GHG ANALYSIS OF A TRANSIT ORIENTED DEVELOPMENT SCENARIO FOR THE TOWN OF COMOX OCP

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RECOMMENDED OCP LANGUAGE

The modelling undertaken indicates that a per capita GHG emissions reduction of 28% by 2030 over 2007 levels is achievable under the proposed OCP. In order to achieve this reduction the Town will:

1. Encourage growth near existing service centres and higher frequency public transit routes.
2. Give priority to pedestrians, cyclists and public transit when planning public realm improvements.
3. Work with BC Transit to extend transit service and enhance transit frequency and locations.
4. Explore opportunities for district heating in higher density mixed use area shown in Appendix 2.
5. Encourage local agriculture within the Town boundaries.
6. Support and enforce energy efficiency regulations in the BC Building Code.

Justification: SSG's modelling indicates that a 28% per capita reduction is likely according to the Transit-Oriented Development scenario developed by Arlington Group. This reduction compares favourably with other communities that have modelled potential reductions associated with land-use. The Comox Valley Regional Growth Strategy has an adopted a target of an absolute reduction of 50% by 2030. The TOD scenario can be considered to lay the groundwork for a trajectory that achieves the 50% target but significant additional efforts will be required to achieve that target.

Additional reductions toward achieving the target can be achieved from the following, some of which are beyond the jurisdiction of the Town of Comox:

- Reducing solid waste.
- Capturing methane from solid waste disposal sites.
- Upgrading liquid waste treatment.
- Encouraging behaviour change in support of cycling and walking (improving infrastructure and educational campaigns).
- Increasing the number of trees in public and private spaces in the community.
- Providing incentives for hybrid or efficient vehicles.
- Providing incentives for geothermal or ocean-based heating (to offset oil and/or wood).
- Deploying of new district energy systems as technologies evolve.
- Supporting an energy-efficiency retrofit program for existing buildings.

SUMMARY OF METHODOLOGY

SSG used our open source model, *GHGProof*, to compare the greenhouse gas implications Comox's existing land use pattern against future land use policies as guided by its draft Official Community Plan. The model translates the existing and future land use patterns into greenhouse gas emissions across four sectors:

Buildings

- CO_2 emissions from heat and electricity demands of detached dwellings, attached dwellings, low-rise apartments and high-rise apartments.
- CO_2 emissions from heat and electricity demands of commercial buildings.
- CO_2 reductions resulting from more energy efficient building practices.
- CO_2 emissions reductions in future land use scenarios where higher densities enhance the viability of renewable energy systems.

Transportation

- CO_2 emitted from private vehicles based on the total vehicle trips and average trip distance.
- CO_2 reductions from the introduction of fuel efficiency standards.
- CO_2 reductions from modal shifts from automobiles to walking and public transit. This is based on the population that is within walking distance of common destinations and transit bus stops.
- CO_2 emitted from the transportation of imported food.

Waste

- CO_2 emitted from waste disposal sites
- CO_2 emitted from the treatment of liquid waste at centralized treatment facilities

Biomass

- CO_2 absorption from forest cover
- CO_2 emissions from farming practices, including machinery and livestock

In this exercise, however, emissions from Biomass were not considered in order to be consistent with the Ministry of Environment's Community and Emissions Inventory.

Three scenarios were considered; the Baseline represents current conditions. The Business as Usual (BAU) scenario and Transit-Oriented Development (TOD) scenario were generated by Arlington and EcoPlan Consultants. Figure 1 indicates the populations that were used in each case.

	Factor	*Baseline*	*Business as usual*	*TOD Scenario 1*
General	1. Total Households	5,223	8,600	8,600
	2. Total Population	12,136	19,780	19,780
	3. People per household	2.3	2.3	2.3
	4. Year	2006	2030	2030

Figure 1: Population Characteristics for Scenarios

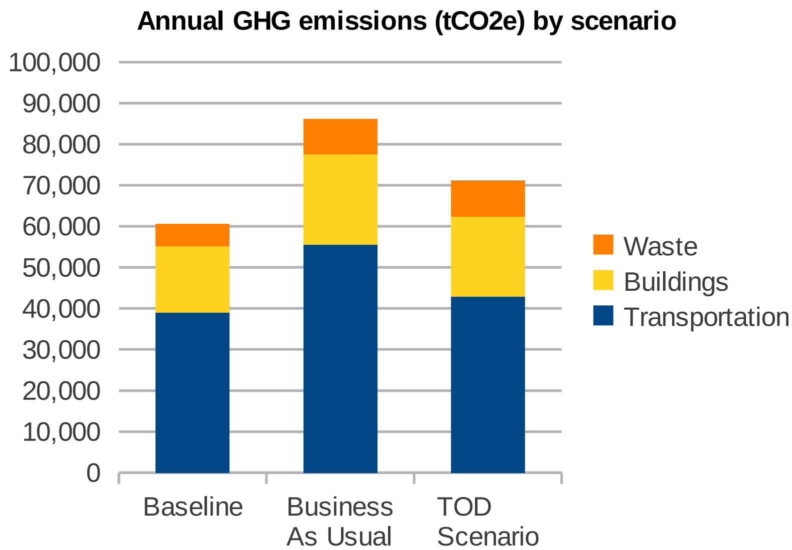
The population growth was distributed in the Town in the BAU according to the existing OCP. In the TOD Scenario, dwellings were distributed according to proposed OCP developed by Arlington.

GIS analysis was used to analyse the impact of the BAU and TOD scenario on a range of variables. The variables were then inputted into GHGProof.

RESULTS

The Baseline from the Community Energy and Emissions Inventory for Comox is based on the data totals 60,508 tCO2e, less than the 69,736 tCO2e identified for Comox in the Ministry of Environment's Community Energy and Emission Inventory. This difference can be accounted for due to two factors: 1. GHGProof does not include emissions from diesel fuel; and 2. GHGProof includes public transportation and walking trips in its transportation calculation.

A population increase of 63% over the baseline in the BAU scenario results in an absolute emissions increase to 86,135 tCO2e, 142% of the baseline. In the TOD Scenario emissions increase to 71,186 tCO2e, or 118% over the baseline with the same population increase as in the BAU scenario.



Per capita emissions decrease from the baseline to the TOD scenario by 28%, from 4.99 tCO2e per person to 3.60 tCO2e. The most significant reduction occurs in transportation, as accessibility to public transit and therefore use increases significantly. In the baseline and BAU scenarios, 10% of the trips originating from dwellings within 400m (considered to be reasonable walking distance) of transit service are assumed to occur on transit[1]. In the TOD scenario the number of people whose dwellings are within 400m from transit increases by just under 4,000, an increase of 35% over the baseline. As a result, it is assumed that both the frequency of transit service and familiarity of the population with transit increases to accommodate the population increase and the percentage of trips from originating from dwellings within 400m of transit increases from 10% to 40% [2].

Emissions from buildings are also reduced in the TOD scenario as there is an increased proportion of dwellings with shared walls and smaller footprints such as condominiums and apartments.

Emissions from waste increase proportionately with the population; a reduction would occur if methane capture is installed in the waste disposal site, however this is outside of the scope of the OCP.

1 10% of the trips by people who live within 400m of transit translates to 6.8% of all trips in the community. This is higher than the 2.6% of commuting trips on transit that Statistics Canada reported in the 2006 census for Comox. The commuting number tends to understate transit use as transit is favoured by the elderly and young people who are not typically commuting.

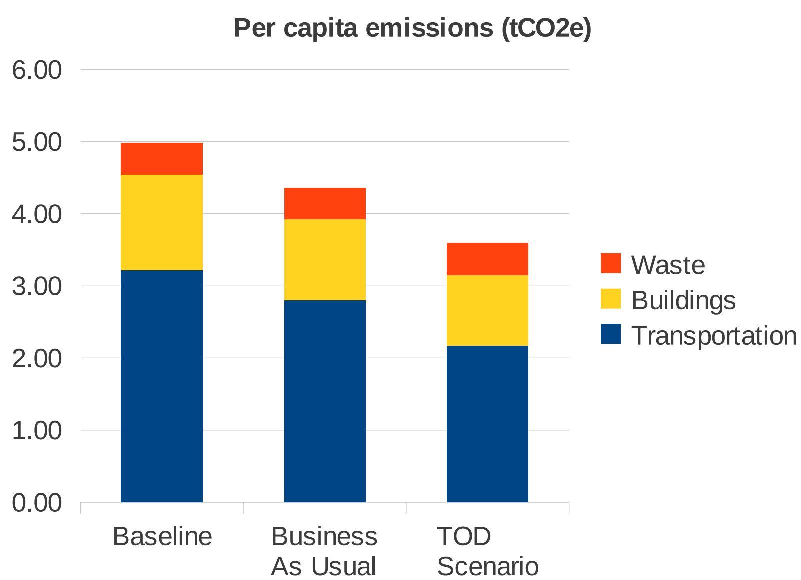
2 40% of people who live within 400m of transit translates to 23% of all trips (In the TOD scenario, 76% of the population live within 400m of transit and 76% of their daily trips are by vehicle, 40%*76%*76%= 23%). The 40% assumption is based on the analysis of travel behaviour for all of the US as reported in the National Personal Transportation Survey.

Per capita GHG emissions (t CO2e/person)

	Baseline	*Business As Usual*	*TOD Scenario*
Transportation	3.22	2.81	2.17
Roads	0.00	0.00	0.00
Buildings	1.33	1.12	0.98
Waste	0.44	0.43	0.45
Total	*4.99*	*4.35*	*3.60*
Percent over Baseline	100%	87%	72%
Percent over BAU		100%	83%

Additional assumptions which contribute to the per capita reductions in the BAU and TOD scenarios are:

- A federal fuel emissions standard;
- The installation of district energy systems in one area of Comox due to increased concentration of heat load in that areas. An analysis of the density of buildings was conducted to identify any areas that have a sufficient heat load to financially justify a district energy system. Appendix 2 illustrates the area that was identified. Based on current funding programs by BC Hydro and Terasen for district energy and technical advances in retrofitting techniques, this is a reasonable assumption in the next five to ten years. The installation of a district energy system does not result immediately in significant reductions but does facilitate the incorporation of renewable technologies in the future.
- Residential building code improvements, as detailed in the BC Energy Plan.



COMPARISON OF TWO DIFFERENT NEIGHBOURHOODS

In order to illustrate the impacts of two different development patterns on GHG emissions, please see the following example from the Comox context:

Kingsley Court single-family housing

- annual energy use per house: 103 gigajoules.
- 3.5 km from downtown.
- cal-de-sac.

Balmoral Ave low rise apartments

- annual energy use per unit: 27 gigajoules.
- 300 metres from downtown thereby enabling walking and cycling access.

Citizens living in the Balmoral Avenue low rise apartments consume a little more than one quarter the energy of those living in Kingsley Court single-family detached dwellings due to energy savings resulting from shared walls, walkability and bicycle access, proximity to transit and other factors.

RECOMMENDATIONS

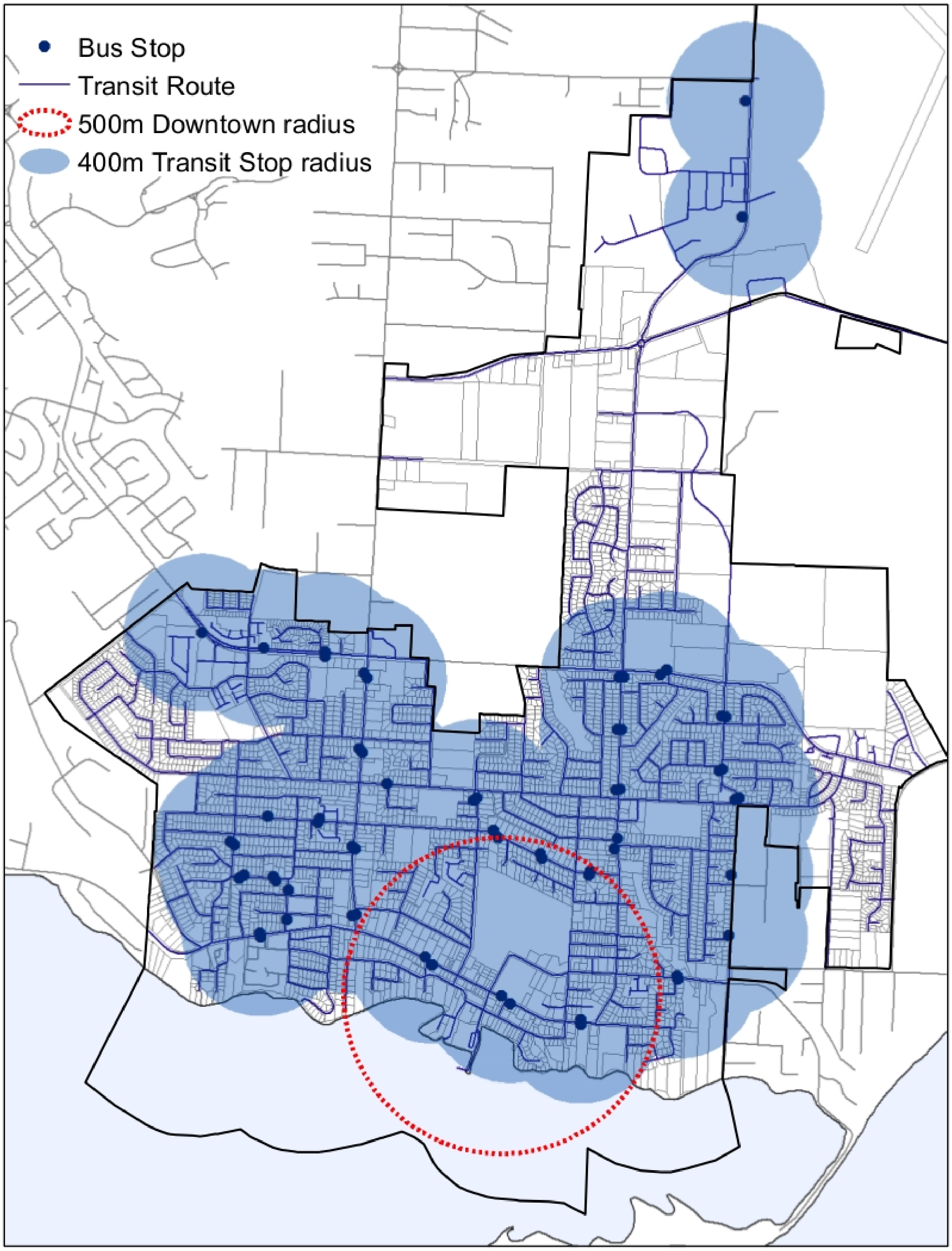
The analysis indicates that the following strategies will be instrumental in Comox achieving its GHG target.

1. Encourage growth near existing service centres and higher frequency public transit routes;
2. Give priority to pedestrians, cyclists and public transit when planning public realm improvements;
3. Encourage local agriculture within the Town boundaries;
4. Explore opportunities for district heating in higher density mixed use areas shown in Appendix 2; and
5. Support and enforce energy efficiency regulations in the BC Building Code.

ADDITIONAL INFORMATION

The GHGProof modeling user manual and literature review are available at www.sustainabilitysolutions.ca/landuse

APPENDIX 1: WALKING ACCESS TO DOWNTOWN AND PUBLIC TRANSPORTATION IN TOD SCENARIO



APPENDIX 2: DISTRICT ENERGY POTENTIAL IN TOD SCENARIO