CLIMATE CHANGE COMMITTEE

Executive Summary

The Climate Change Committee convened from December 2007 – May 2008 to advise on implementation of the City's commitment under the Climate Action Charter to mitigate the negative impacts of climate change.

The City has committed to be carbon neutral in respect of its operation by 2012. In 2007, the City produced around 2000 tonnes of carbon dioxide equivalent with an energy bill of over $1 million. To become carbon neutral, this will need to be reduced where possible and the remainder offset, by purchasing or investing in reductions elsewhere. Reductions could also lead to significant cost savings which is important given current energy cost increases.

Leadership from the City is also important to help reduce carbon dioxide emissions in the wider community. Up to 45% of emissions in the wider community (related to transport, buildings and waste) are, or can be, influenced in some way by local government. Carbon dioxide emissions from vehicles are the major emission source in BC communities, and because of escalating gas prices, the committee suggests a focus on reducing transport related emissions. The City can also influence urban density and energy efficiency through its planning process and co-sponsor public education activities with local organizations.

Extreme weather and weather-related events pose the greatest climate risk for the Valley and these are expected to increase in intensity and frequency over time. In the longer term, this is predicted to translate to average increases in precipitation of 5% (mainly falling in winter) and rises in temperature of average 2 degrees C. Adapting to these changes has implications for some City operations in the short-medium term and the longer term environmental, social and economic implications need to be taken into account across key organizations in the region. If recent changes in Arctic ice are any indication, the pace of climate change may be faster than current thinking allows, and may require a level of flexibility in our responses that our society is not currently set up for. If this worst case develops there will be a need for the City to gain a more in-depth understanding of its vulnerabilities and the risks it faces than this report presents.

The Committee recommends the following:

1. Establish a GHG management capability within the City responsible for managing emission reduction and offset activities and accounting and reporting on the City commitment to be carbon neutral (Action 1)

2. Establish a Climate Action Team which can network effectively across City Government, Regional District, First Nations and community/business groups, building capacity among stakeholders to address the more strategic adaptation and emission reduction issues (Actions 4 through 9).

3. Adopt least cost, highest impact measures to reduce City GHG emissions and reduce energy costs (Action 2)

4. Establish a carbon offset/reduction fund as an internal account and earmark sufficient start up funds (Action 3)

5. Update City purchasing policy, planning and development regulations and bylaws to encourage low carbon development in the community. (Actions 5)

6. Hold a public forum to discuss this report, develop community priorities for energy saving and energy efficiency and identify groups that would be willing to combine efforts with the City to take on longer term community project development (such as commuter trails and local food production) and public education functions. (Action 6)

7. Take forward infrastructure projects that enable the community at large to reduce GHG emissions, with a priority being to develop and implement a bike and walking trail master plan for the City. (Actions 4 and 7 and Appendix B)

Contents

Part 1: How can the City meet commitments under the Climate Action Charter?

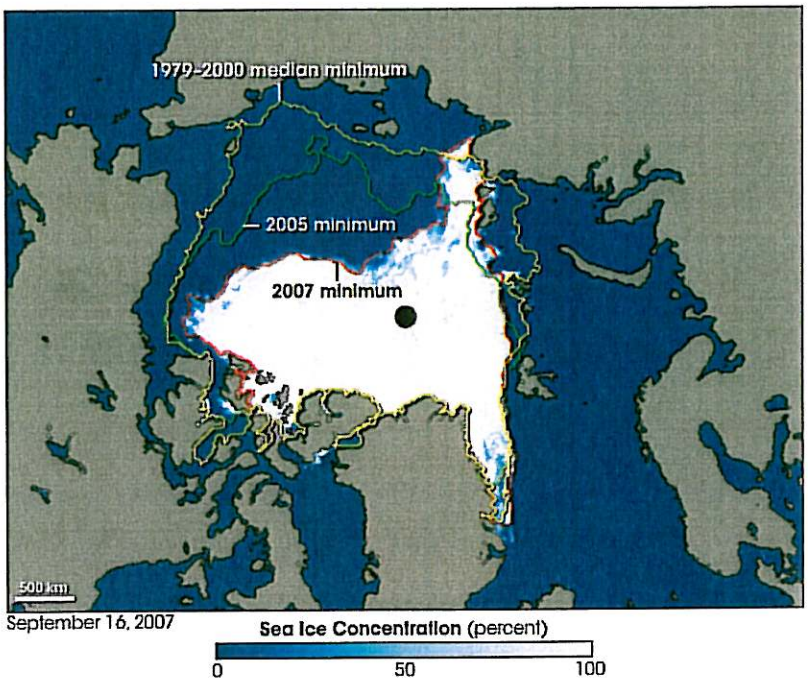
"We used immense amounts of creativity, ingenuity and adaptability on the way up the energy upslope, and there's no reason for us not to do the same on the down slope... If we collectively plan and act early enough there's every likelihood that we can create a way of living that's significantly more connected, more vibrant and more in touch with our environment than the oil-addicted treadmill that we find ourselves on today".
Transition Towns 2008

The IPCC's most recent assessment report concludes that it is "*unequivocal*" that the Earth's climate is warming, "*as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level.*"

1. What is Climate Change?

Climate Change can be defined as **a significant change in weather patterns in relation to long term trends for the same area.** It can be caused by emissions of heat trapping gases, called 'greenhouse gases' (GHGs) to the atmosphere, which occur from both natural sources (such as volcanic or solar activity) as well as from human related activities.

After assessing millions of years of climate and CO_2 records, leading scientists from around the world who make up the Intergovernmental Panel on Climate Change (IPCC)[1] have reported major advances in our understanding of climate change.

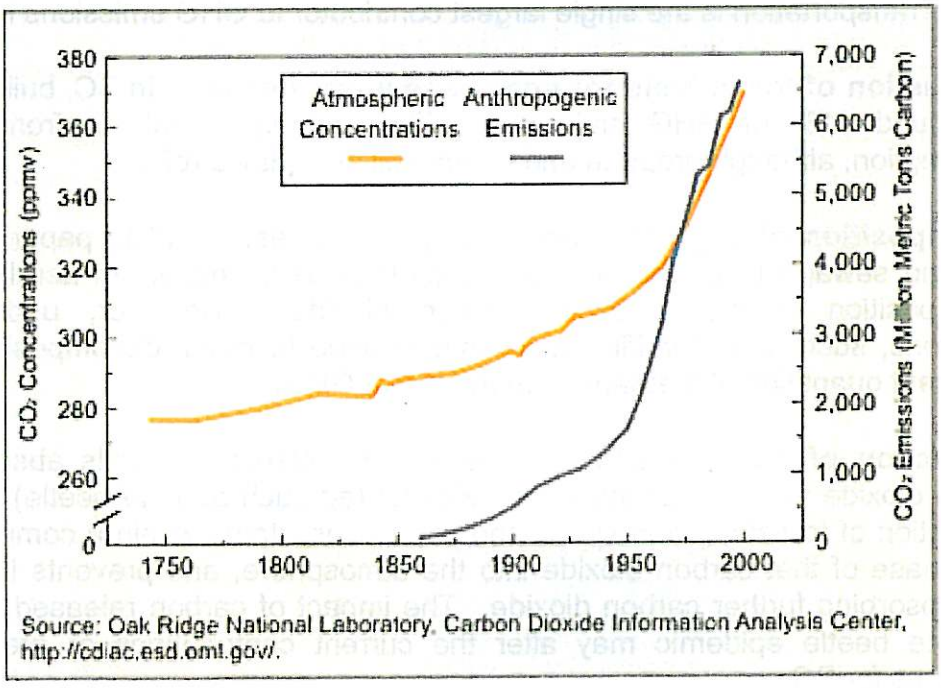


[1] IPCC Fourth Assessment Report: Climate Change Science. 1,200 Authors and 2,500 scientific reviewers from more than 130 different countries.

In September 2007 (above, red line), a record low area of sea-ice was measured in the Arctic Ocean. On March 1, 2008 Norwegian scientists warned that if the 2008 summer follows pattern of past years, the Arctic could be free of ice this summer (2008), many others believe it could be ice free in 5-6 years. (http://www.canada.com/vancouversun/news/story.html?id=643c7cba-bb80-4b52-a2a9-a266b607c31d&p=1 The loss of the Arctic ice cap would mean far more heat captured by the Arctic ocean... the effect on weather patterns from this loss is still being studied. The Arctic ice cap has not been ice free in the summer for at least 1.1 million years.

The IPCC report also confirms that the current atmospheric concentration of carbon dioxide and methane, the two important heat-trapping gases, "*exceeds by far the natural range over the last 650,000 years.*" Since the dawn of the industrial era, concentrations of both gases have increased at a rate that is "*very likely to have been unprecedented in more than 10,000 years.*"

The report finds that it is "*very likely*" that emissions of heat trapping gases from human activities have "*caused most of the observed increase in globally averaged temperatures since the mid-20th century.*" (graph X)[2] and calls for global action to reduce emissions of these gases to try and slow the pace and extent of future predicted increases in temperature.



[2] Greenhouse Gases, Climate Change, and Energy – Energy Information Administration - http://www.eia.doe.gov/oiaf/1605/ggccebro/chapter1.html

2. What are Green House Gases (GHGs)?

The most common GHGs, in order of warming potential in the atmosphere, are Nitrous Oxide, Methane, and Carbon Dioxide (CO_2). It is customary to report greenhouses gases as a single measure, metric **"tonnes of carbon dioxide equivalent" or tCO_2e**, which takes into account the different warming potential. The main source of GHGs is from the combustion of fossil fuels and crude oil which forms the backbone of the economies of the developed and developing world. Major sources of GHGs in British Columbia in 2005 are shown in Figure 1, and arise from the following activities.

- **Combustion of fossil fuels used to generate electricity.** Although most of the electricity produced in BC is generated in hydroelectric stations, a small amount is generated in diesel and natural-gas-fired power stations. BC also imports power from other jurisdictions outside of the province, many of which produce power less cleanly than BC (for example, from coal).

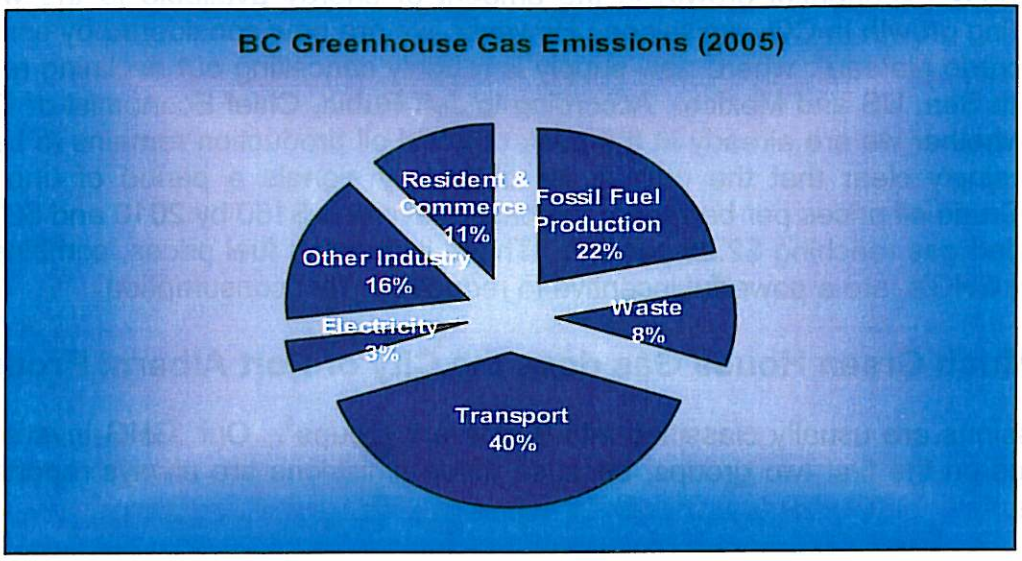
- **Combustion of fossil fuels in transportation.** Most of our transportation modes (shipping, aviation, trains and cars) are powered directly by the combustion of fossil fuels. Transportation is the single largest contributor to GHG emissions in BC.

- **Combustion of fossil fuels for space and water heating.** In BC, buildings account for around 11% of GHG emissions. The majority of this is from natural gas consumption, although propane and heating oil also play a role.

- **Decomposition of organic wastes.** Organic wastes, including paper, wood, waste food and sewage solids all emit GHGs as they decompose. In aerobic conditions, decomposition largely produces carbon dioxide. However, under anaerobic conditions, such as in landfills and some sewage lagoons, decomposition produces significant quantities of methane, a more potent GHG.

- **Destruction of "carbon sinks".** Trees, other plants and soils absorb and store carbon dioxide from the atmosphere. Natural (eg such as pine beetle) and industrial destruction of forests, green space and other ecosystems within a community causes the release of that carbon dioxide into the atmosphere, and prevents the ecosystem from absorbing further carbon dioxide. The impact of carbon released as a result of the pine beetle epidemic may alter the current contributions of greenhouse gas emissions for BC.

Figure 1. Sources of GHG emissions in British Columbia 2005



Source: GHG Assessment Guide for Local Governments, Feb 2008

Figure 1 shows that transportation is the largest emitter of GHGs in our province. Table 1 below compares different modes of personal transport, showing clearly the impact that more fuel efficient vehicles can have on minimizing emissions. For example, a 180 km return journey to Nanaimo results in CO_2 emissions of about 18 kg in a fuel efficient car, 36 kg in an average car and 58 kg in an SUV or pickup. An air trip from Nanaimo to Toronto, on an as-the-crow-flies distance of 3418 km, results in 939 kg.

Table 1

Comparison of Efficiencies and Emissions of Transportation

Means of transport	Fuel Efficiency (km per Lt)	CO_2 emissions per km
Bicycle	na	0
Bus – well used service	28 – 50 kpL per passenger	80 – 45 g
Rail – normal suburban	18 – 52 kpL per passenger	130 – 100 g
Fuel efficient car	18 – 23 kpL	130 – 100 g
Rail – high speed few stops	14 – 28 kpL per passenger	165 - 80 g
Average car	10 – 16 kpL	200 – 145 g
Air (long haul)	8 -12 kpL per passenger	330 – 210 g
Large cars, SUV's etc	5 – 9 kpL per passenger	400 – 250 g
Air (short haul)	4 – 8 kpL per passenger	460 – 300 g

Since the 1950s, the use of crude oil and the refined petroleum products it can create, have led to a nearly exponential growth in the amount of energy available to the world and a corresponding growth in CO_2 emissions. However, we are now considered by some to be on a "bumpy crude plateau[3]" where new supply is roughly cancelling out declining regions such as the North Sea, US and Mexico. According to Jeff Rubin, Chief Economist of CIBC World Markets, "whether we are already at the peak of world oil production remains to be seen, but it is increasingly clear that the outlook for oil supply signals a period of unprecedented scarcity". Crude oil prices per barrel are forecast to average $150 by 2010 and $200 by 2012 with unleaded gas reaching $2.25 per litre. These increasing fuel prices, combined with the need to cut GHG's, are a powerful incentive to reduce our fuel consumption.

3. How Much Green House Gas does the City of Port Alberni Produce?

GHG emissions are usually classified into 3 different groups[4]. Our 'GHG inventory' for the City focuses on the first two groups, because these emissions are always reported in GHG inventories.

Scope 1: Direct GHG emissions
Direct GHG emissions occur from sources that are owned or controlled by the City. The main City emissions are:

- CO_2 from natural gas consumption in city buildings
- Emissions from fuel combustion (gas and diesel) resulting from city fleet operation, and
- Nitrous oxide from nitrogenous fertilizers applied to city landscapes.

CO_2 emissions from sewage aeration ponds are biogenic and thus not included as an emission source. Methane and nitrous oxides are also unlikely to be generated from an aerobic shallow pond such as that used by the City, provided it is well managed.[5] There may be methane generated as a result of processing hake waste as long as it remains untreated at source. However, there are no means to estimate the volume of methane from this source at this time.

Scope 2: Electricity indirect GHG emissions
Accounts for GHG emissions from the generation of purchased electricity consumed by the City operations. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.

Scope 3: Indirect Emissions
The third group, are indirect emissions and are optional for inclusion in a GHG inventory. These are dealt with in Section 6.

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[3] Bumpy Crude Oil Plateau in the Rear View Mirror: April 2008: http://www.theoildrum.com/node/3793

[4] Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition, World Business Journal for Sustainable Development, World Resource Institute

[5] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol. 5 Ch. 6

The amount of greenhouse gas emissions directly attributable to the operations of the City, or from purchased electricity totalled 1,994 tonnes of carbon dioxide-equivalent (tCO_2e) in 2007 at a cost of over $1 million to the City.

Scope 1 and 2 GHG Emissions from City Operations, Port Alberni 2007

Source	Total Consumption	Tons CO_2 emitted (tCO_2e)[6]	% of Emissions	Cost to City
Natural Gas (buildings)	21830 GJ	1113	56%	**$261,061**
Electricity	8712891kWh	192	10%	**$503,121**
Transportation (diesel)	187420 litres	517	26%	**$187,420**[7]
Transportation (gas)	71360 litres	172	8%	**$ 71,360**[8]
Fertilizers (N,P,K)	7023kg	3	0%	
TOTAL		1997	100%	**$1,022,962**

These data are based on actual consumption figures for all sources, from externally generated records and using emissions factors recommended by the provincial government. These are believed to be the most significant Scope 1 and 2 emissions but need to be properly verified. **The scope of the City inventory should also be confirmed when Provincial Guidance is issued on what is to be included in the carbon neutral definition.**

How much GHG does City land absorb? Trees store carbon at quite high rates, each 100kg of completely dry wood contains about 44kg of carbon, which required about 72kg of CO_2 from the atmosphere to produce through photosynthesis. However, when trees are cut some of this carbon is released from those parts of the tree that are burnt, allowed to decay etc, while some is stored longer in wood and wood products used for construction and other longer term uses. If the size of the lands and size and type of the trees on the forest lands owned by the City could be surveyed, a Mean Annual Increment could be determined, which could be used to estimate the amount of carbon being stored by these patches of timber annually. It is not clear whether the City will be able to account this as an annual off-set. However, if allowable, additionality of sequestration eg. through improved management, would have to be demonstrated. It would have to ensure that these trees were not cut down.

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[6] tCO_2e are calculated using emission factors recommended in GHG Emissions Assessment Guide for local governments in British Columbia, Version 1 Feb 2008.

[7] Estimated at $1 per litre

[8] ibid

4. How Can City Operations become Carbon Neutral by 2012?

What is carbon neutral? Being carbon neutral is like having a balanced financial book, with equal expenditure, and revenue, at the end of the year. That is to say if we produce 1,994 tons of CO_2 equivalent in a given year, we must either reduce these through carbon reduction projects or offset them through carbon storage (also called carbon sequestering) projects, so as to reduce the overall amount of CO_2 that the City produces in that year to net zero. Offset projects may be local or involve buying into projects elsewhere – the carbon market.

The provincial government defines carbon neutral in this way, but it has not yet determined what must be included in the carbon production figure. Our inventory assumes only Scope 1 and 2 emissions will be included.

What's the financial bottom line? Assuming there is no reduction and that all emissions must be neutralised, the annual cost for the City of being carbon neutral from 2012 would be $49,857[9] (based on 2007 emissions and using the existing provincial rate of $25 per ton).

The following three actions are suggested for Council to meet its goal of being carbon neutral by 2012.

Action #1 - Set up a GHG management capability for the City

An essential first step will be to assign responsibilities for GHG management and ensuring that staff who will carry out the basics of GHG management are adequately trained and can allocate adequate time to essential tasks (including identifying and managing emissions reductions and offsets, accounting, monitoring and reporting GHG emissions and staying abreast of guidance and funding opportunities). Procedures also need to be put in place within City operations that would facilitate the gathering of necessary data on an annual basis. An outreach function to the wider community will also be necessary and GHG management staff should be active in the proposed Climate Action Team. The City will need to examine whether this can be done within existing capacity.

Action #2 - Adopt least cost, highest impact measures to reduce GHG emissions

Natural gas is by far the biggest GHG emissions source (56%) as well as being a significant cost to the City. Use is mainly during winter months. A breakdown of use by facility in 2007 shows that Echo Pool and the Multiplex together account for 65% of natural gas use (costing $97,000 and $65,000 per year respectively). RCMP, Public works, Fire Hall, Parks and Recreation wood buildings account for a further 25%. The remaining gas users are small but also need to be evaluated. For example, Glenwood Centre and City Hall both consume similar amounts of natural gas per year ($7,000 each) although their usage is far different.

Historical records show that consumption is fairly static and is forecast to remain static as no major new building projects are anticipated. Costs will, however, continue to rise as the price of gas increases.

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[9] $25 x total emissions (1,994 tCO_2e). The current rate of $25 is that currently set aside by the Provincial government as an offset per ton of emissions generated from Staff travel and represents an average of carbon prices across different markets.

The City should assess current efficiency against established benchmarks (eg consumption/m^2) as well as usage levels of buildings relative to cost and identify options to reduce emissions which could include: i) efficiency improvements eg such as through improved insulation or equipment upgrades, ii) alterations in building use or schedules iii) fuel switching, including feasibility for use of ground source energy, heat recovery from the sewage treatment plant or other alternative energy sources to help reduce reliance on gas.

Vehicle emissions

The priority in the short term should be improved fleet management because this can generate significant emissions and cost reductions (for example banning idling of vehicles, introducing more efficient routing and work scheduling – especially for garbage trucks or reducing the size of the fleet) at little or no cost. The Climate Action Partnership (CAP) is developing an online fleet management tool to assist municipalities with identifying ways to reduce GHG emissions from the fleet.

Fuel consumption is reasonably static, however, costs could rise by up to 30% in 2008. With escalating fuel prices in mind, costs and benefits of converting the fleet to hybrid or electric should be assessed.

Electricity

A third priority would be to reduce electricity use. Electricity consumption is far less significant for GHG emission reduction (unless the electricity baseline is equalized across Canada) but important for reducing costs as electricity accounts for over half of the City energy bill. For example, an overall reduction of 20% in electricity consumption would generate savings of $100,000.

There are around 65 different Hydro accounts in the City, of which sewage aerators, Multiplex, Echo Pool and street lighting account for 57% of total consumption. Another 8 facilities account for a further 26%. Historical data show that consumption is fairly static and likely to remain so, as no major new buildings are anticipated.

The larger consumers should be the initial focus of activity, however, potential to improve efficiency, facilities management and usage and other opportunities should be assessed for all facilities using, for example, LED technology in existing City buildings and street lights. Electricity use for water supply and sewage makes up 30% of total consumption and generates 58 tCO_2e. A constructed wetland could be used to improve sewage treatment and reduce long term operational costs. Reductions in per capita water consumption would also help reduce GHG emissions. Other opportunities include reducing water consumption.

Fertilizer

Fertilizer use has already been significantly reduced through good management practice including user education to accept a longer cut of grass which not only requires less nutrient but is also good for weed prevention and water consumption; conservative watering during the cooler evening and mornings; use of slow release formulations of nutrient to prevent leaching and lessen frequency of application; improving cultural practices such as aeration and topdressing. Further reductions in Nitrous Oxide emissions could be achieved by substituting organic fertilizer.

The potential for emissions reductions across all sources, and associated costs, should be reviewed and the least cost options identified and evaluated. For example, switching from natural gas to electricity would reduce CO_2 emissions by almost half (980 tonnes) but would add approximately $170,000 (70%) per year to the City's energy bill based on current prices and consumption. Investment in alternative energy sources would need capital investment but may generate payback in the form of cost savings.

Action #3 - Establish an offset/reduction account

In spite of reduction efforts there will inevitably be a portion of emissions that will need to be offset. The City needs to identify a strategy for doing this and consider starting to put aside funds to an internal offset account. The example below shows how the purchase of offsets could start by 2010 and rise incrementally to balance 50% of tCO_2e emissions by 2012 (approximately $25,000), the remaining 50% having been achieved through phased reduction in emissions over the next four years.

Where would funds come from? Offset/carbon reduction funds could be built up by earmarking a portion[11] of cost savings on reduced energy consumption resulting from measures proposed in Action #2. However, a modest start up fund would be necessary to fund investments in reductions. Such funds could also be used as matching funding to leverage project funding from external sources. Appendix C provides a list of possible funding sources. Less significant in cost terms but demonstrating visible commitment and leadership, the City could also consider following the Provincial Government lead and start setting aside $25 per tonne of CO_2e generated by official staff travel[12].

What would the funds be used for? The funds should be able to be used for City emission reduction projects as well as to purchase offsets. Offsets could include projects which either sequester carbon within the city or reduce emissions in the wider community. This might prove to be more cost effective than reducing the City emissions as well as providing an opportunity to be innovative in GHG management. Examples of possible local projects could be to:

- Carry out a review of all forests on City lands and creek valleys and determine the baseline for current carbon sink potential and ways of increasing their ability to retain carbon – new plantings, removal of decaying matter and invasive species etc.
- Plant shrub and Tree (Fruit or native) boulevards.
- Encourage organic gardening in the community, since organic soil is a carbon sink.
- Investments to increase transit ridership.
- Retrofitting of buildings for energy efficiency.
- Investment in local food production and distribution to reduce GHG emissions from transport.

[11] A portion of savings would be eaten up by rising energy prices, especially for fuel.

[12] This would vary according to transport type eg efficient car 0.325 cents/km; average car average 0.65 cent/km, large car/SUV 1 cent/km, long haul flight 0.825 cent/km, short haul flight 1.15 cent/km.

A key outstanding question is what criteria and standards will govern what may or may not be counted as an offset in annual accounting or as a carbon credit that can be sold. Guidelines will be issued by the Provincial Government Offsets but in general, offsets are required to undergo a proper process of project-level accounting with baselines, determination of additionality, monitoring plans, validation, and verification. This may well predispose towards projects that can more easily establish a baseline and larger projects that can absorb the transaction costs of accounting and verification. As it is not required to be carbon neutral until 2012 there is time to explore the feasibility of various options and to identify the best strategy.

The newly established Pacific Carbon Trust will provide a clearing house for reduction projects and offsets under the Climate Action Charter. It is currently being designed but envisaged as selling offsets to municipalities at an established rate (eg $25 dollars per ton), purchasing credits from municipalities that wish to sell them and reinvesting the Trust funds in green projects in BC that will generate credits.

Possible phased timeline for City to become Carbon Neutral 2008-2012

(based on example of 2,000 tCO_2e baseline in 2008)

Time	Indicative End of Year Targets
2008	City GHG Baseline tCO_2e/year established City GHG management/accounting system operational, focused audits of key facilities carried out. Develop proposals to access funding. Offset fund established as internal fund account. **Baseline Emission tCO_2e = 2000**
2009	Target of 600 tCO_2e (30 %) reductions on 2008 baseline from reduction in use of natural gas and improved fleet management. Feasibility of further reduction projects and community/city offset schemes or offset purchase explored as guidelines are developed. $ contributions to offset fund from staff travel and energy cost savings **Balance of emissions tCO_2e = 1400**
2010	Target of 280 tCO_2e (20%) new GHG reductions on 2009 baseline from low cost investments (funded from energy cost savings + external funding where available) 100 tCO_2e offset from community sequestration schemes or purchase on market ($2,500) **Balance of emissions tCO_2e 2010 = 1020**
2011	Target of 100 tCO_2e (10 %) new reductions on 2010 balance 300 tCO_2e cumulative offset from community sequestration schemes or offset purchase on market ($7,500) **Balance of emissions tCO^2e = 720**
2012	Target of 20 tCO_2e (3.5%) new reductions on 2011 balance 1020t CO_2e cumulative offset from community sequestration schemes or offset purchase on market ($25,500) **Balance emissions tCO^2e = 0**

5. What actions might the City take to promote a more compact, energy efficient community?

In addition to the Scope 1 and 2 emissions covered in the inventory, there is a third category **Scope 3 Indirect Emissions.** These emissions are a consequence of the activities of the City, but occur from sources not owned or controlled by the City and are usually optional for inclusion in an inventory. We are assuming the City does NOT need to account for Scope 3 emissions for being carbon neutral in its operations. However, the City DOES need to consider its influence on these emissions and take action to help reduce them as part of its commitment to help develop a more compact, energy efficient community under the Climate Action Charter. It is important for the City to show leadership and commitment, both in addressing its own emissions as well as helping the community reduce its emissions and improve energy efficiency in whatever way it can.

Scope 3 emissions potentially include:

- Emissions from the municipal landfill site
- Emissions resulting from contracts, leases or purchase agreements conducted by the City
- Emissions as a consequence of local government decisions around land use and infrastructure which greatly influence buildings (residential and commercial sectors), transportation (urban sprawl and the use of transit vs. driving) and waste. One study estimates up to 45% of emissions in the wider community are or can be influenced in some way by local government[13].
- City staff official travel in non city owned vehicles is also a Scope 3 emission.

The following are four actions the City can take to realise this part of its commitment.

Action #4 - Better understand and quantify the community carbon footprint

Where possible the City could start to compile baseline estimates on key 'scope three' emissions to help track the potential for developing CO_2 reduction projects in the wider community and for public awareness raising. Depending on eligibility, some projects might be used to offset City emissions or sold as credits to the Carbon Trust. A quantitative understanding of the regional carbon footprint might also assist in accessing capital or grant funds.

Action #5 - Update City purchasing policy, planning and development regulations and bylaws to encourage low carbon development in the community

Priorities identified by the Committee are:

[13] Figure estimated by the Community Energy Association, based on Environment Canada's 2004 emissions data for British Columbia.

Planning

- Linking approvals for future developments, private or public, to demonstrate how it can minimize its carbon footprint, for example by promoting best practice such as LEED for design features, materials, equipment and or processes that use a renewable energy source or recycle energy and by providing incentives where appropriate e.g. waiving development permit fees and other land development costs.
- Review of zoning bylaw for housing alternatives to increase density
- Identify sites within the city for the development of high-density, walk able urban villages. Encourage high density residential development and retail development in these zones and limit it elsewhere. Possible walk able villages could be centered on sites such as Argyle and 3rd, 10th and China Creek, 10th and Redford, 10th and Roger, Johnson and Cherry Creek and the two quay areas.

Purchasing policy

- Include requirements to account for and minimize carbon footprint as part of selection criteria for major City contracts, purchases, leases etc.

Bylaws

- Introduce bylaws which encourage city residents to produce their own power (wind generator height restrictions, solar heaters, solar panels;
- Introduce bylaws which encourage backyard food production so as to promote the 100 mile diet (now officially endorsed by MoA);

Forthcoming regulatory changes, Bill 27, Local Government Green Communities Statutes Amendment Act, 2008, which is currently under discussion by the House, proposes a number of changes to the legal framework relevant to local government addressing greenhouse gas emissions. The proposed amendments will also require community development plans and regional growth plans to include greenhouse gas emissions reduction targets and strategies. http://www.leg.bc.ca/38th4th/1st_read/gov27-1.htm

Action #6 - Promote public awareness on possible mitigation actions

The City can play an important role in public education, sponsoring key activities jointly with local organizations that can help build community capacity and action. It is recommended that the city hold a public forum to discuss this report, develop community priorities for energy saving and energy efficiency and who would be willing to combine efforts with the City to take on city project development and public education. Possible activities include:

- Showcasing and publicizing demonstrations e.g. of solar, wind power for public buildings as part of the City carbon neutral strategy
- Publishing an annual carbon account and management plan
- Co-sponsor training on GHG management for local businesses eg through community futures (eg the Carbon Trust provides three sessions for groups of about businesses to walk them through managing their own carbon footprint at a total cost of $1,000 – this is being done in Tofino/Ucluelet)
- An annual competition for innovation/best practice in the community – household, small business

- Conferences/tradeshows eg on green building, alternative energy systems, how to increase local food production and promote the Vancouver Island Diet

Action #7- Promote infrastructure projects that enable the community at large to reduce GHG emissions.

Greater effort is needed to encourage use of buses, walking and cycling. As the price of gasoline increases citizens will gradually change their habits, judging by the response in other developed countries. However, the City needs to make walking and cycling easier, especially between both sides of town through creation of multi use commuter trails and bicycle routes.

There is an urgent need for a trail and bike masterplan which includes, for example, Roger Creek crossing and other links to valley trails. A low carbon transport master plan needs to be produced which complies with requirements to obtain funding support for implementation, and should include a full range of measures such as park and ride, no drive zones, air care for commercial vehicles etc.) The City might also work with BC Transit on a possible electric bus pilot project and adopt measures to improve bus ridership. One proven method of increasing transit ridership many times over is to offer a free service. More shelters and benches, as well as improved schedules, are needed to make transit an attractive option.

GHG reductions from some projects such as district heating, landfill gas utilization and composting may become tradable in the voluntary offset market. Intermediaries such as the Green Municipalities Corporation, a part of FCM, are set up to help municipalities access the carbon market. It does not appear that capturing methane from Port Alberni's landfill is presently economically viable.[14]

What other municipal jurisdictions are doing to reduce GHG's – some examples from other BC communities

The municipalities of Whistler, Courtenay, Vancouver, and Ladysmith have all implemented a number of similar strategies to deal with climate change. These initiatives include:

i) improved recycling and solid waste management services, with some jurisdictions looking into the collection of landfill methane gas for power generation purposes.
ii) the development or improvement of non-vehicular transportation, such as the development of cycling lanes and walking paths.
iii) the improvement of public transit methods and incentives for the public to use them.

All of these municipalities have also launched awareness and education campaigns, as well as offering incentives for domestic energy efficiency based on Energy guide ratings, and the encouragement of the economic sector in achieving low GHG emissions levels.

Each municipality has independently reviewed its own fleet of city vehicles, and is attempting to improve efficiency. Domestic bylaws for GHG reductions have also been passed, or are planned, for each municipality. Whistler and the City of Vancouver have both set laws regarding domestic idling and vehicle maintenance. Additionally, bylaws regarding air quality have also been considered.

[14] The rule of thumb used by GMC is that landfill gas emissions need to be >10,000 tCO_2e per annum for a project to be economically feasible for them to invest in. The most recent study conducted by ACRD identified 2029 as the year by which landfill gas capture might be an economically viable option.

The City of Vancouver has also considered the implementation of an energy delivery networks within city limits to reduce unnecessary waste. Alternative energy sources are such as fuel cell and hybrid power, along with bio-diesel and ethanol fuels are being investigated or implemented for city and transit fleets.

Vancouver has implemented a food security policy, promoting local production of food.
http://vancouver.ca/commsvcs/socialplanning/initiatives/foodpolicy/
Ladysmith, in partnership with VIHA, has done the research to develop a food security policy. Montreal has a community garden for every 2500 households as part of its policy. Toronto has developed a shade policy in response to an initiative of the Canadian Cancer Society but also as a climate change response.

Part 2: How Might Climate Change Affect Our Community?

"...even after introducing significant measures to reduce greenhouse gas emissions, some additional degree of climate change is inevitable and would have economic, social and environmental impacts on Canada and Canadian communities. Although impacts would vary on a regional basis, all areas of the country and virtually every economic sector would be affected."
From Impacts to Adaptation: Canada in a Changing Climate, Natural Resources Canada 2008

7. How does climate change affect the weather?

The IPCC report predicts with strong confidence that weather events will generally intensify and that storms, hurricanes, and typhoons will become more frequent and more powerful. The temperature of the ocean is the energy source of world weather cycles. In the last 40 years the average global temperature went up 2 tenths of a degree Celsius and represents the largest effect of global warming. The world ocean is expected to heat up in the next 40 years 2 to 10 times as much as it did in the last 40 years. So, we know that all kinds of weather will continue to intensify, whilst predicting the where and the when will become even more difficult.

Here in the Alberni Valley, we can expect:

- winds to increase in intensity and turbulence
- more intense rainfall events
- more intense snowfall events
- more unusual types of weather like hail, thunder and lightning
- more unseasonable weather
- hotter hot spells

Scientists using computer models and simulations have been able to create some possible outcomes as to how these chaotic and more extreme events will add up into climate averages[15]. The models are being improved and are expanding in scope and detail every year. The current regional predictions for coastal areas of BC, are:

- Average temperature rise of 2 degrees Celsius in both summer and winter by 2050, however, the range of their predictions is between 1 and 3 degrees (which is higher than the average global predictions).

[15] Dr Andrew Weaver, School of Earth and Ocean Sciences at the University of Victoria

- Coastal BC precipitation models show wide variability with a range of values between 2% less to 10% more rain and a mean value of 5% more by 2050. It is suggested that most change will occur in winter rainfall, with little change in summer precipitation, or perhaps longer periods of drought. The present average rainfall is about 1950mm per year in the City.

Increased temperatures in summer will result in the ground drying more rapidly. Increased temperatures in winter mean that snow pack will not be as reliable as in the past to supplement summer stream flow. It is also worth noting that, with the overall trend to global warming, high and low pressure systems will both be more intensified, which will lead to extremes of cold as well as heat.

How certain are these predictions? Every model has an uncertainty with it and current models give predictions over wide areas (currently 100 x 100km grids) and so do not take into account the many micro-climates on Vancouver Island. There is high confidence that the Pacific Northwest will warm (all models project warming). However, predicted changes in precipitation are less certain than changes in temperature and changes in summer precipitation are less certain than changes in winter precipitation. It is possible that winter precipitation increases may be underestimated.

It is helpful to remember the difference between climate and weather. Climate is a mathematical average of many weather events. Weather is the events as they actually happen. The average temperature, for example, cannot tell us whether that average is made up of events close to the average (moderate weather) or if it is made up of events much above and below average (more extreme weather).

While the increase in global average temperatures is the unequivocal result of increasing GHGs, the exact weather at any time and place remains as unpredictable as ever. What we do know is that increasing the energy in a closed system (as global weather is) will certainly increase the intensity of events within the system.

8. What might this mean for the Alberni Valley?

Extreme weather and weather-related events pose the greatest climate risk for the Valley. British Columbia's Provincial Emergency Program (BC-PEP) records extreme weather events that cause personal and economic losses due to infrastructure damage. From 2003 to 2005, the frequency, severity and costs of extreme events recorded by BC-PEP rose dramatically as a result of wildfires, storm surges, heavy rains causing flooding and landslides, and drought. Warmer winter weather, resulting in ice jams, freezing rain and rain-on-snow events, also resulted in economic losses. These events cost BC taxpayers an average of $86 million per year in payouts of disaster financial assistance, compared to an average of $10 million per year from 1999 to 2008. Data specific to Alberni Valley are not currently available.

Impacts on current and future water supplies, hydroelectric power generation, fisheries and river ecosystem integrity are also significant concerns for BC. Most of BC's alpine glaciers are retreating rapidly and many may disappear in the next 100 years.

Coupled with reduced snow pack and warmer spring temperatures, this will result in earlier spring freshets, warmer river temperatures, declining summer flows and increasing peak flows in many of BC's watersheds. The City water supply on China Creek could be negatively affected by these changes. The dams and the weir on Great Central and Sproat Lakes would help maintain lake levels, despite reductions in snow pack. Agriculture might possibly benefit from an extended agricultural season, but will also become more difficult due to extreme and unseasonable weather.

In British Columbia, relative sea-level change differs from the global trend due to vertical land movements. During the twentieth century, sea level rose 4 cm in Vancouver, 8 cm in Victoria and 12 cm in Prince Rupert, but dropped by 13 cm in Tofino (BC Ministry of Water, Land and Air Protection, 2002). For this reason it is difficult to make local predictions about sea-level rise.

Within this context and drawing on priorities identified by other municipalities some key areas which may merit attention by the City are as follows:

Factors	Possible Effects based on current predictions
Water Supply and Quality	Reduced snow pack would lead to implications for China Creek water supply and could bring forward significantly the need to tap Somass River or Great Central Lake as an alternative source. Water quality issues arise around heavier and more prolonged rainfall especially where other stress factors exist, such as logging.
Erosion and Flooding	Implications for land use planning and zoning, especially with regard to floodplains. Any rise in sea level will cause problems for sewage ponds and exacerbate existing storm water issues on 3rd Avenue in heavy rainfall and at high tides. A sea level rise of 0.5 metres would leave 3rd Avenue flooded for significant periods of time. Progressively more saturated steep slopes may give way more frequently to more landsides.
Energy	The connection between climate change and water will also increasingly impact energy planning and management. BC Hydro power generation capacity is vulnerable to declining water supply and changing river flow patterns. By 2025 electricity demand in BC is expected to be 30-60% higher than 2005. BC Hydro's plan is that the majority of this is to be met by greater conservation and efficiencies and from other renewable sources. Studies on the costs of climate change adaptation identify significant increase in energy consumption as a major contributor to cost increase.
Infrastructure and Maintenance	Increased maintenance costs (especially storm water, flood and transport related) and possible shortened lifespan of existing infrastructure.
Emergency Services	Increase in frequency and costs of extreme weather events can be expected. Should consider the adequacy of existing emergency response plans.
Economic Development	Economic development policy is needed to take into account climate change vulnerabilities and risks as well as opportunities eg forest and fishery dependent communities vulnerable to increasing climate risks whereas benefits are expected for summer tourism as well as the emerging renewable energy/waste management and local food production industry. Insurance costs are also rising.
Food Security and Self Dependence	Decreased ocean capacity to produce protein rich foods and vulnerability and disappearance of First Nations' indigenous food supply. More locally produced food will become key in the face of rising transport costs, and global food security issues. Local non-marine food sources will be affected negatively due to specific extreme weather events. The carbon sinking capacity of organic soils will be a big plus in creating carbon offset markets in the rural and urban farming mix. Interdependence and projects that promote community resiliency should be considered as ways to raise local food production.
Population Dynamics	Population growth prediction is for the City to remain around 18,000 with the population ageing. As impacts of climate change or mitigation strategies for other regions kick in, there is a possibility that our region will become a more desirable place to be. City may consider its capacity to adapt to a range of possible population growth scenarios.
Health	Climate change is expected to change distributions of diseases such as Lyme disease and tick-borne encephalitis, and to increase rates of Salmonella and other food borne infections in Europe and North America (WHO 2008) and West Nile virus. Our ageing population will also be increasingly vulnerable to extremes of heat and cold and service interruptions as result of extreme weather events.
Vulnerability	While the community has shown resilience in the past, the population is getting older with a much higher proportion of traditionally more vulnerable groups to health risks, to economic shocks as well as signalling a decline in the traditionally high levels of volunteerism associated with strongly resilient communities.

It is not possible to easily predict the pace of climate change – will it be gradual over 50 years or perhaps subject to sudden shifts? - nor predict the social, economic and environmental impacts of climate change and how they will play out. Climate change is also only one of many stressors and vulnerabilities which need to be looked at in terms of the 'cumulative impact' on a community. Economic stressors already exist in the form of our shrinking industrial base, recent price increases for energy and food, tightening credit and increased insurance costs, many of which are likely to intensify in future. This accumulation affects the overall vulnerability and attitude of an ageing population with obvious impacts on the community as well as posing limitations on City future revenue potential.

At the same time studies on the economic impact of climate change on municipal infrastructure and the built environment identify significant capital and maintenance cost increases over time, as well as significant increase in energy demand and costs (eg for air conditioning), even where adaptation measures are taken[16].

9. What actions might the City take to help the community adapt to the impacts of climate change?

Drawing on the experience of other municipalities, the following actions might be considered in the short-medium term.

Action #8 - Build Knowledge Capacity

- Increase public awareness of climate change and its projected impacts on the community, for example by ensuring public access to up to date and locally relevant information on climate change impacts and adaptation measures individuals can take.
- Increase the technical capacity to prepare for climate change impacts, for example, conducting or learning from more in depth analyses of impacts in a specific area, evaluating the flexibility of current built, natural and human systems to adapt to a possible range of change scenarios including conducting community assessments of vulnerability and risk.
- "Mainstream" information about climate change vulnerabilities, risks, and preparedness into planning, policy, and investment decisions for example by ensuring design criteria for new infrastructure projects or upgrades take into account future, as well as past, climate conditions. The implications for scope and delivery of emergency response services might also be assessed as well as the need for a food security policy.

Recommendation: Establish a Climate Action Team which can network effectively across City government, regional district, First Nations and community/business groups. The Climate Action team will help build community partnerships and intercommunication that underpin the capacity (resilience and systems integrity) to adapt to potentially rapid or significant change and also help to take forward the carbon reduction and energy conservation agenda (Part 1).

Action #9 - Increase Adaptive Capacity of built, natural, and human systems in the community in priority areas

Possible Short-medium term considerations for City Operations

- Strengthen municipal watershed protection provisions working with the provincial government
- Improve water conservation to help delay the eventual need to tap Central Lake and associated capital costs
- Separate storm water from combined sewers
- Increase storm water capacity including reducing asphalt within the city limits[17]
- Restrict development density in the floodplains
- Start tracking impact of climate change/weather instability on operational costs to identify problem areas
- Consider how the City can use incentives or subsidies to encourage private land owners to plant and maintain trees within the city
- Consider how the City can use incentives and subsidies to encourage land owners to produce food within the City, encourage local experimentation with food production and development of acclimatised varieties.
- Ensure preservation of the existing forest canopy

[17] This also has a potential cost saving function given that price of asphalt more than doubled from $35 to $40 a tonne to $75 to $80 in the last 5 years and is likely to increase further.