Zone (Figures 3.5 and 3.6).

Using this metric, the City has an adjusted land base of 1,062 hectares. With over 45,000 residents and 28,000 jobs, it is the second densest municipality in the Metro Vancouver region.

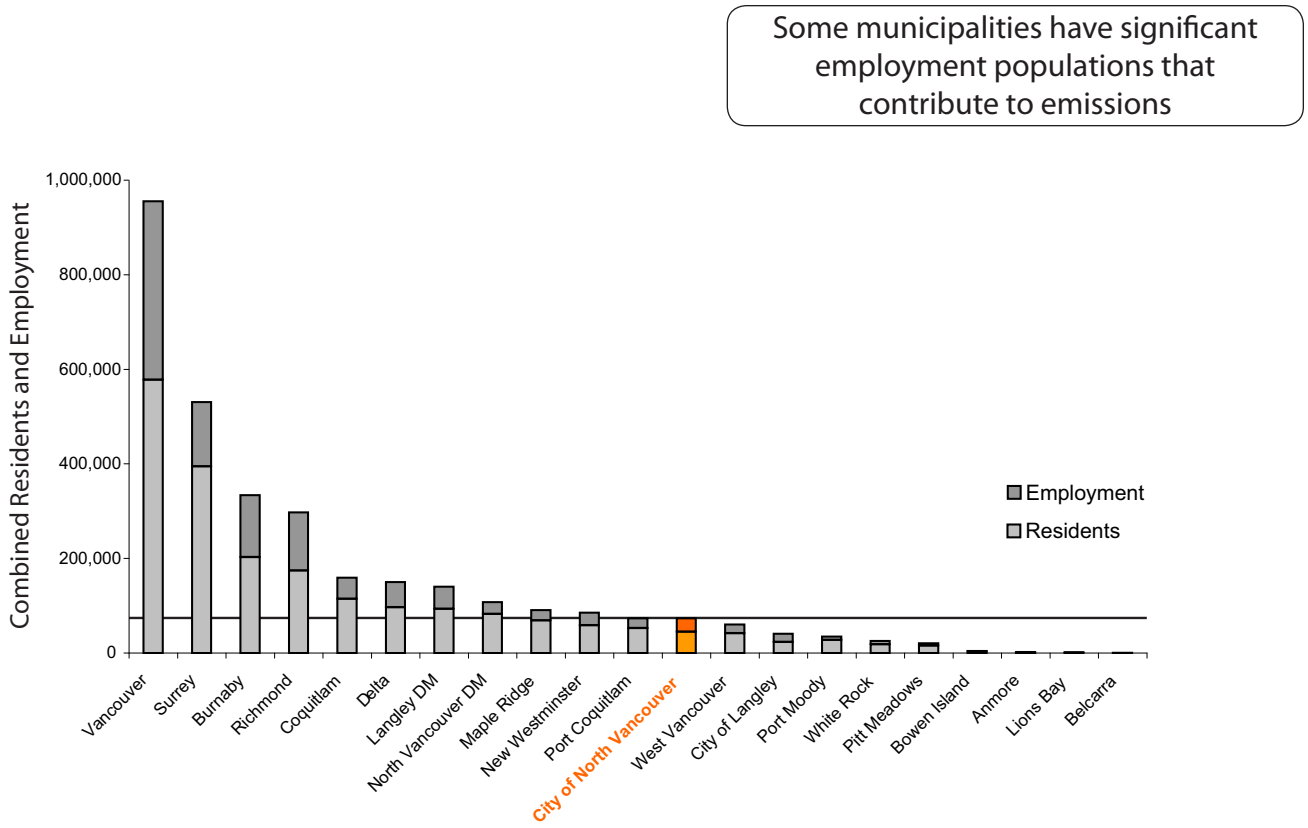

Figure 3.4: Combined Residents and Employment
Data source: StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

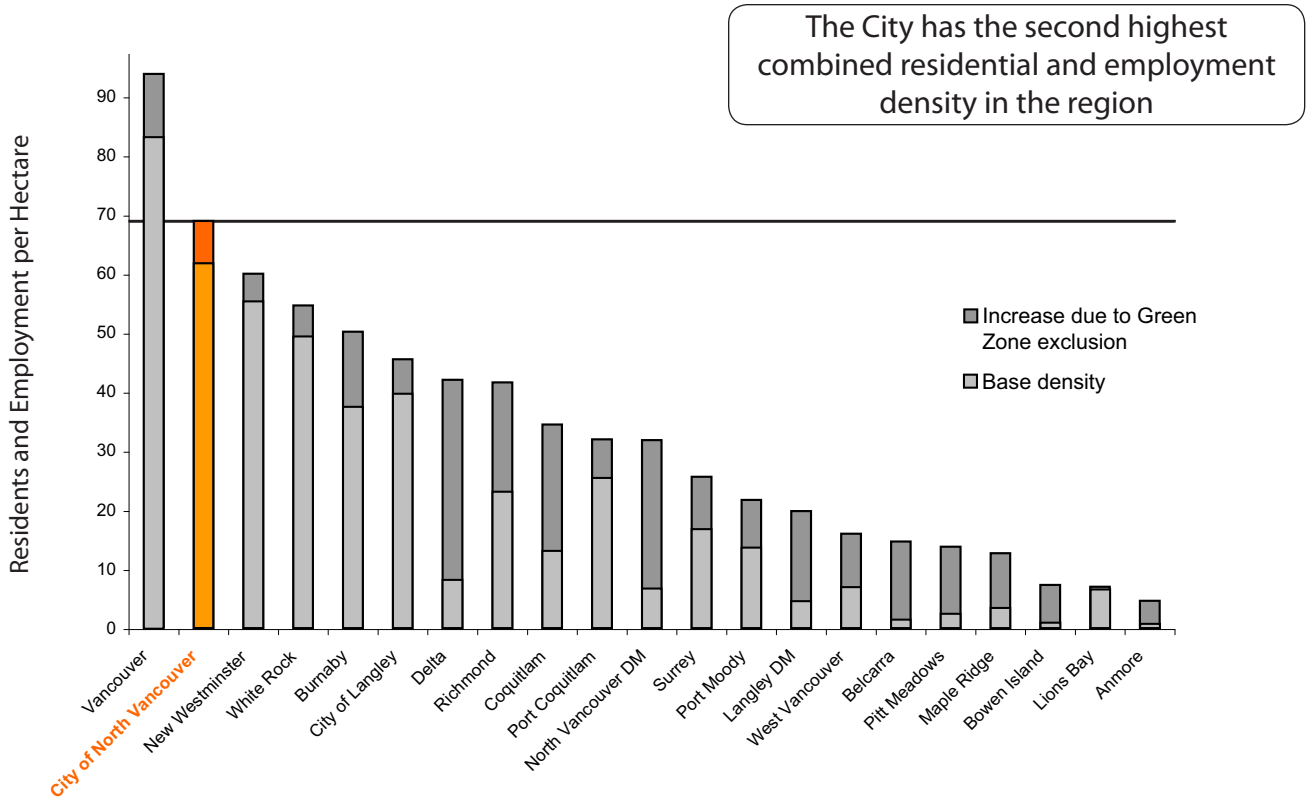

Figure 3.5: Combined Residents and Employment per Hectare
Data source: StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*, GVRD *Liveable Region Strategic Plan*

Combined residential and employment density is more accurately reflected by excluding the green zone

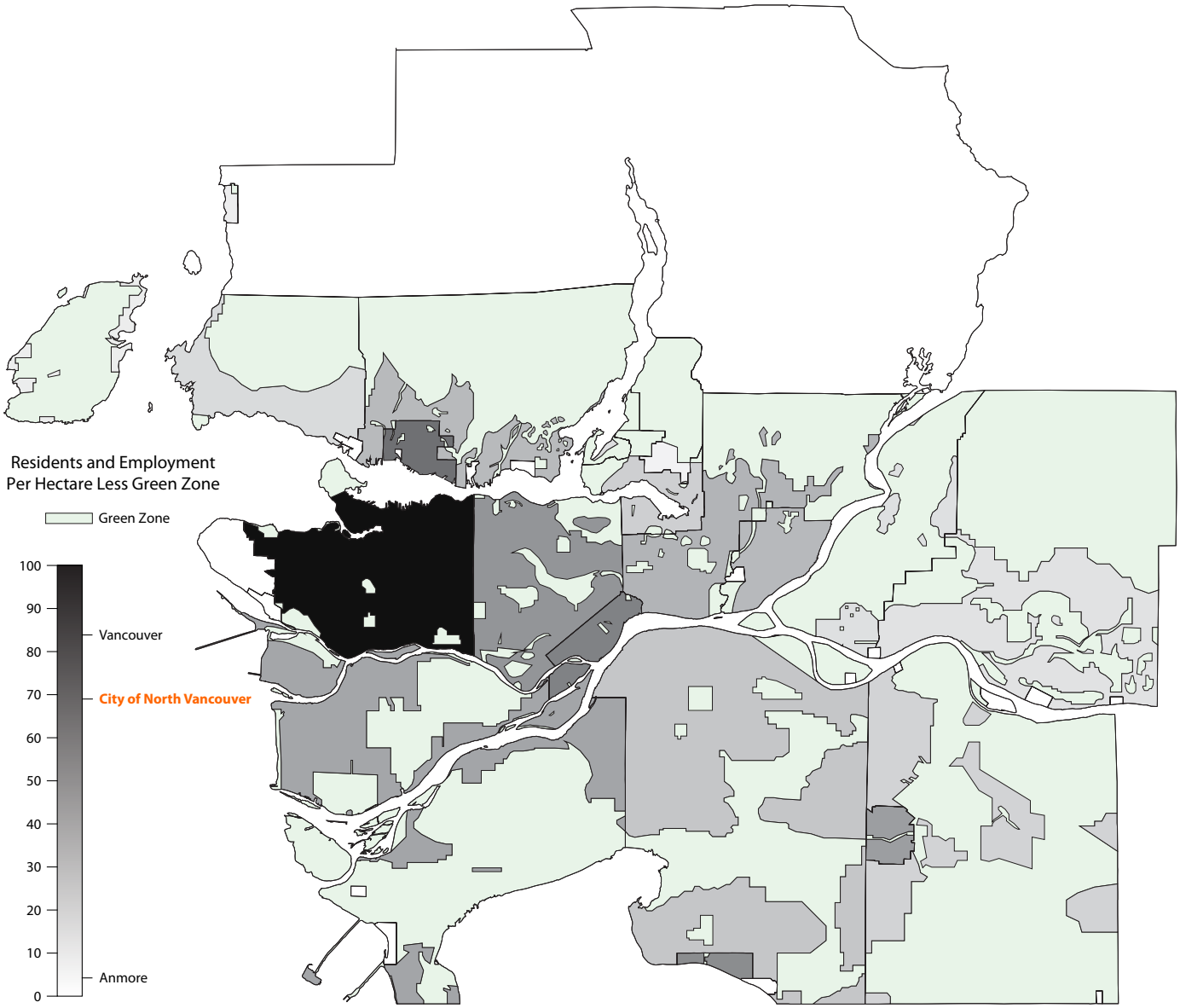

Figure 3.6: Combined Residential and Employment Density of Metro Municipalities
Data source: StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*, GVRD *Liveable Region Strategic Plan*

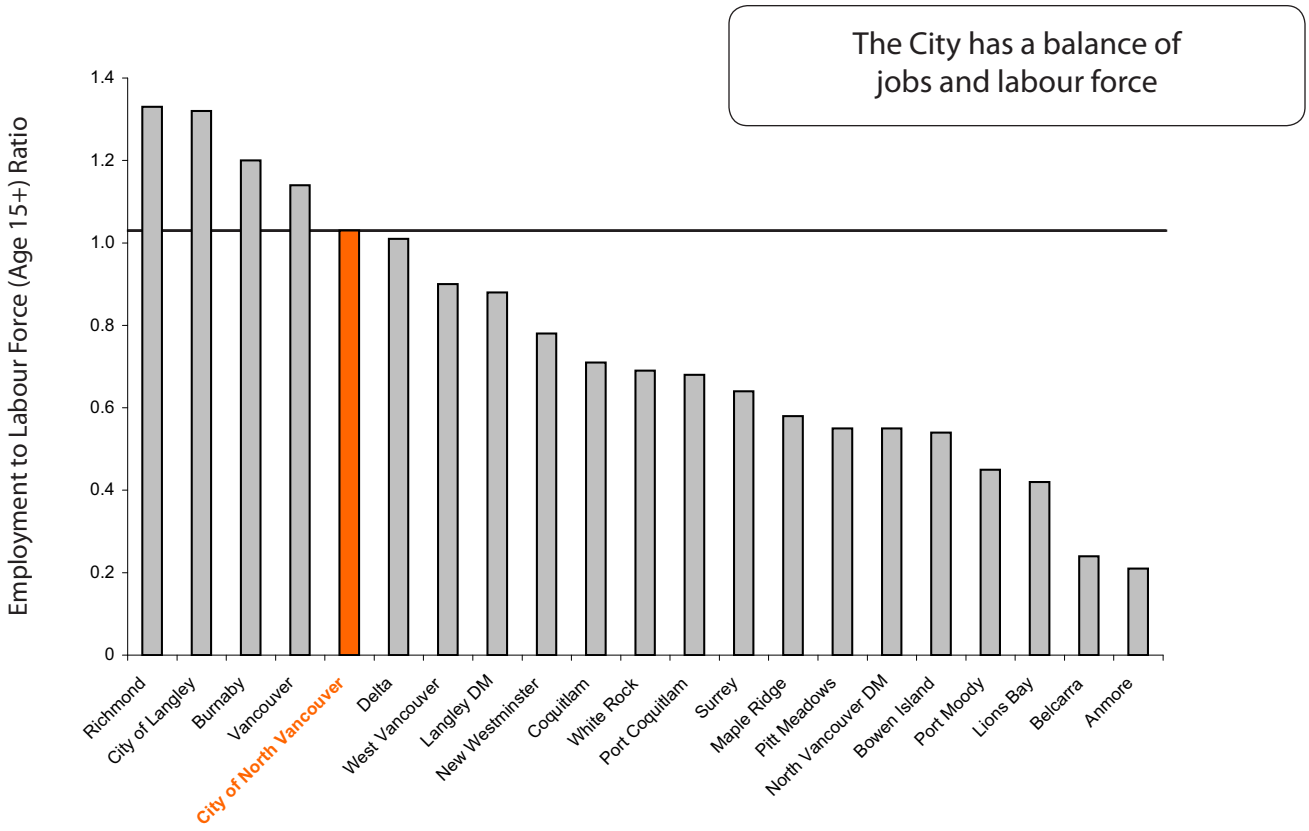

Figure 3.7: Employment to Labour Force Ratio
Data source: StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

3.2.3 Employment

While the City is an employment centre within Metro Vancouver as a whole, its significance is most evident at the sub-regional level: 62.3% of people employed within the City reside on the North Shore. The City has an employment to labour force ratio near one (1.03), indicating that there is a balance between the number of working age residents and jobs in the community (Figure 3.7).

Census data indicates that 12.2% of City residents reported employment with no fixed workplace. Jobs without a fixed workplace include contractors, truck and taxi drivers, couriers and traveling salespersons. To facilitate estimating GHG emissions per worker, jobs without a fixed workplace are assumed to be distributed in Metro Vancouver in proportion to fixed jobs; since Census data indicates the City has 2.5% of fixed Metro employment, it is also assigned the same percentage of total employment with no fixed workplace.

3.3 Emissions and Energy Consumption Profiles

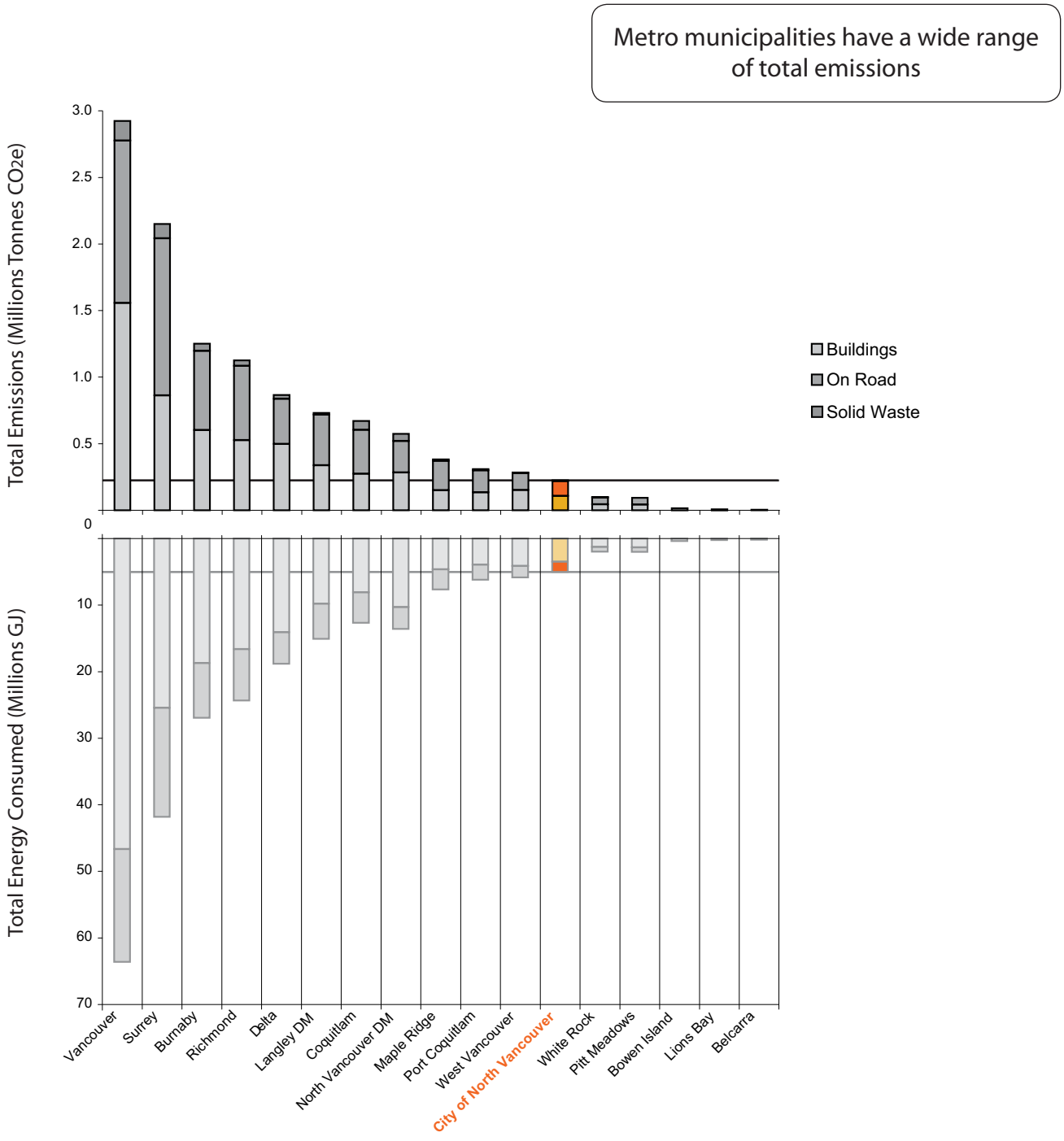

Figure 3.8: Total Emissions and Energy Consumption
Data source: BC MoE *2007 CEEI Reports*

The City has among the lowest emissions per combined residents and employment in the region

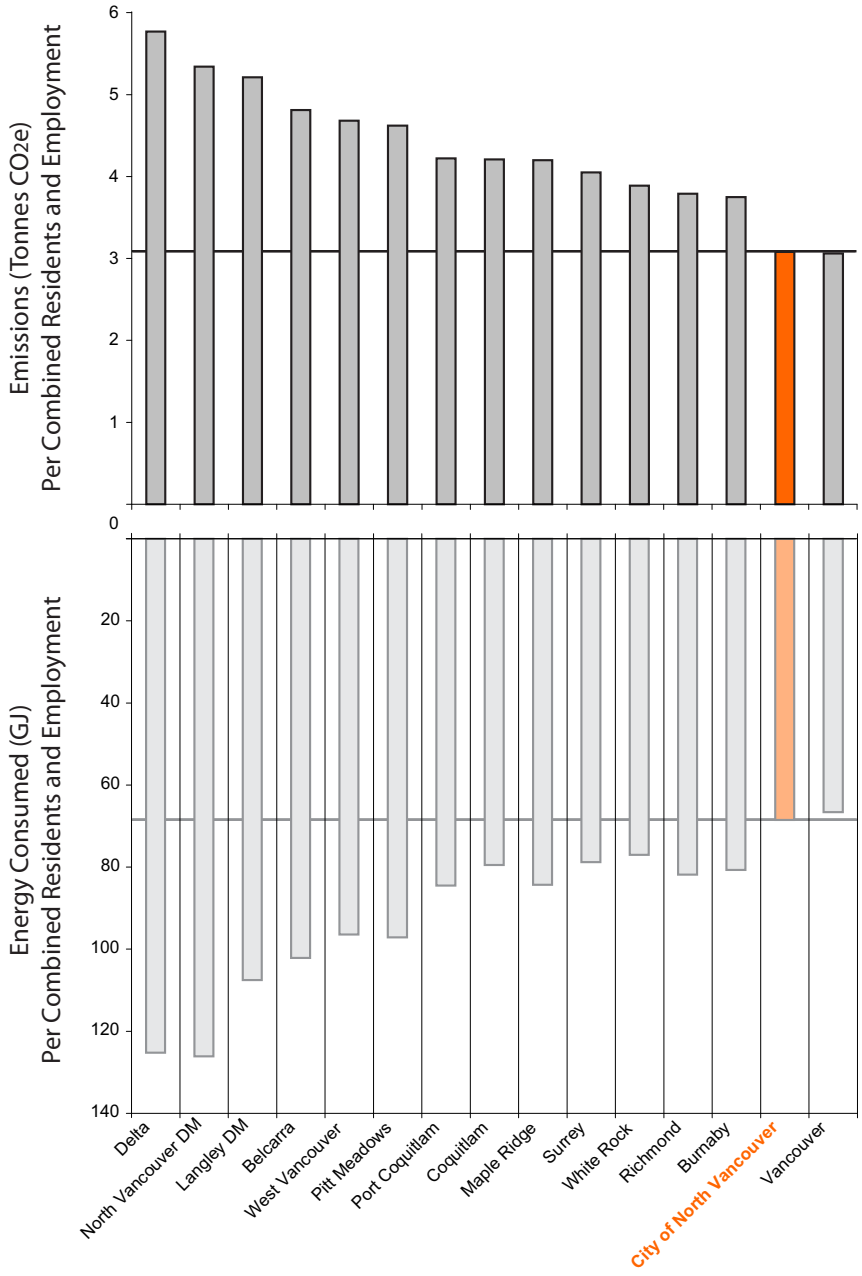

Figure 3.9: Total Emissions and Energy Consumed Per Combined Residents and Employment
Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

3.3.1 Total Emissions and Consumption

The City ranks sixth lowest among 17 Metro Vancouver municipalities in total emissions (four communities are omitted due to incomplete inventories). Cities with large populations (Vancouver and Surrey) account for a large share of Metro emissions (Figure 3.8). Communities with small populations (Bowen Island, Lions Bay and Belcarra) have limited total emissions. Considering emissions per combined residents and employment, the City ranks as second lowest behind Vancouver (Figure 3.9).

Only two Metro communities are not served by piped natural gas and are more likely to consume fuel sources not accounted for in the CEEI such as heating oil. As a result, emissions are presumed under reported for Bowen Island and Lions Bay, and these communities are omitted in Figure 3.9.

Although there are many factors that affect the relative GHG emissions of Metro municipalities, there is generally a correlation that denser communities have fewer emissions per combined residents and employment (Figure 3.10). However, there may also be diminishing returns of increasing density given current lifestyles and technologies. More aggressive strategies may be required to lower per capita emissions further, and it would be useful to calibrate per capita emissions of other North American and international cities to those measured in Metro Vancouver.

The division of total emissions between sectors also varies by municipality. The City of North Vancouver generally has a lower percentage of community emissions from the Buildings sector with the balance attributed to passenger vehicles, light trucks, vans and SUVs; the 42.6% share of total emissions for On Road Transportation in the City is among the highest in the Vancouver area.

The remainder of this report considers Buildings, On Road Transportation and Solid Waste separately. The introduction to each sector presents the total sector emissions and energy consumed (for Building and On Road Transportation) per combined residents and employment. Charts follow to provide greater detail and to calibrate the CEEI results against other metrics.

Denser municipalities tend to have fewer emissions per combined residents and employment, but none are close to zero emissions

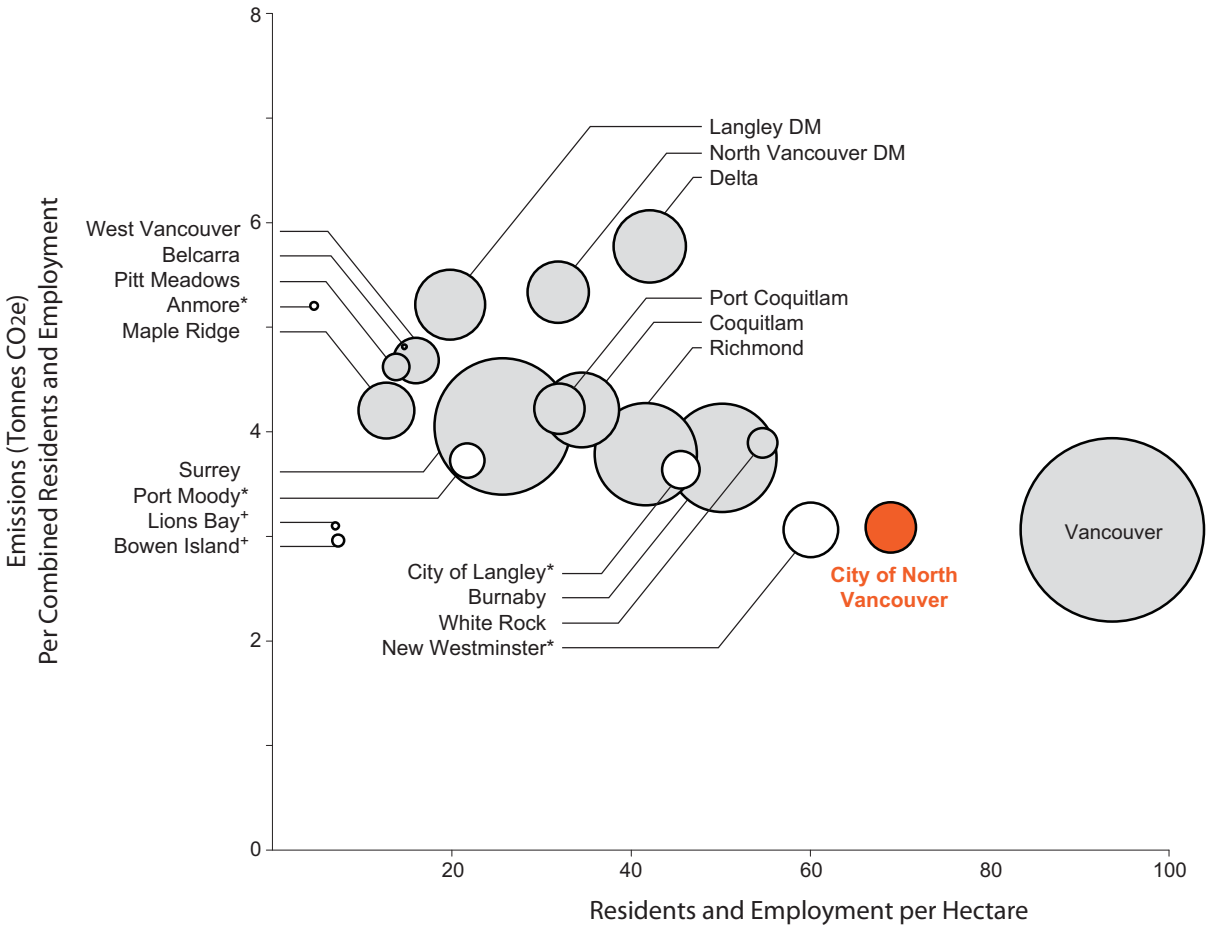

Figure 3.10: Relation of Density to Emissions Per Combined Residents and Employment

Relative population equal to area of data point; (*) CEEI data exclusion, (+) community without piped natural gas

Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*, GVRD *LRSP*

The City has the lowest buildings sector emissions per combined residents and employment for municipalities served by natural gas

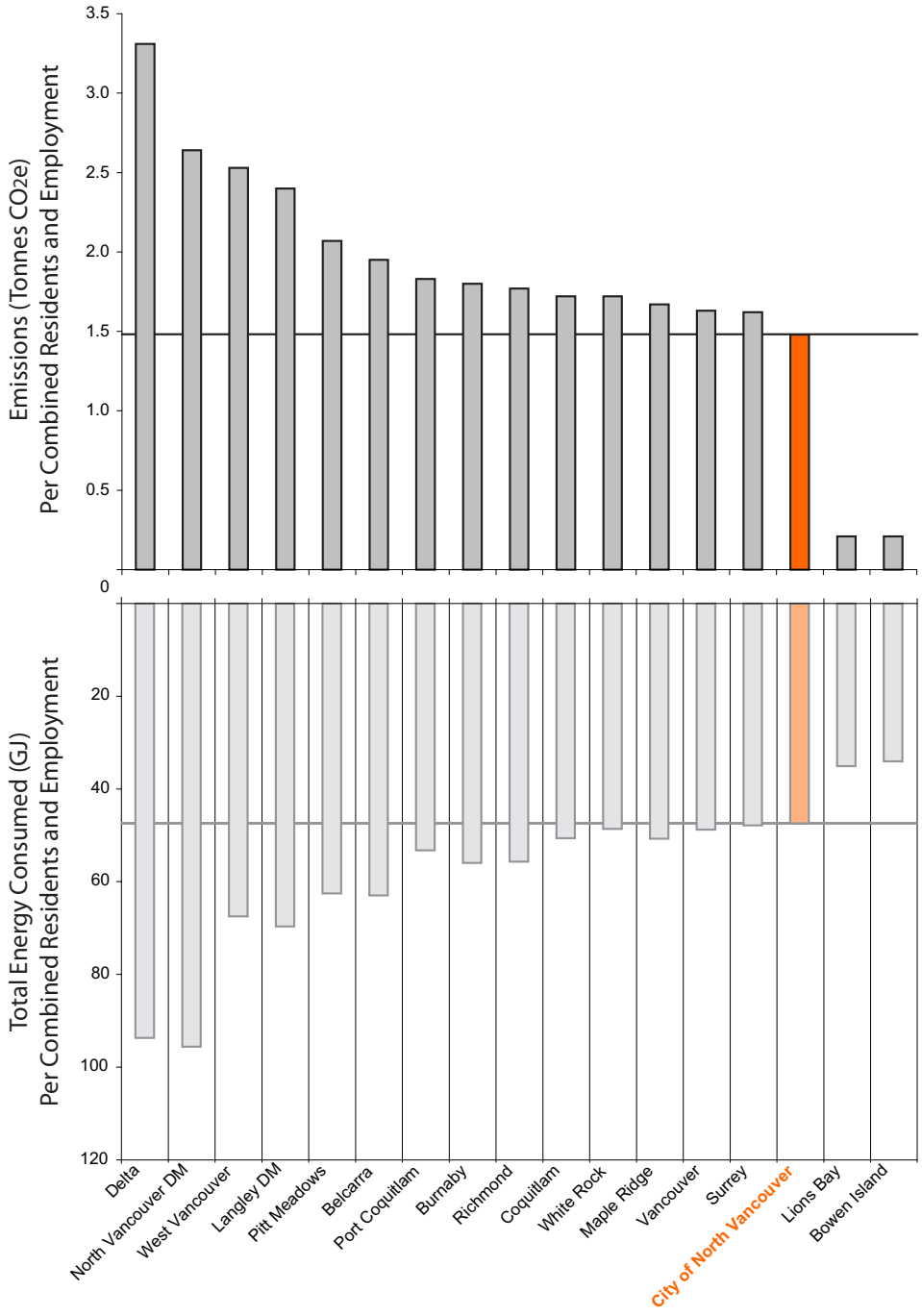

Figure 3.11: Buildings Emissions and Energy Consumed Per Combined Residents and Employment
Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

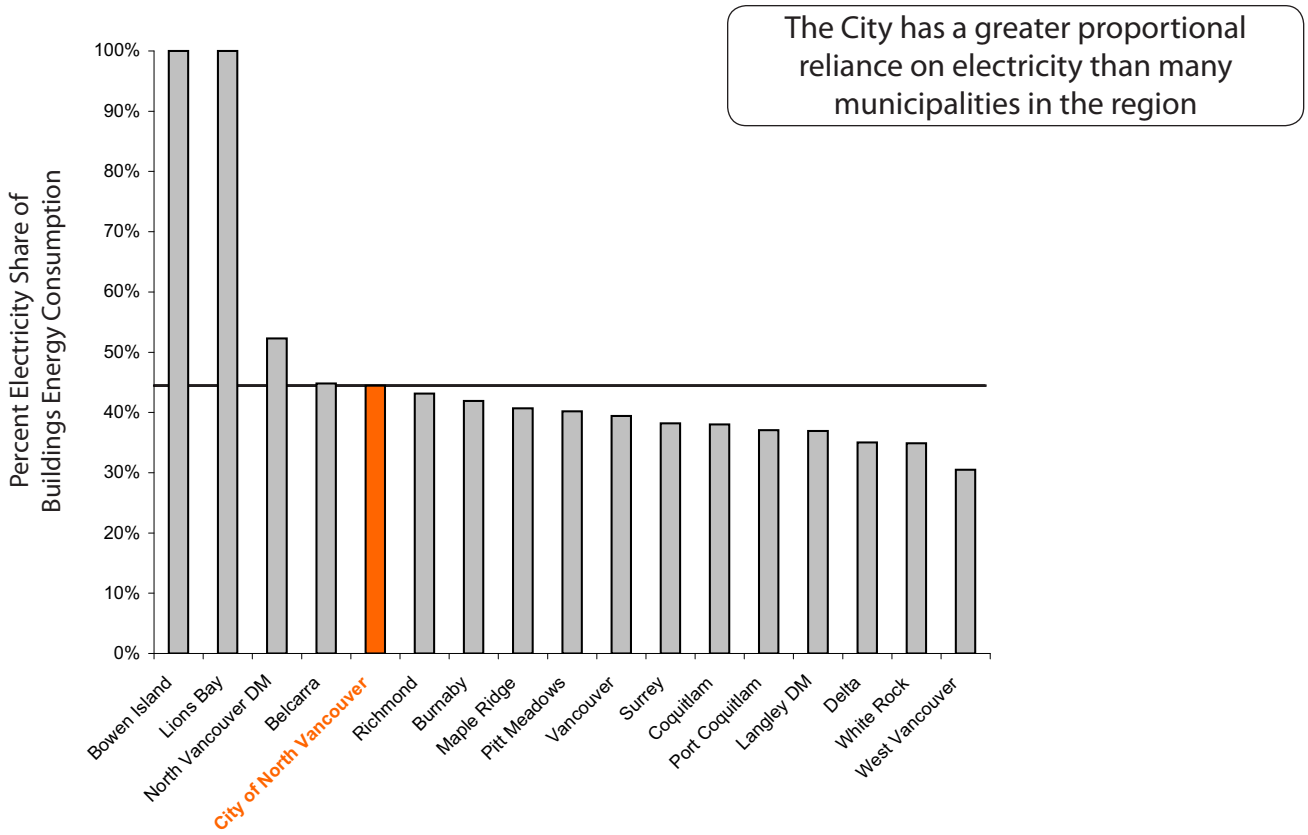

Figure 3.12: Electricity Share of Buildings Energy Consumption
Data source: BC MoE *2007 CEEI Reports*

3.3.2 Buildings Sector

The City has the lowest building emissions and energy consumption per combined residents and employment with the exception of Lions Bay and Bowen Island (Figure 3.11). Comparing the energy consumed (lower axis) to the sector emissions (upper axis) illustrates a narrowing between the City and other Metro municipalities due to the City's greater reliance on electricity (Figure 3.12). However, most communities' share of building energy consumption from electricity is within a relatively narrow range with less than ten percentage points separating the City and the Corporation of Delta (the local government with the third smallest reliance on electricity).

The City has the second lowest transportation emissions per combined residents and employment

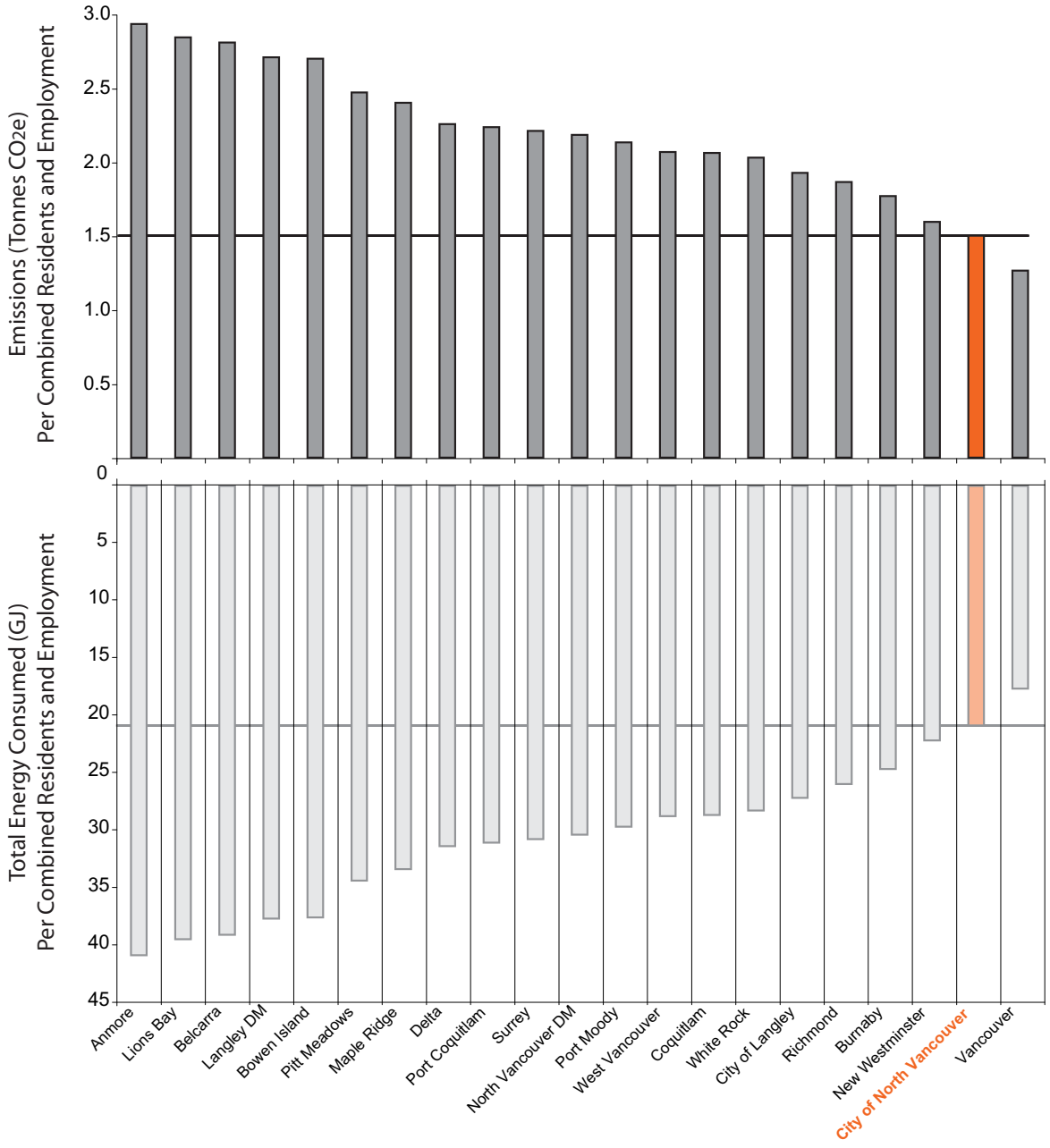

Figure 3.13: On Road Transportation Emissions and Energy Consumed Per Combined Residents and Employment

Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

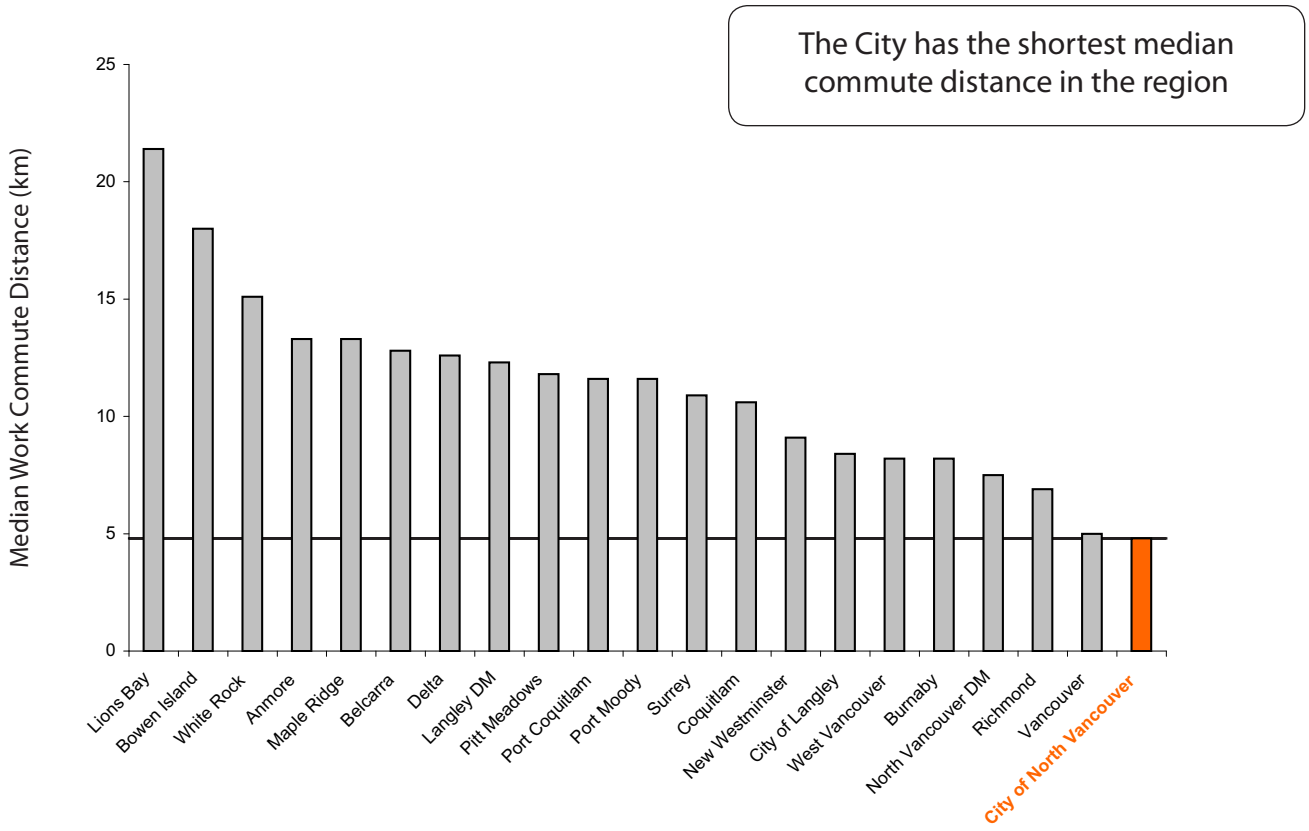

Figure 3.14: Median Work Commute Distance
Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

3.3.3 On Road Transportation Sector

The City has the second lowest GHG emissions from On Road Transportation per combined residents and employment (Figure 3.13). By locating residents close to employment sites and services, denser communities benefit from greater transit serviceability and shorter median commute distances. The City does, however, maintain a greater dependence on passenger vehicles than the highest performing Metro communities.

The extent of the probable correlation between VKT and median commute distance in Metro is unknown. However, if this relationship exists, it suggests that the reported passenger vehicle emissions for the City of North Vancouver are overestimated. Metro Vancouver's *2006 Census Bulletin* reports that the City has the shortest median work commute distance among Vancouver area municipalities: at 4.8km it is 41% of the Metro median work commute distance of 11.6km (Figure 3.14). If the shortened commute distance is correlative to lesser VKT per registered vehicle, then better quality data will result in a decrease in passenger vehicle emissions for the City. Figure 3.15 compares On Road Transportation emissions to median commute distance, suggesting that more accurate VKT will shift municipalities towards a centre trendline and adjust downward the City's passenger vehicle emissions (sum of small / large passenger cars and light trucks / vans / SUVs) per resident.

Passenger vehicle emissions per resident may be over reported for the City if there is a correlation to commute distance

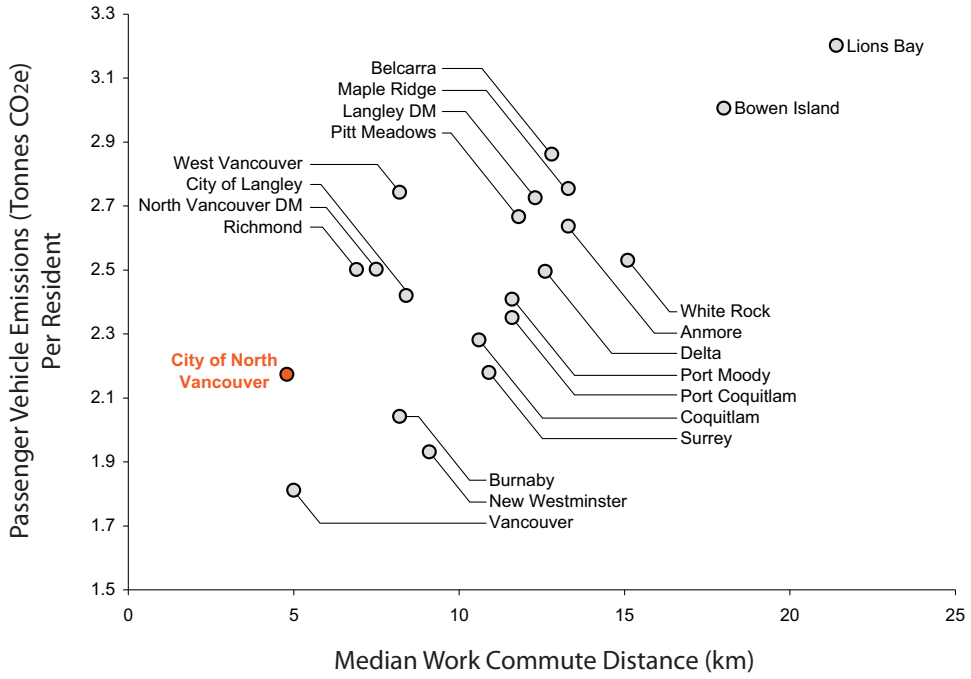

Figure 3.15: Relation of Density to Passenger Vehicle Emissions
Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

The magnitude of this reduction may be tempered by vehicle ownership in the City. While vehicles licensed to addresses within the City are relatively few (.81 passenger vehicles per resident over the age of 15), ownership is lower in the cities of Burnaby, New Westminster and Vancouver (Figure 3.16). These cities each have regional town centres on ALRT corridors—that may contribute to reduced VKT per resident as well —and have the highest ratios of trips by foot, bicycle and transit (Figure 3.17). Located on the North Shore, the City has only a single high-capacity station with ferry service that handles a fraction of the peak capacity of dedicated rail (Figure 3.18).

Measured in terms of GHG emissions per capita, Vancouver residents have 17% fewer passenger vehicle emissions than residents of the City of North Vancouver. For comparison, Vancouver has 31% fewer passenger vehicles per resident, a similar median work commute distance (5.0 km) and a lower ratio of work trips taken by passenger vehicle (41% compared to 32%) than the City.

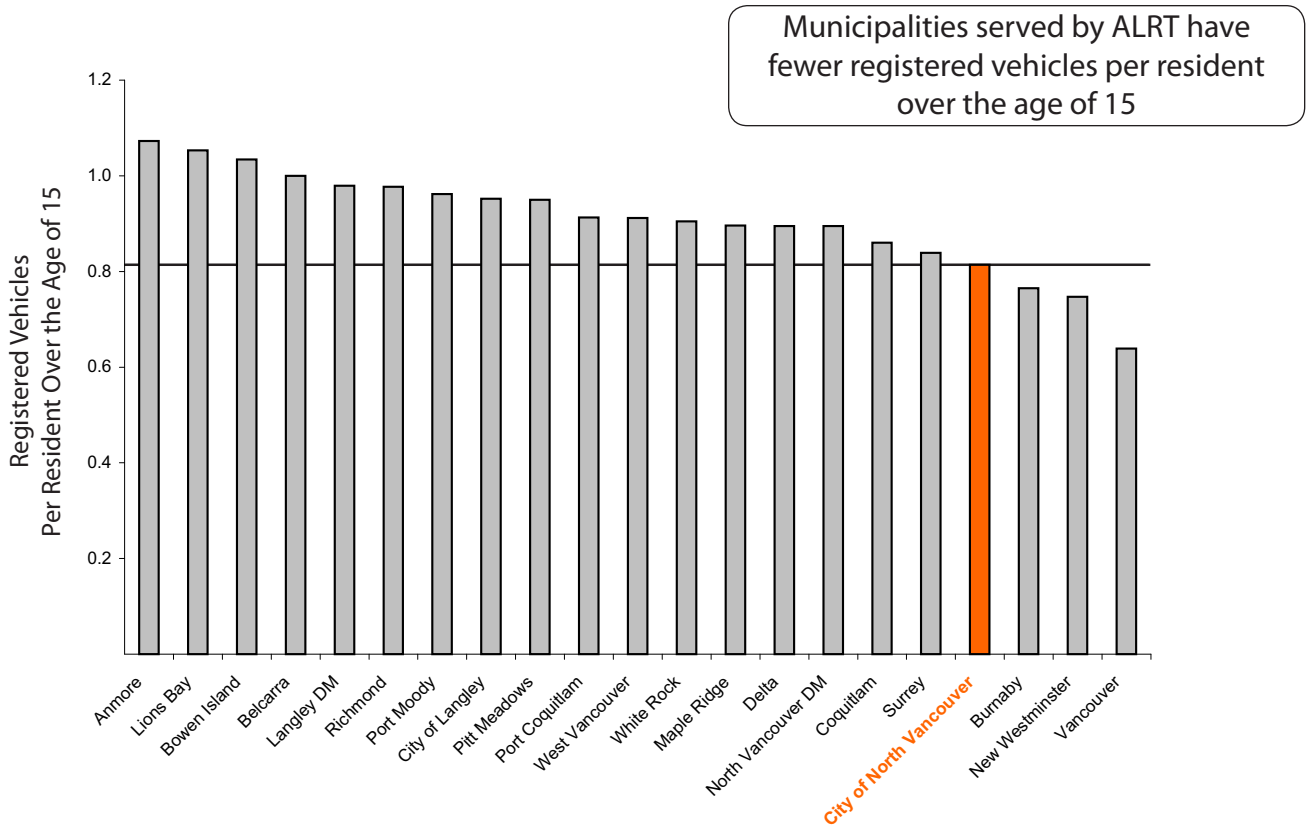

Figure 3.16: Registered Passenger Vehicles Per Resident Over the Age of 15
Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

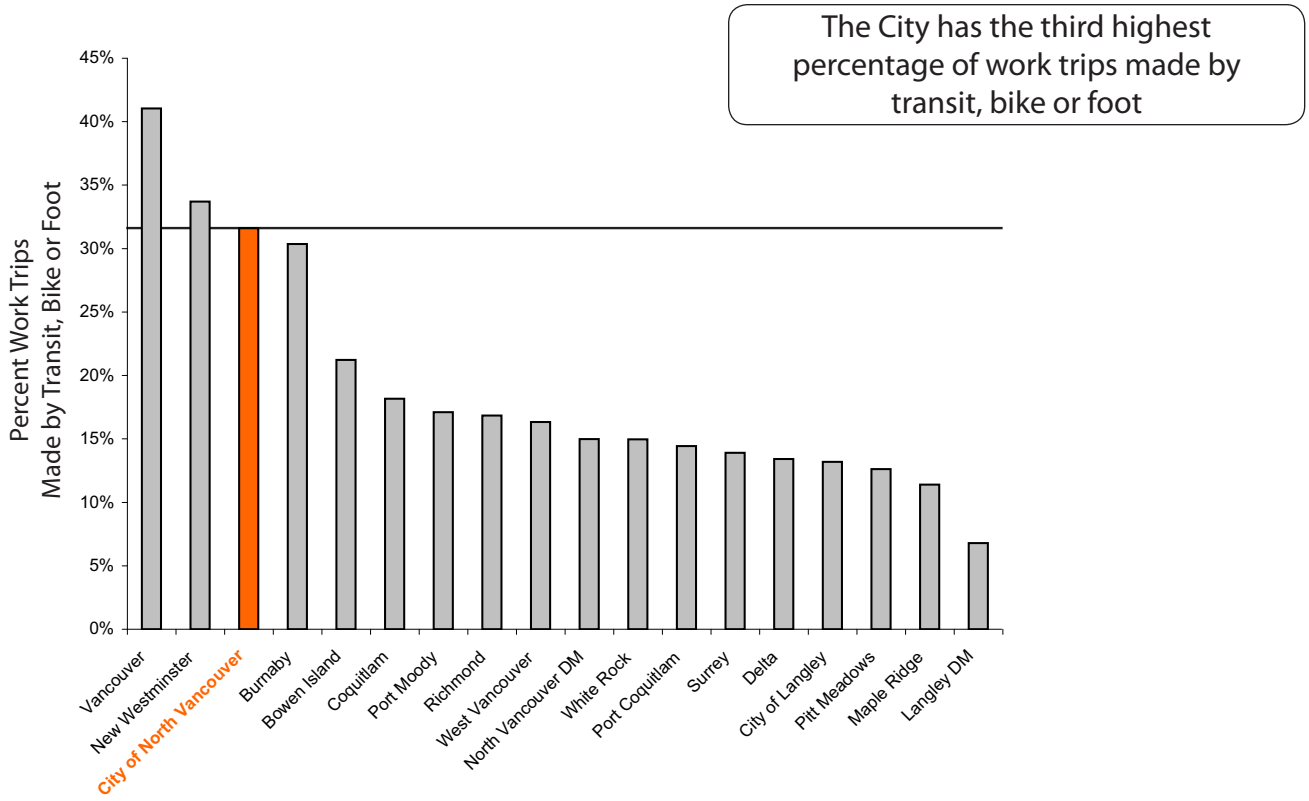

Figure 3.17: Work Trips Made by Transit, Bike or Foot
Data source: Metro Vancouver *2006 Census Bulletin*

Municipalities with high capacity transit infrastructure have more work trips made by transit, bike or foot

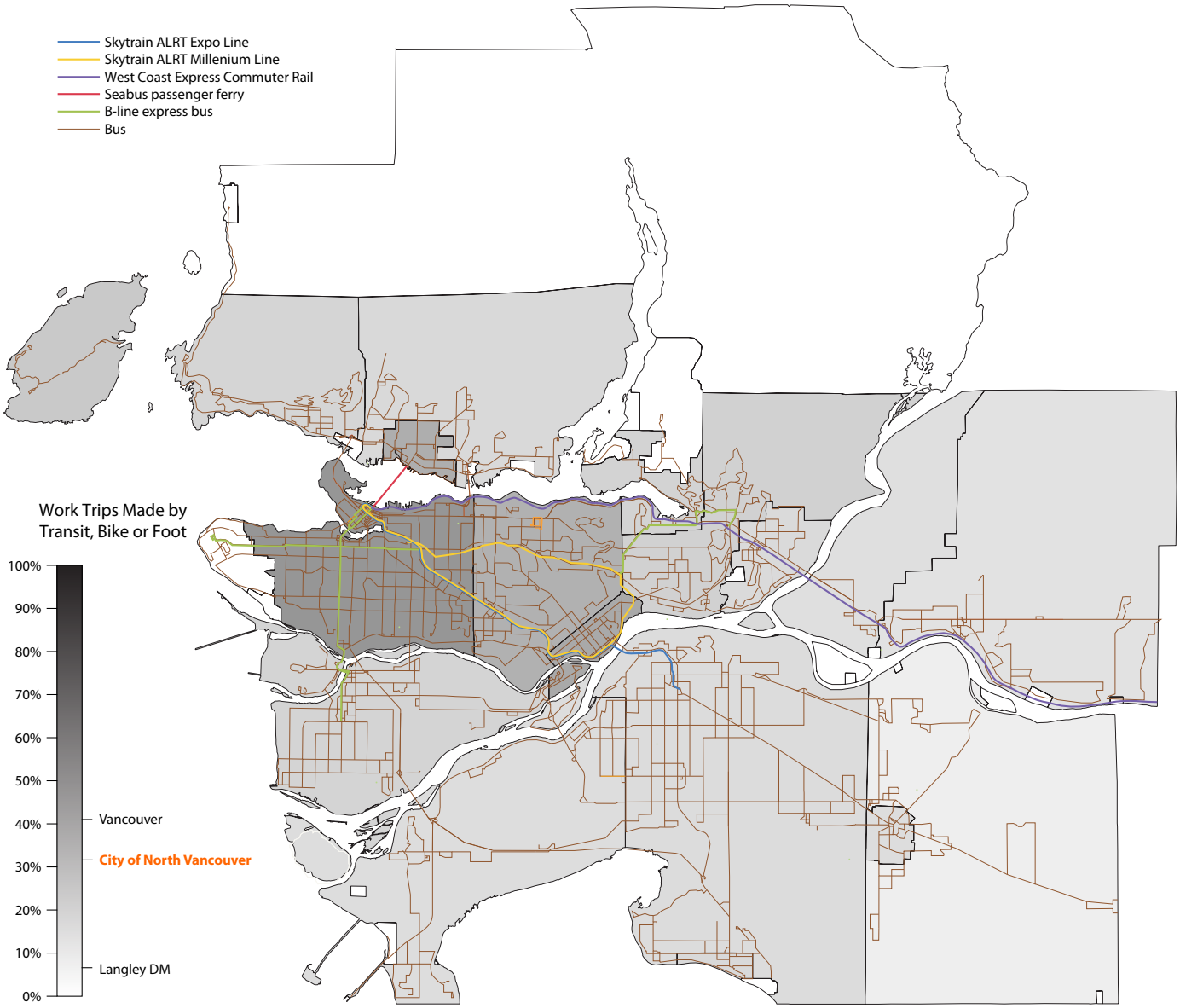

Figure 3.18: Transit Infrastructure
Data source: StatsCan *Vancouver CMA*, Metro Vancouver *2006 Census Bulletin*, Translink *System Map*

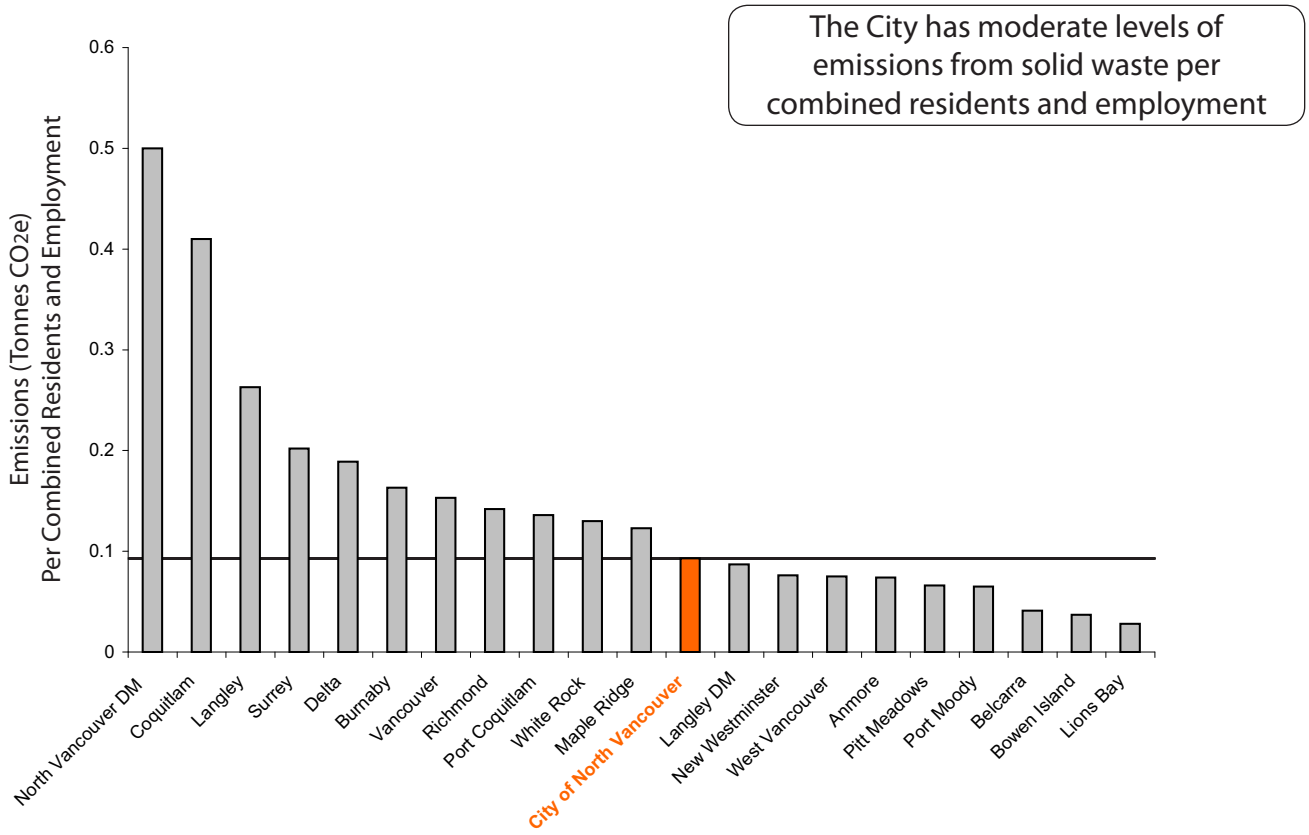

Figure 3.19: Solid Waste Emissions Per Combined Residents and Employment
Data source: BC MoE *2007 CEEI Reports,* StatsCan *2006 Census*, Metro Vancouver *2006 Census Bulletin*

3.3.4 Solid Waste Sector

The City has moderate levels of GHG emissions from solid waste (Figure 3.19). This is likely due to a higher than average amount of commercial and industrial activity suggested by the City's high employment to labour force ratio. More solid waste is attributed to business subsectors than to residential use. In 2004, the Greater Vancouver Regional District (now Metro Vancouver) assigned 44.3% more waste disposed (654,000 tonnes) to Institutional, Commercial and Light Industrial (ICI) than residential (453,000 tonnes). The GVRD further disposed of 370,000 tonnes of Demolition, Land clearing and Construction (DLC) waste, material that is omitted from CEEI calculations.

All Metro municipalities benefit from relatively low emission factors per tonne tipped. Solid Waste is taken to the Waste-to-Energy incinerator in Burnaby, the Vancouver Landfill in Delta where methane is collected for electricity generation and greenhouse heating or to the Cache Creek landfill where methane is flared. Although emissions vary based on the facility as well as the constitution of the solid waste, emissions would be higher without mitigation strategies.

Conclusion

This regional comparison of energy consumption and GHG emissions finds that the City of North Vancouver consumes less energy and produces fewer emissions per combined residents and employment than most other Metro Vancouver communities. It supports the understanding that compact communities using *SmartGrowth* principles have lesser emissions than other types of development. It also indicates that action is required to significantly reduce the emissions attributed to the On Road Transportation and Buildings sectors.

The City commends the Province for releasing the CEEI to assist local governments in the reduction of community GHG emissions. While *SmartGrowth* development in Metro Vancouver has led to lower GHG emissions, they are still far from zero. Considerable improvement is required by all municipalities if the Provincial GHG reduction goals are to be met. The CEEI is a valuable tool to inform this effort.

The City of North Vancouver welcomes any comments or questions regarding this report.

Please contact: Courtney Miller
Planning Technician, City of North Vancouver
604-990-4219
cmiller@cnv.org

Appendix A
Limitations of the CEEI Data

A.1.1 Municipal Boundaries

The comprehensive accounting of community GHG emissions requires the use of a range of data sets with different definitions, divisions and geographic limitations. Reconciling these discrepancies is key to accurate assignment of emissions. The efforts of the Province and its partners in the CEEI Working Group have made substantial gains in reporting for the 2007 CEEI.

Canada Post Corporation divisions illustrate how data boundaries may vary from political divisions (Figure A.1). Postal codes are managed for the efficient handling of mail, but are linked to standard geographic areas through StatsCan products. The CEEI uses the BCStats Provincial Translation Master File (TMF) to assign electricity consumption and vehicle registrations to municipalities. At the level of the full six character code, a postal code that crosses a jurisdictional boundary may be assigned to one community exclusively. This is an issue that primarily impacts rural municipalities that have a small number of postal codes with significant border overlap. However—although typically inconsequential—boundary deviations affect every community. Work continues to improve boundary accounting: the City and District of North Vancouver are no longer flagged for significant TMF boundary related issues.

Utility providers in the Province are usually able to provide data by municipal boundary. However, Terasen Gas Inc. combined consumption data for two pairs of Metro local governments: the City and District of North Vancouver; and Surrey and White Rock. Since separated data was not available in time for release of the 2007 draft reports, the CEEI utilized averaged consumption data from the two previous years (2005 and 2006). This extrapolation is not expected to deviate meaningfully from actual use data when released.

A.1.2 Buildings Subsector Determination

Determining energy use and emissions for building subsectors remains challenging; differences in metering complicates the separation of residential from commercial use. For example, natural gas consumption for a multifamily residential building may be metered as a commercial structure. This has rendered this subsector distinction largely unusable. BC Hydro data and models may be used to estimate residential versus commercial use, but the results are highly uncertain. Building subsector analysis is further hampered by the dramatic impacts a single industrial property can have on community emissions. It is difficult to differentiate between industrial and commercial sectors given the range of industrial uses and crossovers with commercial businesses.

Assigning emissions requires reconciling data set boundaries

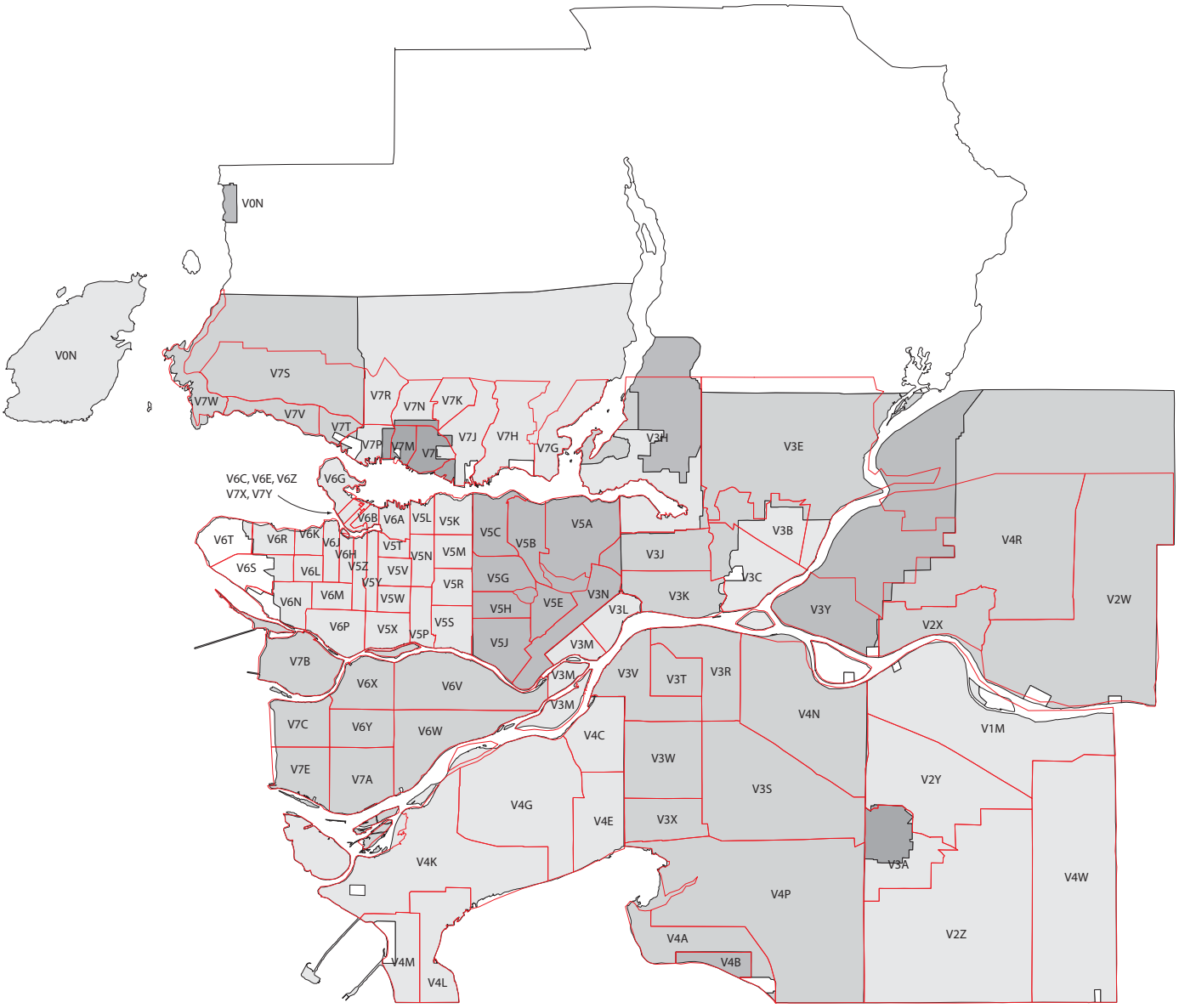

Figure A.1: Boundary Differences Between Data Sources
Data source: Canada Post *Vancouver FSA*, StatsCan *Vancouver CMA*

A.1.3 Electricity Emission Factors

Greenhouse gas intensity ranges widely in electricity generation plants, with some energy sources emitting as much as 5.5 times more GHG per unit than the Canadian average for all generation facilities. The source for nearly 90% of electricity generated in the Province is hydroelectric and is not considered to contribute significantly to GHG emissions. Although Manitoba, Quebec, Ontario, Labrador and Newfoundland and Yukon all generate the majority of their electricity needs from hydroelectric, the national emissions factor per kWh produced is still over 9 times the British Columbia average; the average in the United States is over 30 times the Provincial average (Figure A.2).

Whether the Province is a net importer or exporter of electricity is a contemporary and politically charged debate centred on the accounting of fluctuations in generation and demand, independent power generation, international agreements and active energy trading. However, the validity of these competing claims does not diminish the recognition that electrical generation and consumption in British Columbia is connected to production and use elsewhere on the continent. Natural Resources Canada reports that over 230 million GJ of electricity was traded between the Canada and the United States in 2005, with British Columbia having the greatest volume among the provinces.

The consequence of low generation emissions to the CEEI is that the use of electricity in British Columbia—unlike other locations in North America—is a minimal contributor to community GHG emissions. Although GHG intensity of natural gas is roughly aligned with the Canadian average for electrical generation (and substantially lower than electrical generation in the U.S.), consuming natural gas in British Columbia emits 8.4 times more GHG than the equivalent use of electricity. This difference in GHG may preference particular solutions in terms of energy source. However, the present GHG benefits of electricity can only be sustained if increasing demand continues to be met by conservation or greater generation from low-GHG sources. Further, with increased applications for electricity (such as on road transportation) anticipated, the reliance on high-grade energy as a primary means to heat homes and businesses should be reviewed.

It is important to consider not only the source and emissions intensity of energy use, but also the amount of energy consumed since greater efficiency and conservation are important means to meet reduction targets. The CEEI reports both emissions (tonnes CO_2e) and energy consumed (GJ), and each are presented in this review.

Provincial emissions intensity for electricity generation is a fraction of the national average

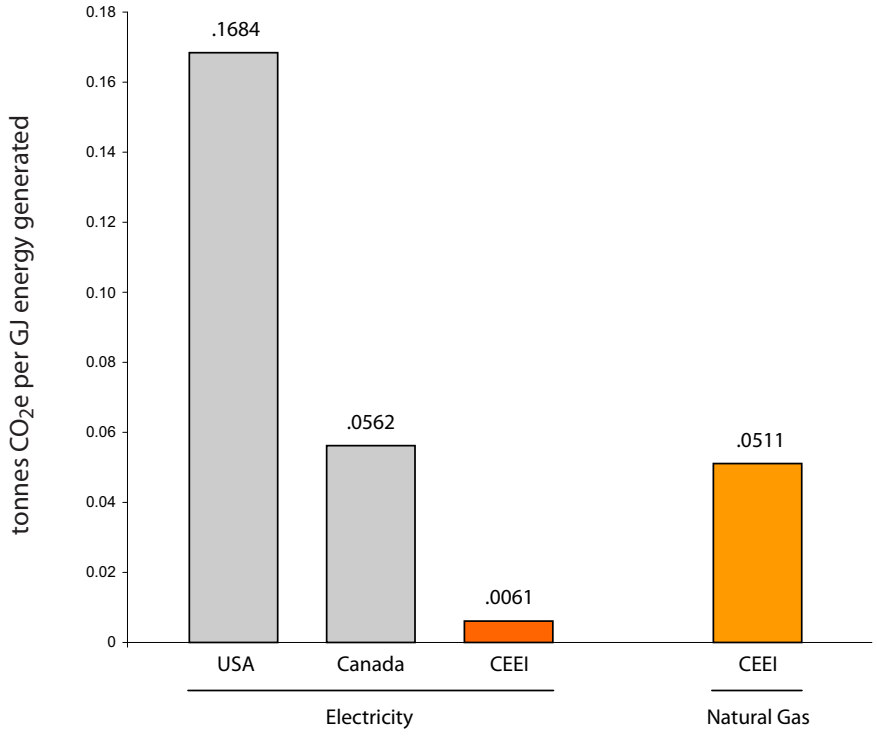

Figure A.2: Electricity Emissions Factors Compared to Natural Gas
Data source: BC MoE *CEEI User Guide*, NRCan *Electricity Generation*, US DoE *Voluntary Reporting of Greenhouse Gases*

Vehicle emissions are the product of several factors, with VKT the most challenging to determine

Figure A.3: Vehicle Emission Determination
Data source: BC MoE *CEEI User Guide*

A.1.4 Vehicle Kilometres Travelled

GHG emissions from on-road vehicles is a product of the number and types of vehicles, fuel consumption per vehicle, kilometres driven per vehicle and GHG emissions factors for fuel (Figure A.3). These factors are defined as follows:

- *Number and type of vehicles:* vehicles actively insured by ICBC are assigned to municipalities based on the registered owner's postal code
- *Fuel consumption:* Hyla Environmental Services Ltd. matches vehicles to NRCan fuel consumption data provided by manufacturers (adjusted upwards by the USEPA 7.5% correction factor)
- *Kilometres driven:* VKT is regressed from dummies defined by class, fuel and type in AirCare catchment data. Econometric analysis utilizes model age, real fuel prices and per capita income by census district
- *Emission factors:* emissions specific to fuel type and respective global warming potential provided by IPCC

Owner registration may assign a vehicle to a community in which it does not predominantly operate, and overlapping TMF boundaries may limit data accuracy in rural communities. Emissions intensities also vary by fuel source, although the range of those included in the CEEI (gasoline, diesel and mobile propane) is limited in comparison to building energy.

The most problematic factor in the determination of on road emissions remains assessing vehicle kilometres travelled (VKT). Currently, VKT is determined through econometric regression at the Census District (regional) level from aggregate AirCare data. As more refined data becomes available, substantial shifts in per capita vehicle emissions may result.

Appendix B
Report Sources

2007 Community Energy and Emissions Inventory (CEEI) Reports User Guide. BC Ministry of Environment: 2009.

Boston, Alex. Best Practices and Better Protocols: Guidance for a comprehensive community emissions inventory system from a high level review of international best practices. BC Ministry of Environment: 2007.

British Columbia Ministry of Environment. Greenhouse Gas (GHG) Reporting Regulation Policy Intentions Paper for Consultation. 2008.

CH2MHILL. Comparison of Greenhouse Gas Emissions from Waste-to-Energy Facilities and the Vancouver Landfill. City of Vancouver: 2009.

Community Energy Association. Community Energy & Emissions Planning: A Guide for B.C. Local Governments. BC Ministry of Environment: 2008.

Elevate Consulting. Community Energy and Greenhouse Gas Emissions Inventory: User Needs Research. BC Ministry of Environment: 2007.

Greater Vancouver Regional District (now Metro Vancouver). Green Zone Issues and Policy Options. Livable Region Strategic Plan Review Workshop. 2005.

Greater Vancouver Regional District (now Metro Vancouver). Solid Waste Management 2004 Annual Report. 2004.

Mechanda, Kaveri and Hanry Puderer. How Postal Codes Map to Geographic Areas. Geography Working Paper Series. Statistics Canada: 2007.

Metro Vancouver. The Sustainable Region Initiative 2006 Census Bulletins. 2007.

Miller, Nicole and Duncan Cavens. City of North Vancouver 100 Year Sustainability Vision: GHG Measurement and Mapping Technical Paper. BC Ministry of Environment: 2008.

Natural Resources Canada. Electricity Generation Energy Use and Generation by Energy Source 1990-2006.

Natural Resources Canada. Electricity Generation GHG Emissions by Energy Source 1990-2006.

Nyboer, John, Michelle Bennett and Katherine Muncaster. Energy Consumptions and Supply in British Columbia: A Summary and Review, Final Report. BC Ministry of Energy and Mines: 2004.

Pacific Analytics, Inc. Assessing Vehicular GHG Emissions: A Comparison of Theoretical Measures and Technical Approaches. BC Ministry of Environment: 2008.

Pacific Analytics, Inc. VKT Study – Part of the CEEI Reporting Initiative. BC Ministry of Environment: 2008.

Province of British Columbia. Climate Change Action Plan.

The Sheltair Group. City of North Vancouver Greenhouse Gas Local Action Plan, Revised Draft Final Report. City of North Vancouver: 2005.

The Sheltair Group. Community Energy & Emissions Inventory (CEEI) Secondary Indicators for Community Inventory Interpretation, Final Project Report. BC Ministry of Environment: 2008.

The Sheltair Group. Energy & Greenhouse Gas Inventories by Local Governments in BC: Implications for the CEEI Initiative. BC Ministry of Environment: 2007.

Statistics Canada. 2006 Census Data.

Urban Systems. Transportation Plan – Interim Report: Technical Appendix. City of North Vancouver: 2007.

U.S. Department of Energy. Voluntary Reporting of Greenhouse Gases, Appendix F: Electricity and Emission Factors. 2007.