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Are Small-to-Mid Sized *Businesses the Catalyst* to a Low Carbon Economy in BC?

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EXECUTIVE SUMMARY

This research paper disputes the notion that the transition to a low-carbon economy will create an undue burden on businesses, especially the small-to-medium-sized enterprises (SMEs) that are responsible for an estimated 20 percent of British Columbia's greenhouse gas emissions.

This white paper includes 11 British Columbia (BC) business case studies that demonstrate the financial and environmental benefits of greenhouse gas (GHG) emissions-reducing projects. The projects are distributed across the top emission activities relevant to most businesses: electricity, heating, transportation and waste. Each company, or organization, has worked with the Vancouver-based social enterprise, Climate Smart Businesses Inc. to measure and manage its emissions ("carbon footprint") between the years 2010 and 2013. Each company is also considered an SME, with fewer than 500 FTE employees¹.

Multiple examples are given from each of the four main activities that release GHGs. Efforts to reduce emissions levels are demonstrated through examples of capital investments, simple technology improvements, and behavioral initiatives. Descriptions are provided of government incentives or rebates that were accessed by each business to encourage action. GHG emissions reductions, the return on investment (ROI), and simple payback periods for each project are given, highlighting the business case for GHG management. (See Table 1).

Of the almost \$1 million invested in emissions reductions (\$671,175 of the organizations' own money plus outside incentives), annual cost savings of \$288,650 are now being realized across the 11 organizations. Based on current energy and waste-disposal costs, the estimated total savings over 10 years (minus the initial investment) is more than \$2.2 million dollars. With a projected payback period of 2.3 years, this equates to a 43 per cent rate of return and annual emissions reductions of 485.6 tonnes CO₂e.²

Drawing from the case studies in this paper and from the larger pool of data compiled from the 700 businesses with which Climate Smart has worked, a number of observations can be made about SMEs' approach to, and potential for, reducing GHG emissions.

- Reducing emissions is a multi-year effort. Companies on average achieve a 3.6% reduction in their first 12 months of tracking emissions. This reduction increases to 11.5% for those firms that tracked to the end of the third year.
- Companies are drawn towards projects that have either one or both of the following: 1) a financially justifiable payback period, and 2) a project that represents important co-benefits to the organization.
- BC businesses tend to choose reduction activities with the strongest price signals, regardless of whether they are "simple" (i.e. projects with low capital requirements) or capital-intensive. Respectively, the diversion of landfilled waste and fleet fuel switching/replacement have shown the highest uptake due to anticipated rises in fuel and landfill costs.
- Companies that have invested in emissions-reduction activities illustrate a willingness within the SME sector to share financial data, experiences, and lessons learned in order to help other businesses begin to take action and build market demand for low-carbon economy products, services and policies.

- Employees are further incentivized to participate in emissions-reducing activities if there is financial reward - a sharing in the savings, in addition to the more esoteric benefit of doing the right thing for the environment.

SMEs comprise 98 percent of all BC businesses yet they have been largely overlooked by climate change policy. But it is their prevalence throughout all industries that make them a potential catalyst for establishing environmentally sustainable and lower cost productivity across the whole business sector. They can also influence the communities in which they operate. Government policies can help SME's accelerate their transition to supporting a low carbon economy through adoption of the following recommendations:

1. Use government purchasing power and procurement contracts (worth billions of dollars) to catalyze business emission reductions by requesting from vendors GHG reporting and/or quantification of greenhouse gas emission reductions.
2. Expand BC's programs that encourage business energy conservation to also assist SMEs in reducing their overall GHG emissions.
3. Invest a portion of BC Carbon Tax revenue to support education and emissions-reductions projects for SMEs. This could include:
 - i. enabling the wider deployment of efficiency upgrades in the business sector through targeted programs and utility partnerships
 - ii. implementing new technologies and rapid innovations which are typically too difficult for SMEs to undertake without clear signals from government
 - iii. developing a multi-year tax rebate (for instance, over a three year period) that incentivizes businesses to measure emissions and invest in green job skills, operational improvements and technology upgrades to reduce emissions
 - iv. helping educate and inform SMEs that emissions reduction and capital investments can result in ongoing, long-term cost savings with attractive pay-back periods
4. Ensure SMEs have equal access to emissions reduction training and support regardless of industry or geographic location
5. Issue an annual report that tracks SME-sector contribution toward provincial emission reduction targets.

Table 1: Case Studies

Emission Activity	Company	City	Industry	GHG Savings (metric tonnes CO ₂ e)	Annual Cost Savings	Pay-back Period
Electricity	Delta View Campus of Care	Delta	Healthcare	8.6	\$24,100	5.7 years
Electricity	Collingwood Neighbourhood House	Vancouver	Community Services	2.3	\$9,300	2.8 years
Electricity	Aggressive Tube Bending	Surrey	Manufacturing	2.7	\$7,700	1.6 years
Heat	Shirtland Drycleaners	Vancouver	Services	10.4	\$2,300	6.5 years
Heat	Victoria Butterfly Gardens	Saanichton	Entertainment	80.6	\$4,000	1–1.3 years
Heat	The Listel Hotel	Vancouver	Hospitality	150.0	\$55,000	7 years
Solid Waste	Victoria Women-In-Need Co-operative	Victoria	Retail/Not-for-Profit	41.1	\$2,750	0.3 years
Solid Waste	CBR Products	Vancouver	Manufacturing	4.3	\$1,100	0.1 years
Transportation	Starfish Medical / ViVitro Labs	Saanich	Research & Development	7.7	\$7,000	0.3 years
Transportation	Paradise Island Foods	Nanaimo	Food Production and Distribution	88.5	\$21,400	2.4 years
Transportation	Van Houtte Coffee Services	Coquitlam	Food Production and Distribution	89.4	\$154,000	1–2 years

1. INTRODUCTION

Engaging SMEs as key contributors to reducing community-wide GHG emissions is of great importance. SMEs, of which there are more than 385,000 in BC³, represent 98% of BC businesses⁴, and employ over a million people. Collectively they are significant consumers of energy and materials, and also generators of waste. According to data compiled by Metro Vancouver, BC's largest regional government, SMEs are responsible for 20% of regional GHG emissions⁵. Combining the abilities of entrepreneurs to contribute as innovators, calculated risk-takers and investors, SMEs can bring a healthy dose of competition to the race towards more sustainable business operations and lower community emissions.

This paper provides tangible, case-based evidence to challenge the perception that business and environmental practices must be at odds. It also challenges the notion that the transition to a low-carbon economy will create an undue burden on businesses in general, and SMEs in particular. These 11 case studies along with the larger pool of SMEs working with Climate Smart, show that it is precisely these businesses that are devising innovative ways to sustainably advance their industries and their communities. Each of the 11 organisations profiled had select staff members undergo training through the Climate Smart program between the years 2010 - 2013.

Candidates for this publication were identified through analysis of Climate Smart's growing data pool of more than 500 completed GHG inventories and reduction plans submitted by the organizations with whom it works. Climate Smart carried out in-depth interviews and financial analyses of the emissions-reduction projects considered. The top reduction strategy examples were grouped by emissions activity and screened for geographical and sector diversity to form the basis of this report.

2. BACKGROUND

In 2009, Climate Smart Businesses Inc. launched the first municipally supported climate change and emissions-management training program designed specifically for SMEs. This segment of the economy was identified as a gap in terms of business engagement around emissions reduction. Climate Smart's training, certification, and data services are designed to link business-sector actions to community-wide carbon emission reduction targets. This approach simultaneously addresses common municipal goals targeting economic development and green job creation. To date, Climate Smart has worked with more than 700 businesses, the vast majority of which are based throughout British Columbia.

Climate Smart works by training key staff at SMEs, and providing tools and support that enable businesses to begin to measure, manage, and ultimately reduce emissions. Its advisors review the emissions measurements ("GHG inventories") according to the internationally recognized Greenhouse Gas Protocol standard developed by the World Resources Institute and the World Business Council for Sustainable Development.

It is important to note the voluntary context within which all of these businesses have chosen to participate. Many of these businesses claim status as the first in their respective com-

munities and/or industries to tackle GHG measurement and management. As context, the principal “drivers” to measure this aspect of their organizations, as identified by the businesses themselves, included personal motivation and interest; marketing and brand image; community and industry engagement; and cost cutting and efficiency boosting⁶.

While top-line benefits (e.g., brand lift, marketing, business development and meeting external requirements) are achieved, these case studies focus on the bottom-line benefits of reducing emissions. Specifically, this paper focuses on the financial metrics used to evaluate the success of the projects and the mechanisms through which the projects were financed. While the majority of companies that have worked with Climate Smart (81%) pursue more than one emissions-reducing project simultaneously, this report focuses on one project from each business featured – with the exception of two businesses that have completed multiple projects with definitive payback periods, within the same activity type.

Financial metrics like payback period and return-on-investment (ROI) are just one way to measure the business benefits of emissions-reduction projects. For instance, consideration of GHG measurement has led some businesses to change their choices in products and services. Other motivations include employee engagement, preparing for future requirements, expectations of rising cost of fuel and/or landfill fees, as well as changing customer and consumer preferences.

3. FINDINGS : CASE STUDIES

3.1 Electricity

3.1.1. Delta View Habilitation Centre/Life Enrichment Centre – Delta, BC

Delta View Habilitation and Life Enrichment Centres are comprehensive seniors residences and health care facilities in Delta, BC. The Habilitation Centre consists of 80 beds in 76 rooms; the Life Enrichment Centre has 212 beds in 192 rooms. Together the facilities employ approximately 300 staff, and represent a physical footprint of 249,000 square feet.

The company has pursued multiple emissions reduction strategies over the past several years. The Life Enrichment Centre, built in the mid-2000s, incorporated a closed-loop geothermal heating and cooling system in the initial build. Delta View then replaced rooftop air-exchange units and boilers at the Habilitation Centre. These measures combined to significantly reduce the natural gas usage for these facilities.

Delta View then identified lighting retrofits in its two facilities as a high priority for reducing emissions and costs. It completed a commercial lighting retrofit program with the aid of BC Hydro Power Smart incentives at its older facility, constructed in the early 1990s. By replacing incandescent fixtures with LED fixtures, Delta View accessed a \$22,000 incentive for the \$44,500 project, essentially halving costs. This project yielded permanent, recurring energy savings, and greatly enhanced the lighting environment at the facility.

In 2012, Delta View again addressed lighting efficiency (this time in their newer building) by replacing its fluorescent light fixtures with LED fixtures. This retrofit resulted in a 1,000-kWh-per-day reduction in electricity usage. Again Delta View was able to access a BC Hydro incentive of \$60,500, over a third of the \$174,800 capital cost for the project.

Most recently, Delta View has been virtualizing its servers, reducing the physical server units from 12 to three. This allows the company to reduce not only the electricity powering the units, but also the cooling required to keep the servers from overheating. Delta View continues to investigate further opportunities to reduce its lighting electricity load in 2013.

Initiative: Lighting retrofits
 Project cost: \$219,300
 Incentives: \$82,500 (BC Hydro Power Smart incentives)
 Total Investment: \$136,800
 Savings: 344,669 kWh = \$24,100 (annually)
 Projected Payback Period: 5.7 years
 Rate of Return: 17.6%
 Greenhouse gas emissions reduction (projected⁷): 8.6t CO₂e

3.1.2 Collingwood Neighbourhood House – Vancouver, BC

Collingwood Neighbourhood House has been promoting the wellbeing of the Renfrew-Collingwood community since 1985 through a range of social, educational, economic, health, cultural and recreational programs. The community consists of 50,000 people and is one of the most diverse in the province. The Neighbourhood House operates out of nine locations, the primary site being a 26,900 square foot facility on the border between Vancouver and Burnaby.

Collingwood measured its baseline inventory for the 2011 fiscal year and immediately took steps to reduce emissions by establishing a “green team”, conducting a heat and electricity efficiency audit and exploring options to reduce commuting-related emissions.

The most impactful initiative to date has been a comprehensive lighting retrofit of its primary facility in Vancouver. An assessment found that the lighting needs of the parkade could be met by de-lamping approximately half of the area. This delivered an immediate electricity savings of 50% within the parkade, without any capital cost.

Following these changes, Collingwood initiated a \$36,000 lighting retrofit to the rest of its main facility. With a \$10,000 rebate from BC Hydro Power Smart, Collingwood was able to replace existing 32W T-8 lamps with 28W T-8 lamps, without sacrificing light levels. In addition, Collingwood switched incandescent and halogen lamps in ceiling and wall sconces for LED lamps. It installed occupancy sensors in washrooms throughout the building and installed LED lights in place of compact fluorescents in the building’s exit signs.

These retrofits, combined with energy conservation awareness campaigns targeting employees and facility users, resulted in overall electricity savings at Collingwood of nearly 25%. Based on this, Collingwood projects its \$26,000 investment to have a payback period of 2.8 years, at which point the savings can be invested directly back into its community programs.

Initiative: Lighting retrofit
Project cost: \$36,000
Incentive: \$10,000 (BC Hydro Power Smart incentives)
Total Investment: \$26,000
Savings: 25% total electricity consumption - \$9,300 annually
Projected Payback Period: 2.8 years
Rate of Return: 35.7%
Greenhouse gas emissions reduction (actual): 2.3t CO₂e

3.1.3 Aggressive Tube Bending – Surrey, BC

Aggressive Tube Bending is a manufacturer in Surrey, BC, employing 45 people between two industrial facilities. It offers a wide spectrum of products and services, including pipe, tube, and structural steel forming. It also carries out custom fabricating and manufacturing. The company measured its baseline inventory for the 2010/2011 fiscal year at a time when it was undergoing extensive renovations. This experience gave the firm an additional lens—energy efficiency—through which to evaluate renovation options.

Aggressive Tube Bending is working to reduce its emissions by improving insulation in its new facilities, introducing anti-idling practices for vehicles and heavy equipment, retrofitting lighting for maximum efficiency, increasing recycling efforts and eliminating unnecessary paper use.

This case study focuses on the company's most impactful project: the replacement of two aging air compressors integral to its operations with a newer, considerably more efficient model in late 2012. The move followed a seven-day evaluation of the two-piston compressors' usage and efficiency, which indicated they were significantly oversized for the output that was required.

The higher upfront cost of moving to a right-sized, higher-efficiency variable frequency drive compressor, compared to a standard model, was manageable due to the energy savings and BC Hydro Power Smart incentives.

By replacing their two aging compressors with the high-efficiency model, and lowering the pressure of the compressor by 20 pounds-per-square-inch (psi)—which provides -1% electricity savings per 1 psi lowered—Aggressive Tube is projected to save \$7,700 annually and 109,500 kWh. After BC Hydro provided an incentive of \$15,300, the projected payback on this \$27,800 investment was lowered to 1.6 years.

Initiative: Air compressor retrofit

Project cost: \$27,800

BC Hydro Power Smart Rebate: \$15,300

Total Investment: \$12,500

Savings: 109,486 kWh or \$7,700 annually (~22.7% total electricity consumption)

Projected Payback Period: 1.6 years

Rate of return: 62.5%

Greenhouse gas emissions reduction (projected): 2.7t CO₂e

3.2 Heat (Natural Gas)

3.2.1 Shirtland Dry Cleaners – Vancouver, BC

Shirtland Dry Cleaners is a 50-year-old dry cleaning operation in Vancouver, with 14 employees and a 21,500 square foot facility that processes approximately 1,600 pieces of clothing per day. In addition to dry cleaning, Shirtland handles alterations and tailoring, shirt service and laundering of bedding and table linens. This case study focuses on the recent upgrade to a high-efficiency boiler without utility incentives, and the unexpected savings from reduced maintenance requirements.

Shirtland established GHG data and reports that showed just over 90% of its emissions originated from its twin natural gas-fired condensing boilers. These boilers served as the source for hot water heating, steam production for pressing garments; they also powered the hydraulic movement of equipment. Shirtland spent approximately \$32,000 annually on natural gas.

The company replaced the existing two 30-horsepower (hp) boilers by leasing one 40 hp “modulating” boiler (retaining one of the older boilers as back-up). No incentives were available for the particular type of condensing boiler required. As a result, the inflation-adjusted payback period for the boiler replacement was approximately 10 years, not typically considered an acceptable financial timeline. However, Shirtland’s choice to lease the boiler and avoid the significant upfront capital cost of purchasing outright helped make the business case for the replacement more palatable.

Including fine-tuning the gas pressure for the new boiler, this modulating boiler has delivered annual natural gas cost savings of \$3,300 (6-7%) and reduced Shirtland’s GHG emissions by 15.5t CO₂e per year. As an added benefit, the new boiler has reduced downtime and maintenance costs, and improved the consistency of garment treatment, as it fires at a much more consistent rate.

The company is also reporting some top-line improvements related to its overall sustainability projects. For example, Shirtland has replaced disposable, plastic garment bags with reusable, branded garment bags that are provided to customers. This initiative has diverted 7,500 to 8,000 lbs of plastic film from landfill annually and the company believes the reusable bags help generate return business as they serve as a reminder to customers to bring in their dry-cleaning with the bags.

Initiative: Boiler retrofit

Project cost: \$37,000 (\$15,000 more than a conventional boiler)

Incentive: -NA

Total Investment: \$37,000

Savings: \$2,300 annually

Projected Payback Period: 6.5 years (based on additional cost of high-efficiency boiler) 16.1 years (simple boiler payback)

Rate of Return: 15.4%

Additional benefits: Business development/retention, consistency of garment care, decreased down-time/maintenance

Greenhouse gas emissions reduction (projected): 15.5t CO₂e

3.2.2 Victoria Butterfly Gardens – Saanichton, BC

The Victoria Butterfly Gardens is a popular tourist attraction on Vancouver Island’s Saanich Peninsula and home to more than 5,000 butterflies as well as tropical fish and birds. As a year-round tourist destination, the Butterfly Gardens has significant heating requirements in the winter to maintain a viable climate in its 12,000-square-foot greenhouse. Therefore the focus was on investigating and implementing a variety of initiatives aimed at reducing natural gas usage.

The company first set out to evaluate the R-factor (insulative effectiveness) of the current greenhouse. This analysis led to insulating the greenhouse with a “thermal polymembrane greenhouse cover”, essentially a second layer of insulation installed around the existing greenhouse, leaving a 2 1/4” insulating airspace, conceptually the same as double-paned windows. With a project cost of \$10,900 in materials and labour, this was considered an attractive investment given monthly natural gas costs in previous winters had approached \$8,000.

Following the installation of the polymembrane, savings averaging \$2,000 monthly were achieved between October and March⁸. The payback from natural gas savings over the winter was realized in less than a year.

Following up on its success, the Butterfly Gardens updated its natural gas heating equipment with a new boiler. After investigating, the company confirmed that utility incentives were not available for the high-output (but less expensive) technology it required. Proceeding without incentives, it installed a new \$12,900 boiler in 2012. The company has since realized further natural gas savings of another \$2,000/month over the winter months. Based on current consumption rates, Butterfly Gardens projects a payback on its investment within 16 months—less than two winter seasons of operation.

These initiatives combined cut the heating requirements by over 50%, translating to annual cost savings of \$20,000 and an emissions reduction of approximately 80t CO₂e.

Initiative: Thermal polymembrane greenhouse cover

Project cost: \$10,900

Incentive: -

Total Investment: \$10,900

Savings: \$2,000 monthly (winter months)

Actual Payback Period: 11 months

Rate of Return: 108.9%

Greenhouse gas emissions reduction (actual): 40.6t CO₂e

Initiative: Boiler retrofit

Project cost: \$12,900

Incentive: -

Total Investment: \$12,900

Savings: \$2,000 monthly (winter months)

Projected Payback Period: 16 months

Rate of Return: 75.2%

Greenhouse gas emissions reduction (projected): ~40t CO₂e

3.2.3 The Listel Hotel – Vancouver, BC

The 129-room Listel Hotel in downtown Vancouver employs 110 people and has been providing “art-full” accommodation for visitors since 2005. The Listel has been measuring its GHG emissions inventory annually since the hotel opened, and calculates that it has achieved a 19% emissions reduction from 2005 to 2011. Emissions from natural gas usage—mainly for space heating, and provision of hot water—consistently represent the largest part of the Listel’s annual emissions (over 70%).

To tackle this, in 2008 a solar hot water system was installed on the hotel’s roof. This was in addition to a highly efficient heat-recovery system that uses waste heat from the hotel’s cooling system to pre-heat water and provide support for heating the building. This system is the most significant contributor to reducing emissions overall. The rooftop solar panels also serve to pre-heat water, however, and with the two systems in place, natural gas is used only to heat water 10 - 20°C rather than the approximately 60°C required without the pre-heating systems.

Together the two systems have helped reduce GHG emissions from water heating by approximately 150 t CO₂e and have reduced costs by approximately 25%. With a grant from Natural Resources Canada contributing to the purchase of the solar panels, the payback period on the hotel’s investment was originally anticipated to be five and a half years. However, with recent drops in natural gas prices, payback is now estimated at closer to seven years.

With respect to incentives, the Listel looked at its monthly cost of natural gas compared to the value of further available incentives, which would have required time to complete applications and await decisions. Based on this, the financial incentive to go ahead with the project immediately was stronger than the incentives available. The Listel opted not to apply for additional funding, and went ahead with the installation.

The hotel has recently taken further steps to reduce its GHG emissions. For example, the Listel educated employees on both home and work energy conservation, installed thermostats in some rooms to reduce heating needs, and also re-lined its hot-water tank to reduce natural gas usage.

Initiative: Installation of solar hot water system and a high-efficiency heat recovery system

Project cost: \$300,000

Incentive: \$45,000

Total Investment: \$265,000

Savings: \$55,000 annually

Projected Payback Period: 7 years (at 2008 natural gas prices: 5.5 years)

Rate of Return: 14.3%

Greenhouse gas emissions reduction (actual): 150t CO₂e

3.3 Solid Waste

3.3.1 Victoria Women-In-Need Community Co-operative – Victoria, BC

Victoria Women-in-Need (WIN) Community Cooperative operates three resale shops that offer high quality, affordable second-hand items, such as clothing, furniture and housewares. The revenue generated by the WIN stores allows the organization to be completely self-sustaining in providing programs for local women who are in transition to self-sufficiency.

Over two consecutive years of measuring its emissions and associated expenses, WIN was able to understand better the extent of its carbon footprint. While it simultaneously pursued a lighting retrofit and comprehensively addressed its overall emissions, increased waste diversion had the most impact. Comparing its two years of data, WIN achieved a 49% reduction in waste.

WIN started its waste reduction in 2010 by diverting and transporting the unsuitable donated goods via reusable bags or containers to more than 10 local recipient organizations. Some of the clothing unsuitable for re-sale is repurposed as packing material for overseas medical aid shipments. WIN also improved its approach to sorting materials, using rolling bins, Rubbermaid containers, and printed educational materials to communicate operation efficiencies across all participating parties: staff, partner organizations and donors. These fixed and operating costs associated with improving waste diversion are factored into the payback period calculation.

By halving their waste generation, WIN was able to greatly reduce their costs associated with solid waste hauling, after working to re-organize the process with fellow Climate Smart Business, Ellice Recycle Ltd.

The \$4,000 in cost savings achieved in the first year of this initiative meant that the payback of the initial \$1,236 investment for Victoria Women-in-Need's waste reduction efforts was less than four months. In terms of GHG emissions, WIN was able to achieve a 41.1-tonne CO₂e emissions reduction in the first year of implementing this project.

Initiative: Comprehensive recycling
 Project cost: \$1,236
 Incentive: -
 Total Investment: \$1,236
 Savings: \$4,000 (2011) \$1500 (2012)
 Payback Period: ~ 4 months
 Rate of Return: 330%

Savings: Annual average \$2750

Greenhouse gas emissions reduction (actual): 41.1t CO₂e (from 2010-11 to 2011-12)

3.3.2 CBR Products – Vancouver, BC

CBR Products is a Vancouver-based company that develops, manufactures and supplies architectural coatings, specialty restoration and preservation products that reduce impact on the planet and on human health. CBR employs nine people in Vancouver.

CBR's president began in 2011 to experiment with ways to incent employees to reduce electricity consumption and solid waste sent to landfill. For example, CBR established personalized "shame bins" for the personal waste of each employee, such as coffee cups and fast food waste, as a playful way to raise awareness of the waste being generated. The resulting increased waste diversion and recycling cut the company's landfilled waste by three-quarters, and their waste-related expenses (pick-up and removal) by 50%.

Furthermore, CBR created a program to share the operational savings achieved: one-quarter of the efficiency savings achieved is allocated to an "efficiency distribution" paid to employees.

While the efficiency distribution has been a success, the company president credits this achievement to a combination of factors, such as the commitment of CBR employees to the environment. While relatively modest, the president also believes that the cost savings CBR has achieved thanks to 50% fewer garbage pick-ups and the >10% electricity savings from a lighting retrofit are substantial enough to encourage CBR employees to practice other energy-efficient behaviours.

As the capital investment in the waste reduction initiative was negligible (\$90 in sorting bins), the payback for this project has been immediate—the only expense to the company has been the one-quarter savings it has shared with employees.

This is an example of a project with true "triple-bottom-line" benefits—an initiative for which the savings are shared between CBR's people, profits, and the planet. Currently CBR is looking to additional improvements to the efficiency of its heating, ventilation and air conditioning system and installation of a solar thermal hot water system to preheat water for manufacturing processes and domestic use.

Initiative: Employee engagement and comprehensive recycling
Project cost: \$90 (plus ¼ of savings re-distributed to employees)
Incentive: -
Total Investment: \$90
Savings: \$1,100
Payback Period: 1 month
Rate of Return: 1,200%
Greenhouse gas emissions reduction (actual): 4.3t CO₂e

3.4 Transportation

4.4.1 Starfish Medical / ViVidro Labs – Saanich, BC

Starfish Medical works with clients all over North America and around the world to design, develop and manufacture medical devices. The company employs 51 people in Saanich, operating out of one facility. Starfish first measured its emissions inventory over fiscal 2011-2012 leading to emissions reduction strategies that included conducting waste and energy assessments, supporting sustainable commuting with incentives and improved facilities, purchasing Forest Stewardship Council certified paper, and teleconferencing with clients when possible.

Starfish Medical's most innovative emissions reduction strategy is also likely the most impactful the company could pursue – encouraging project managers and clients to reduce their business air travel. On average, for office-based professional services firms, business air travel represents the largest source of emissions, at 37%⁹. Starfish encouraged this behaviour by proactively supplying and encouraging the use of videoconferencing and webcam technology to both employees and clients. This initiative has worked well for the bottom line, with a nearly immediate payoff thanks to savings achieved from reduced air travel.

Since launching this strategy in 2009, Starfish has outfitted all project managers, senior management and numerous clients with top-of-the-line webcams and headsets, using either Skype or GoToMeeting as the software component. Each unit costs \$106 per set-up (not including shipping to clients). Starfish has invested \$2,755 to date, purchasing 26 of the webcams and headsets. Important to note is that the barrier to this type of initiative is much less likely to be technological than it is to be cultural. Perhaps the most important aspect of this “investment” has been the encouragement by senior management that project managers utilize teleconferencing whenever feasible.

While Starfish has found it difficult to provide exact figures for the value of air travel not expensed, and kilometres not flown, over the past three years encouraging this style of work has proven to be a positive investment, with a nearly immediate payback. Anecdotally, the company knows that numerous, otherwise necessary flights to clients (e.g., Charlottesville, West Virginia and San Mateo, California) have been avoided.

Initiative: Air Travel Reduction

Project cost: \$2,755

Incentive: -

Total Investment: \$2,755

Savings: \$7,000 (based on a very small sample)

Projected Payback Period: 4 months

Rate of Return: 330%

Greenhouse gas emissions reduction (actual): 7.7 t CO₂e

3.4.2 Paradise Island Foods – Nanaimo, BC

Paradise Island Foods is a local, family owned and operated company in Nanaimo, BC, that produces, packages and sells a variety of food and dairy products. The company employs 55 people in the manufacturing, warehousing, cold storage, and distribution of its products. In 2011, four employees began quantifying the impact of the company's success in reducing fuel consumption.

Paradise Island first aimed to reduce its fuel use through behaviour change, by implementing Environment Canada Fleet-Smart Driver Training program practices. To further improve the fleet's fuel efficiency and safety, the company also installed onboard computers for its fleet of tractor-trailers. The new technology enabled the following: setting a corporate speed limit of 90 km/h; automatic idle shutdown controls after three minutes; electronic driver logs; GPS tracking; and progressive shifting controls to avoid over-revving.

After deciding to create a staff productivity incentive program and return 50% of the fuel savings to the staff, Paradise Island was able to achieve buy-in from its employees. These initiatives achieved a 21% fuel reduction within the first month of implementation. Paradise Island estimates that maintenance and tire replacement costs also decreased by 15%.

The capital investment with the most noteworthy ROI for Paradise Island—due largely to available incentives—was the upgrade of its refrigerated trailer fleet to the new Carrier Vector Hybrid multi-temp refrigeration unit. The new hybrid trailer units can now be charged electrically by being plugged into the company's building during loading, unloading or while waiting to dispatch. Paradise Island has achieved a net fuel reduction of more than 64% using this technology. In addition, the plugged-in trailers have also balanced morning and afternoon building power usage – reducing BC Hydro usage imbalance penalties.

The investment in the new trucks and trailers qualified with both Green Fleet BC's Environmentrucker program and Transport Canada's Freight Technology Demonstration Fund project. The corresponding incentives available to Paradise Island totaled \$155,000. Therefore, the 9.6-year payback for the \$206,000 investment was reduced to 2.4 years, after available incentives cut the capital cost by nearly three-quarters.

Following the success of these initiatives, Paradise Island is already working towards its next generation of efficient transportation projects. By re-routing vehicles and re-organizing their distribution schedule, the company aims to take two of their trucks and trailers off the road early in 2013, further reducing its carbon footprint.

Initiative: Fleet Retrofit (Carrier Vector Hybrid)

Project cost: \$206,000

Incentive: \$155,000

Total Investment: \$51,000

Savings: \$1,783.25 monthly (\$21,400 annually) (50% fuel use)

Projected Payback Period: 2.4 years

Rate of Return: 41.2%

Greenhouse gas emissions reduction (actual): 88.5 t CO₂e

3.4.3 Van Houtte Coffee Services – Coquitlam, BC

Van Houtte Coffee Services directly services 10,000 customers all over BC, including offices, entertainment centres and convenience store locations. Van Houtte's vice president of operations spearheaded the measurement of the company's emissions for locations in Coquitlam, Kamloops, Cranbrook, Prince George, Vancouver Island, and Kelowna for the 2009 calendar year.

Van Houtte realized a reduction of 117t CO₂e from 2009-2010, and then a further 86t CO₂e from 2010-2011, by implementing a no-idling policy; optimizing truck fleet routes, implementing a recycling program; upgrading its lighting systems; implementing a staff engagement initiative; and retrofitting some delivery vehicles with propane engines.

The company is working to further reduce emissions by reducing paper use, purchasing 100% recycled content paper; continuing to retrofit delivery vehicles; performing lighting retrofits at locations outside of the Lower Mainland; and continuing to educate and engage staff to build a culture of conservation.

One of Van Houtte's most compelling emissions-reduction projects has been the retrofit of 25 conventional gasoline cube-vans to a hybrid gasoline-propane fuel system. Propane costs less than gasoline, and produces considerably less GHG emissions per distance travelled (~35% less expensive, and ~24% less GHG emissions).

Van Houtte expects the \$5,000 cost to retrofit each fleet vehicle to be repaid in 1-2 years (the range in payback is dependent on the usage and routing of each particular vehicle). As the engines start on gasoline, and then automatically switch to propane once the engine reaches a certain temperature, the vehicles with higher usage, and that start and stop less often, will have the shortest payback period. With fuel-conscious driving habits, Van Houtte has found that the vehicles are capable of operating using propane 95% of the time, and gasoline for only 5% of their driving time.

As a company continually striving to find further areas of efficiency, Van Houtte has been making a conscious effort to reinvest its savings in additional projects. As for the fleet optimization project, the payoff will be felt throughout Van Houtte's business for some time.

Initiative: Fleet route optimization, right-sizing and driver training & fleet fuel switching (gasoline to propane-gasoline hybrid)

Project cost: \$125,000 (25 vehicles, \$5,000 per conversion)

Incentive: -

Total Investment: \$100,000

Savings: Actual: \$154,000

Projected Payback Period: 1-2 years (depending on routing/usage)

Rate of Return: 50-100%

Greenhouse gas emissions reduction (actual): 80.0t CO₂e (2010-2011), 89.4t CO₂e(2011-2012)

4. CONCLUSION

This paper has demonstrated that transitioning to a lower carbon model does not impose undue pressure on small-to-medium sized enterprises, and in fact can lead to significant cost savings. With a total of \$978,975 invested (\$671,175 of the organizations' own money plus outside incentives) in emissions reductions projects, annual cost savings of \$288,650 are now being realized across the 11 organizations profiled.

Based on current energy and waste-disposal costs, the estimated total savings over 10 years (minus the initial investment) is more than \$2.2 million dollars. With a projected payback period of 2.3 years, this equates to a 43 per cent rate of return, and an annual reduction of 485.6 tonnes CO₂e that would have otherwise gone into the atmosphere.

It is important to note that these 11 case studies were chosen to reflect a diversity of industry sectors, organization sizes and geographies. Applying such a broad range of filters presents inherent difficulties, in terms of producing findings that are applicable across all different types of businesses throughout BC. However, there are a number of commonalities reflected not only in these case-based studies, but also statistically in the larger pool of data compiled from the 700 businesses with which Climate Smart has worked.

The process of establishing a baseline carbon footprint—and then working toward reducing and minimizing this footprint—is a multi-year process. SMES on average achieve a 3.6% emissions reduction from their first 12 months of emissions tracking. This reduction increases to 11.5% for those firms that tracked to the end of the third year¹⁰. Taken together data and case studies suggest that although some companies and organizations are able to act quickly on reducing emissions, significant projects are planned and implemented over a multi-year period.

Companies are drawn toward projects that have a financially justifiable payback period. While this period amongst the case studies varies from 1 month to 10 years, typically companies look for a 3-year maximum payback.

Companies are also drawn to projects that represent important co-benefits to the organization, and may accept longer payback periods if these are deemed significant. Examples of co-benefits include business development opportunities (e.g., marketing, ability to respond to requests for proposals or qualifications that demand sustainability information); employee engagement; meeting the future requirements of clients or customers; and simply the opportunity to significantly reduce their environmental impact.

It is worth observing that both the top “simple” and the top capital-intensive reduction activities pursued by SMEs are those with the strongest price signals in BC. One in two businesses is taking action on reducing waste to landfill¹¹, as landfill tipping fees in BC are projected to increase steadily¹². Meanwhile, while fuel prices fluctuate throughout North America, a steadily increasing BC carbon tax on fuel brought a measure of certainty that average prices would continue to rise. For capital projects aimed at reducing emissions, it is transportation measures that have seen the highest uptake, with companies investing capital in fleet efficiency and replacement (22% of firms).

Those activities for which the price signals are either not projected to rise or are somewhat uncertain—for instance, heating and electricity—have seen lower percentages of businesses pursuing capital-intensive emissions-reducing projects. Of course, this may be partially coincidental, as projects reducing heating and natural gas usage most often require a certain extent of control over operations that not all SMEs have (i.e. facility ownership) and projects involving HVAC are both complex and capital intensive.

A significant number of businesses both in this study and the larger pool of Climate Smart organizations are taking advantage of utility and government incentives and rebates. However, the presence of incentives is neither an absolute prerequisite to action, nor is a lack of available incentives a complete barrier to action, as demonstrated by several of the case studies discussed here.

Knowledge of the relative magnitude of emissions may not be a primary driver for change. Just one in five organizations (18%) is taking action on its greatest source of emissions¹³. Often these high-emitting activities are integral to their operations: for example, companies that primarily distribute goods and people may find great difficulty making net reductions in transportation - an activity essential to their business success. However, this figure may speak more to the inclination of businesses—and SMEs in particular—to first address the emissions-producing activities for which the price signals are clear, where incentives are available, or where change can be made relatively easily and “early wins” achieved, before addressing what may actually be their greatest sources of emissions.

A surprising finding is the willingness of SMEs to share their sustainability research, development and implementation intelligence with other companies. For example, sharing private financial data is not standard practice; yet each of the 11 businesses freely shared its financial information in this report. In addition, these businesses agreed to have their stories shared in future training and via both traditional and social media. These businesses are contributing to a shared R&D pool on “green” business operations, with organizations from different communities and sectors participating and benefiting from the experiences of others. It is this kind of collaboration and sharing of information will help accelerate the building of a new low carbon economy.

However the impact of SMEs as individual reducers of emissions is at the same time limited by current operating realities: the policy and infrastructure frameworks in which they do business, including systems of regulatory reporting, tax policy, energy transmission, procurement options, waste collection, and freight distribution. Collectively, and as individual organizations, they may act as catalysts for the transition to a low carbon economy, but they are inherently constrained by the political, economic and built environments within which they work.

Yet as an aggregated sector of our economy SMEs are important to engage on climate action: in their critical mass, as these businesses change practices, they can build the necessary market demand for sustainable products, services and policies. Small and mid-sized businesses can and do serve as catalysts for a low carbon economy, and government and policy can play an important role in accelerating that transition.

5. RECOMMENDATIONS

Government can help SME's accelerate their transition to supporting a low carbon economy by adopting the following recommendations:

1. Use government purchasing power and procurement contracts (worth billions of dollars) to catalyze business emission reductions by requesting from vendors GHG reporting and/or quantification of greenhouse gas emission reductions.
2. Expand BC's programs that encourage business energy conservation to also assist SMEs in reducing their overall GHG emissions. Support could take the form of incentives for technology and training to reduce emissions from waste, fleet, transportation, materials, product design & delivery.
3. Invest a portion of BC Carbon Tax revenue to support education and emissions-reduction projects for SMEs. This could include:
 - i. enabling the wider deployment of efficiency upgrades in the business sector through targeted programs and utility partnerships
 - ii. implementing new technologies and rapid innovations which are typically too difficult for SMEs to undertake without clear signals from government
 - iii. developing a multi-year tax rebate (for instance, over a three year period) that incentivizes businesses to measure emissions and invest in green job skills, operational improvements and technology upgrades to reduce emissions
 - iv. helping educate and inform SMEs that emissions reduction and capital investments can result in ongoing, long-term cost savings with attractive pay-back periods
4. Ensure SMEs have equal access to emissions reduction training and support regardless of industry or geographic location
5. Issue an annual report that tracks SME-sector contribution toward provincial emission reduction targets.

ENDNOTES

1. Key Small Business Statistics, Industry Canada: <http://www.ic.gc.ca/eic/site/061.nsf/eng/02714.html>
2. The emission factor for BC is based on the provincial power grid intensity of 25 g CO₂e/kWh and does not account for electricity imported by British Columbia. This value is also recommended in BC Ministry of Environment's 2012 Best Practices Methodology for Calculating Greenhouse Gas Emissions. Environment Canada, 2011. National Inventory Report 1990-2009 - Greenhouse Gas Sources and Sinks in Canada. Part 3, Tables A13-1 to A13-12.
3. BC Government: Small Business Profile 2012: <http://www.resourcecentre.gov.bc.ca/pdf/SmallBusEngWeb.pdf>
- 4 BC Government: Small Business Profile 2012: <http://www.resourcecentre.gov.bc.ca/pdf/SmallBusEngWeb.pdf>
5. Metro Vancouver Sustainable Region segment: <http://www.youtube.com/watch?v=RDnGIYHMwE>
6. Beyond Big: Small Business, Green house Gases, and Competative Advantage. Climate Smart Businesses, Inc. 2012
7. A combination of realized emissions reductions from the first project, and projected emissions reductions from the second project
8. It is difficult to control for the effect of year-over-year weather variation when calculating payback, as outdoor air temperature has less effect on the Gardens' greenhouse heating demand than the amount of solar radiation received.
9. Beyond Big: Small Business, Green house Gases, and Competative Advantage. Climate Smart Businesses, Inc. 2012.
10. Beyond Big: Small Business, Green house Gases, and Competative Advantage. Climate Smart Businesses, Inc. 2012.
11. Beyond Big: Small Business, Green house Gases, and Competative Advantage. Climate Smart Businesses, Inc. 2012.
12. Metro Vancouver Projected Tipping Fee Increase, contained in City of Burnaby 2013 Garbage Toter Disposal Fees Council Report available at <https://burnaby.civicweb.net/Documents/DocumentDisplay.aspx?Id=13156>
13. Beyond Big: Small Business, Green house Gases, and Competative Advantage. Climate Smart Businesses, Inc. 2012.



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