

DECEMBER 2014

FINAL REPORT:

**Roadmap for Growing
Vancouver's Green &
Local Food Jobs**



GLOBE  GROUP



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Prepared by:



December 2014

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Executive Summary

A global economic transition is underway that is associated with mega-trend drivers including climate change, widespread biodiversity and ecosystem loss, major demographic dynamics, rising consumption patterns, resource depletion, and aging infrastructure that needs to be replaced. At the same time, there is a growing appreciation for the potentially significant business, investment, economic, and employment opportunities that come from the transition to a lower-carbon, resource efficient, and socially inclusive “green” economy.

Within this context, many cities (where over half of the world’s population now live), are actively mitigating and adapting to climate change and addressing environmental and social challenges while embracing innovation and investment opportunities through economic development initiatives.

Project Background & Context

In 2010, the City of Vancouver (CoV)¹ launched its *Greenest City Action Plan 2020* (GCAP 2020), a comprehensive plan to becoming the ‘greenest city’ in the world by 2020. The CoV and Vancouver Economic Commission (VEC) staff are working with City Council, city residents, businesses, other organizations, and all orders of government to implement the GCAP. A key overarching target within the GCAP goal to securing Vancouver’s international reputation as a mecca of green enterprise is to double the number of green and local food jobs over the 2010 baseline by 2020. This target has been tasked to the VEC.

The VEC has developed its method for defining and quantifying green and local food jobs in line with the approach developed by the United States Bureau of Labor Statistics (BLS) related to both “production” and “process” green jobs. The VEC also classifies green and local food production jobs into seven sectors:

1. Local food;
2. Green building design and construction;
3. Clean technology, alternative energy, and green building products;
4. Green infrastructure, transportation, and planning;
5. Sustainability services and education;
6. Land and water remediation and environmental consulting; and
7. Materials management and recycling.

GLOBE Advisors was commissioned by the VEC in 2014 to develop a *Green and Local Food Jobs Economic Impact Model* (“the Model”). The Model serves as an evaluation tool to help identify the potential impact of programs, policies, and strategic projects on green job growth in Vancouver to 2020. The Model, in turn, allows for the generation of various employment growth scenarios and for the development of a *Green and Local Food Jobs Roadmap* (i.e., this Roadmap document) that is designed to assist the VEC in prioritizing its efforts and directing its energy and resources to achieve the GCAP 2020 job target and assist with communicating decisions to relevant stakeholders.

¹ **Note to reader:** Where “CoV” appears in this document, it refers to the municipal government organization of the City of Vancouver. When reference to the city more generally is made, the name “Vancouver” is used.

Vancouver's Green Economy Growth & Labour Market Realities

Vancouver's economy comprises the tertiary (or services) sector; construction; other secondary industries (including manufacturing and utilities); and the primary sector (including agriculture and extraction industries). The tertiary sector comprises almost 85% of total employment.

The GCAP target is to double the number of green and local food jobs by 2020 over the 2010 baseline. However, the slow rate of increase in population over the next six years will continue to dampen growth in Vancouver's labour pool to the extent that achieving the GCAP target through the creation of new or "incremental" jobs alone will be very challenging. In addition to increasing the amount of new investment leading to incremental jobs in the seven sectors of Vancouver's core green and local food economy, growing the amount of green activity within existing production jobs in the seven sectors (i.e., transitional jobs) will also be vital to reaching the VEC's 2020 GCAP job target.

By focusing on the seven key sectors to improve productivity, strategic investments in R&D and infrastructure, and provide supportive policy and programs, the CoV and the VEC can increase demand for relevant products, technologies, and services and, in turn, grow green and local food occupations at a rate that is much higher than would be the case under business as usual conditions. This statement was validated through GLOBE's economic impact modeling as part of this Roadmap project.

Project Methodology: Research, Analysis & Model Development

The methodology for this project includes:

- 1) Secondary research and a literature review related to relevant programs and initiatives underway in more than 27 leading green cities in North America and Europe;
- 2) The collection and analysis of information and data from the CoV, VEC, and other stakeholders with respect to program performance and return on investment (ROI) in terms of economic and employment impacts;
- 3) Interviews with more than 30 subject-matter experts and program administrators to explore economic and industry trends, as well as outcomes from current and previous green economy and clean technology related programs, projects, policies, and initiatives; and
- 4) The development and validation of a set of assumptions related to some 50 programs, projects, policies, and initiatives that have the potential to substantially impact on job growth in Vancouver.

GLOBE subsequently developed a user-friendly, responsive, and flexible Excel-based model for internal use by VEC staff to compare various green and local food job growth scenarios.

The model consists of two components:

1) The baseline and “Base Case” growth projections for each of the 7 green and local food sectors

The Model used a 2010 baseline of 17,230 green and local food jobs, which is slightly higher than the 2010 baseline of 16,700 jobs estimated by the VEC. The primary differences are a result of using a higher 2010 baseline for the Green Building and Construction sector (which was higher by approximately 370 jobs due to the inclusion of the interior design industry, i.e., NAICS 5414 – Specialized Design Services), as well as the Model’s inclusion of the “interurban and rural bus transportation” industry (NAICS 4852) which was excluded by the VEC and added approximately 70 jobs to the Model’s 2010 baseline. As a result, it is projected that the CoV must reach a total of 34,460 green and local food jobs by 2020 if it is to successfully reach its GCAP target of doubling the number of jobs over the 2010 baseline.

The Base Case job growth scenario comprises business as usual employment growth based on occupational projections developed by WorkBC for the Mainland-Southwest (MSW) Development Region (as part of its *Labour Market Outlook, 2012-2022*) and existing trends and policies and regulations that are impacting on transitional jobs in Vancouver’s green and local food sectors.

2) A list of “incremental” programs / initiatives that are creating new investments and jobs

The Model includes 20 programs and initiatives with incremental impacts on employment, 11 of which are under the direct control of (or led by) the CoV, five under direct control of (or led by) the VEC, and four under the control of (or led by) external organizations.

The economic impact from each of these incremental initiatives was estimated, including the sectors and industries on which these initiatives were most likely to impact. The estimated total economic investment for each initiative to 2020 was then multiplied by the “best fit” Statistics Canada employment multipliers³⁵ for those initiatives and the total job impact was assessed through the Model.

Where major infrastructure investment programs or initiatives were included in the Model, GLOBE did not count the construction jobs as part of the green job total. Instead, professional services and other green job related activities (engineering, planning, design, manufacturing, installation, stakeholder engagement, educational services) were estimated based on Statistics Canada’s Input Output Use Matrix British Columbia table for Engineering Construction (BS23C) and the estimated percentage of these activities (equal to 21%) was multiplied by the total economic investment related to that project multiplied by the blended direct employment multiplier. Estimated employment related to ongoing project operations / maintenance (if relevant) was added to this total to estimate the full direct employment impact associated with these major green infrastructure projects.

The Model and this Roadmap document focus on *direct production jobs* within the seven green and local food sectors and, more specifically, two types of production jobs: transitional and incremental jobs. Transitional jobs were estimated as a percentage or intensity of green and local food activities within relevant industries. Incremental jobs in relevant industries were estimated based on new / increased investment and capital expenditures from specific programs / initiatives.

In many cases however, indirect and induced jobs are also likely to be created by the programs and initiatives that are included in the Model. As an example, the multi-unit residential building (MURB) retrofit program in Vancouver (i.e., Green Landlords program) is generating direct capital expenditures which are considered by the Model in terms of the impact on new jobs, although the program also has an indirect investment into the economy through the energy savings that are delivered to property owners by the building retrofits and equipment upgrades.

While quantifying the indirect and induced economic and employment impacts was outside of scope for this project, it is reasonable to assume that this Model is conservative and underestimates the full job multipliers that may be created as a result of the various programs and initiatives it assesses.

Economic Impact Model Results

Base Case Job Growth

Results from the Model (illustrated in Figure ES1) show that under the Base Case scenario, a total of 31,645 green and local food jobs would exist in Vancouver by 2020, equal to an increase of 14,415 green and local food jobs over the 2010 baseline (approximately 84% growth over 2010). The Green Building and Construction sector is expected to see the largest growth in jobs by 2020 with an increase of 7,800 jobs (equal to 232% growth over the 2010-2020 period), due largely to the impacts of the VBBL on transitional jobs in the sector.

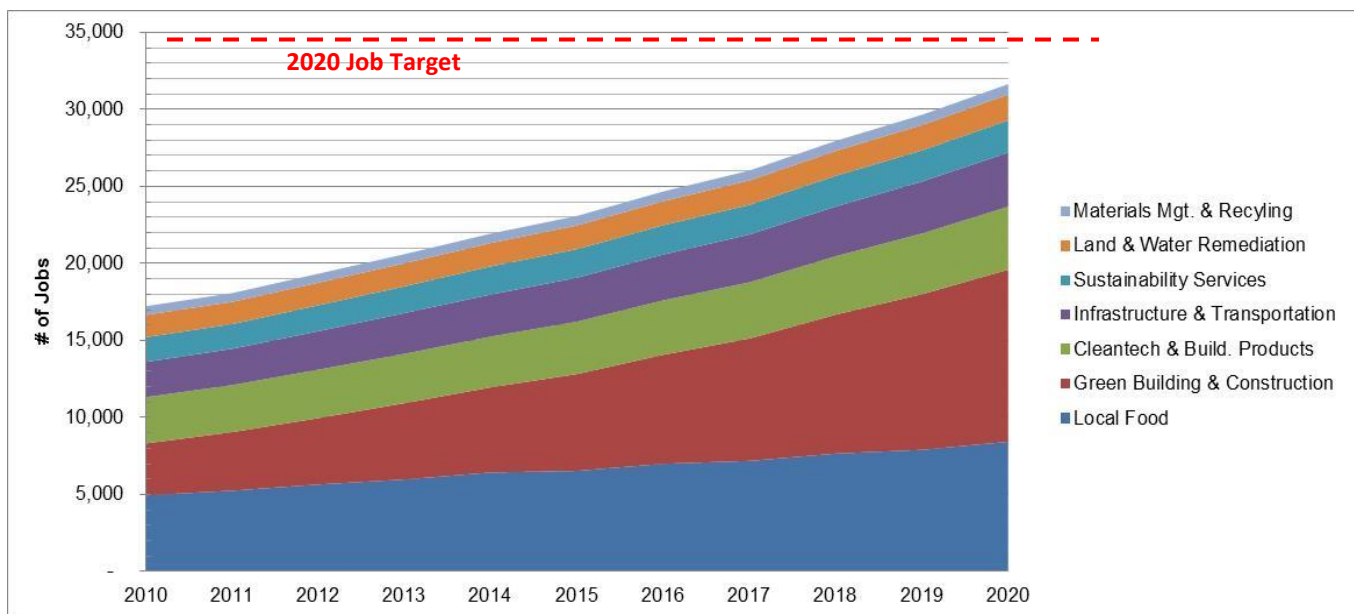
Sector	2010	2020	% Job Growth 2010-2020	Transitional Growth	BAU Growth
Local Food	4,954	8,432	70%	2624	854
Green Building & Construction	3,368	11,168	232%	6776	1024
Cleantech & Build. Products	3,005	4,090	36%	713	372
Infrastructure & Transportation	2,284	3,512	54%	802	426
Sustainability Services	1,606	2,091	30%	153	332
Land & Water Remediation	1,447	1,678	16%	0	232
Materials Mgt. & Recycling	564	672	19%	0	108
Total	17,228	31,644	84%	11068	3348

Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure ES1: Green and local food job growth in Vancouver under the Base Case scenario, 2010-2020.

Business as usual employment growth over the 2010-2020 period (based on WorkBC projections) accounts for approximately 3,350 new jobs or 23% of the green and local food job growth. Transitional green and local food employment growth to 2020 is responsible for an estimated 11,070 jobs, equal to 77% of total Base Case job growth. Combined, the UBC-Broadway Corridor Rapid Transit Line, the VBBL, and local food procurement initiatives have the largest impact on job growth within the Base Case scenario to 2020.

Based on the results from the Model under the Base Case scenario, Vancouver will fall short of its 2020 GCAP target to double the number of green and local food jobs over the 2010 baseline by approximately 2,810 jobs (see Figure ES2). As such, it is essential that the CoV and the VEC focus beyond business as usual and transitional job growth to include additional efforts that spur new / incremental capital investment and employment growth by strategically supporting key policies, programs, and initiatives.



Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure ES2: Base Case job growth in Vancouver by sector against the 2020 GCAP job target.

Incremental Initiatives for Achieving the 2020 Jobs Target

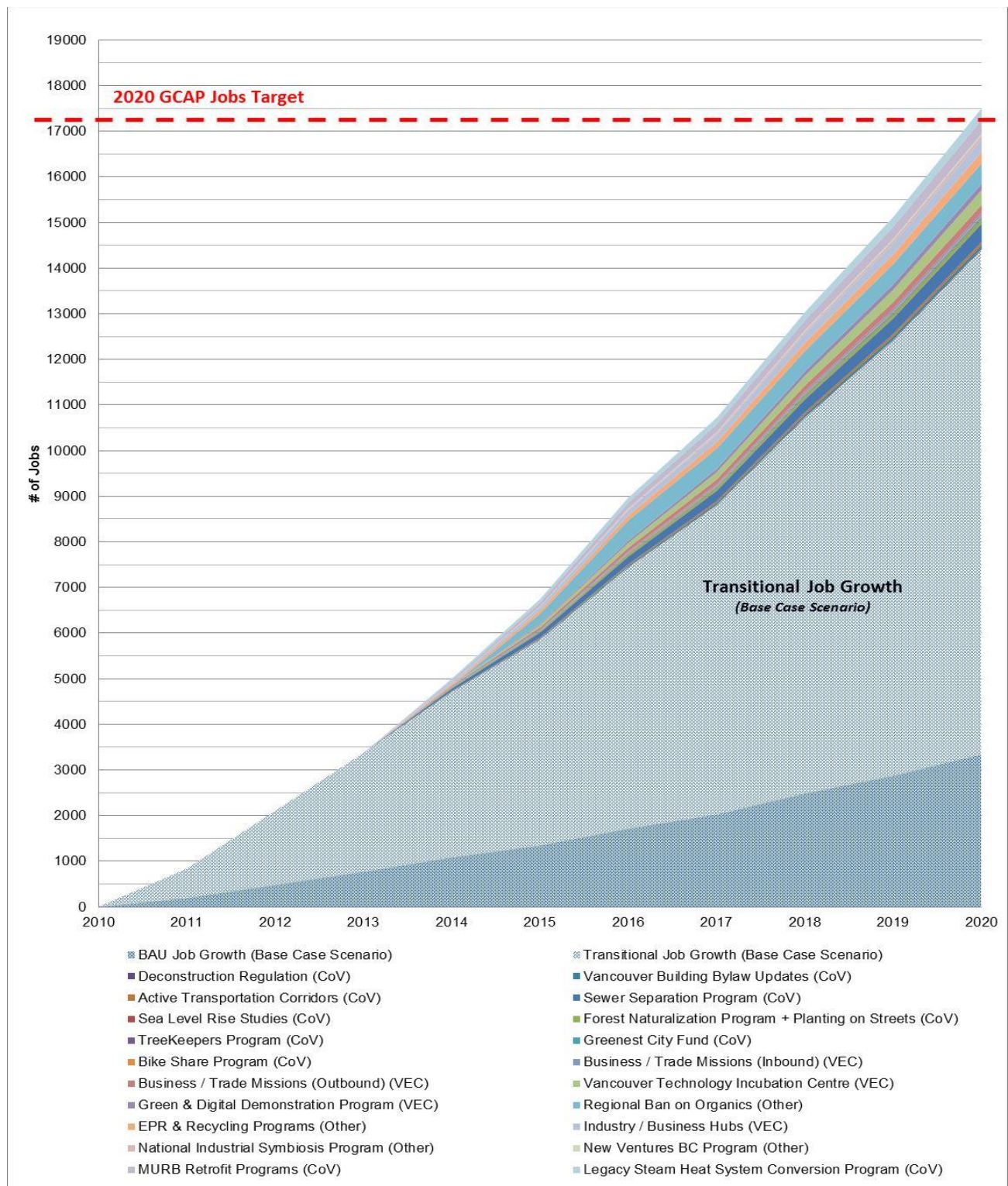
The results from modeling the incremental initiatives are shown in the table in Figure ES3 and presented in the area chart in Figure ES4. The Model shows that by implementing a number of incremental initiatives under the direct control of the CoV and/or the VEC, as well as supporting a handful of other incremental initiatives where the CoV and the VEC have influence, the 2020 GCAP target can be met and potentially exceeded. Based on the programs incorporated into the Model and the assumptions that were applied, the incremental initiatives will allow for the creation of a total of 3,220 new jobs in Vancouver, bringing the total new jobs by 2020 to 17,640 over the 2010 baseline of 17,230 .

The top three incremental initiatives based on job creation potential are: the regional ban on organics; the ongoing sewer separation program; and legacy steam heat conversion program. Together, these three initiatives would create an estimated 1,225 jobs by 2020, equal to 43% of the GCAP target shortfall.

Program / Initiative	Control	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2010 Baseline		17228	17228	17228	17228	17228	17228	17228	17228	17228	17228	17228
BAU Job Growth (Base Case Scenario)		0	198	491	786	1095	1362	1730	2045	2492	2886	3348
Transitional Job Growth (Base Case Scenario)		0	654	1621	2597	3620	4500	5718	6760	8239	9539	11068
Total Base Case Scenario		0	852	2112	3382	4715	5862	7447	8805	10731	12425	14416
Deconstruction Regulation	(CoV)						4	9	13	18	22	27
Vancouver Building Bylaw Updates	(CoV)					10	20	30	40	50	60	70
MURB Retrofit Programs	(CoV)					45	89	134	179	224	268	313
Legacy Steam Heat System Conversion Program	(CoV)					54	108	162	216	270	324	378
Active Transportation Corridors	(CoV)					9	18	28	37	46	55	65
Sewer Separation Program	(CoV)					57	114	170	227	284	341	397
Sea Level Rise Studies	(CoV)					2	3	5	6	8	9	11
Forest Naturalization Program + Planting on Streets	(CoV)					14	27	41	54	68	81	95
TreeKeepers Program	(CoV)					3	6	9	11	14	17	20
Greenest City Fund	(CoV)					5	9	14	19	23	28	33
Bike Share Program	(CoV)							25	25	25	25	25
Industry / Business Hubs	(VEC)					40	80	120	160	200	240	280
Business / Trade Missions (Inbound)	(VEC)					8	16	25	33	41	49	57
Business / Trade Missions (Outbound)	(VEC)					25	51	76	101	127	152	177
Vancouver Technology Incubation Centre	(VEC)						53	106	159	212	265	319
Green & Digital Demonstration Program	(VEC)						24	48	72	96	120	144
Regional Ban on Organics	(Other)						224	448	448	448	448	448
EPR & Recycling Programs	(Other)					35	71	106	141	176	212	247
National Industrial Symbiosis Program	(Other)							17	34	51	68	85
New Ventures BC Program	(Other)					5	9	14	18	23	27	32
Cumulative Jobs over 2010 (Incremental Only)		0	0	0	0	311	927	1585	1994	2404	2813	3222
Cumulative Jobs over 2010 (Base Case + Incremental)		0	852	2112	3382	5025	6789	9032	10799	13135	15237	17638
Total Green and Local Food Jobs		17228	18080	19340	20610	22254	24017	26260	28027	30363	32466	34866

Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure ES3: Cumulative job impacts from various incremental initiatives assessed by the Model to 2020.



Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure ES4: Vancouver's cumulative job impacts from various incremental initiatives assessed by the Model, 2010-2020.

Roadmap to Meeting Vancouver's 2020 GCAP Job Target

From the results of the Model, this Roadmap identifies three strategic areas of importance for reaching the GCAP 2020 target, as summarized below.

Creating and maintaining a supportive policy framework for green and local food job growth

Developing and implementing a strategic and holistic policy framework will allow employment and other benefits to be maximized. Combining and/or integrating GCAP initiatives may, in some instances, lead to new opportunities. For example, overlaying the Digital Strategy to the Climate Adaptation Plan to look at how smart grid technology can help build resiliency around back-up power during extreme weather events could generate new opportunities for investment and jobs and provide opportunities that the two efforts alone would not achieve.

There are also opportunities to use Vancouver's current economic and industry strengths to focus on global green economy challenges. For example, there is potential to focus Vancouver's strong digital media talent on developing more solutions for industrial energy and process efficiency, as well as in the green building sector to develop software solutions such as 3D visualization and building information modeling (BIM), in order to show leadership on addressing global challenges in areas with significant market demand.

Applying a "green jobs" lens across all CoV / VEC activities is critically important. By considering additional benefits from carbon reduction, energy savings, process efficiency, increased productivity, and climate adaptation and resiliency, the potential for creating additional direct, indirect, and induced jobs exists.

Advancing priority programs and initiatives

Seven top priority areas are outlined in the Roadmap and include:

1. ***The Vancouver Building Bylaw (VBBL) and retrofit programs*** – The VBBL is expected to generate close to **7,000 transitional jobs** in Vancouver over the 2010 baseline by 2020 in occupations that include architects, interior designers, engineers, construction trades and builders, and equipment and material suppliers. In addition, **70 incremental jobs** in energy advisory / modeling professions are expected to be added in Vancouver between 2015 and 2020 as a result of progressive updates / amendments to VBBL and an estimated **300 incremental jobs** in Vancouver by 2020 through the expansion of multi-unit residential building (MURB) retrofit programs under the CoV's *Energy Efficiency Retrofit Strategy for Existing Buildings*.
2. ***Local food initiatives*** – The growth of local food purchasing and expanded local processing is expected to create approximately **2,600 transitional jobs** in Vancouver between 2010 and 2020. Additional jobs through the various Food Strategy programs / initiatives are also possible.
3. ***Major transit and active transportation infrastructure*** – The UBC-Broadway Corridor rapid transit line and Vancouver's active transportation corridors are estimated to create close to **1,200 incremental jobs** throughout the design, planning, engineering, community engagement, and operational / maintenance phases (not including temporary construction jobs). It will be important for the CoV to continue pushing forward on the UBC-Broadway Corridor rapid transit project so that Phase 1 construction up to Arbutus Street (with capital expenditures estimated at \$2 billion) can start within the 2020 timeframe.

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4. **Green business support programs** – The VEC’s support services for green and local food businesses with respect to retention and expansion efforts are important for maintaining and growing local jobs. Support for clean technology and green and social venture start-ups in recent years through accelerators, incubators, and other initiatives is also showing positive impacts on job growth. Cluster development has been a major priority as the VEC looks to attract investment, innovation, and talent to key industries and sectors through a new Technology Incubation Centre, as well as its Green and Digital Demonstration Program (GDDP). In addition, the CoV and the VEC’s efforts to develop a Green Enterprise Zone on False Creek Flats is encouraging the expansion of a number of industry hubs, focused on a range of sectors from local food to textiles and beverage container recycling.

Collectively, the development of the VEC’s Technology Incubation Centre, the roll out of the GDDP, a continued focus on business / trade missions that support Vancouver-based companies in the green and local food sectors, and ongoing support for the development and expansion of business / industry hubs will create approximately **980 incremental jobs** in Vancouver by 2020.

5. **Waste / recycling policy and resource recovery** – The economic and employment opportunities come from both the expansion of specific programs in response to regulatory compliance and policy advancements, as well as innovation and entrepreneurship that will spin-off new ventures as circular economy business models emerge. Collectively, expanding provincial Extended Producer Responsibility (EPR) and recycling regulations, the regional ban on organics, the CoV’s Green Demolition Bylaw (deconstruction regulation), and the regional NISP-Canada pilot are estimated to create approximately **805 incremental jobs** in Vancouver by 2020.
6. **Climate change adaptation and green infrastructure** – Investment in climate adaptation and related green infrastructure is an area of strategic importance to Vancouver, from a job generation angle as well as from a broader resiliency perspective. By 2020, the Sewer Separation Program, the coastal flooding studies and related initiatives, and programs under the current *Urban Forest Strategy* are estimated to create approximately **520 incremental jobs** in Vancouver.
7. **Vancouver’s Neighbourhood Energy Strategy** – The CoV plans to continue facilitating the work underway by Creative Energy, various utilities, and developers. It is estimated that the conversion of Vancouver’s legacy steam heat systems will create approximately **380 incremental jobs** between 2014 and 2020, primarily in design, engineering, planning, and community engagement. A number of jobs will also be created related to energy / feedstock supply and ongoing operations / maintenance. Additional employment generation opportunities exist should some of the new neighbourhood energy development projects be advanced into the 2020 timeframe, although these were not included in the current Model.

In some cases, it will be necessary to scale up existing and/or proposed incremental programs; some of which are under the control of the CoV / VEC and others that are not (e.g., the MURB retrofit program, EPR regulations, and the NISP-Canada program). In the latter case, the CoV and the VEC will need to play advocacy roles and/or find ways to contribute financially to ensure these initiatives are effectively delivered. Reviewing best practices from various leading jurisdictions around the world in order to strengthen existing transitional, incremental, and supportive programs can help to ensure that initiatives are optimized for job creation and attraction given the competitive nature of today’s global workforce.

Additional supporting programs / initiatives

Additional programs that are not tied directly to job growth but act as enablers are also important. Greater strategic marketing, branding, and promotional efforts can help the CoV / VEC cut through some of the “clutter” in the global green economy / clean technology race to attract investment and talent.

The projected tightness of the future labour market in BC may require more flexible programs to ensure the adequate supply of workers exists. It is important to consider not only the current labour pool (both employed and unemployed), but also the potential labour pool that is inactive at a given point in time and may later become a source of new supply for filling demand for green and local food jobs. An example might be students who have recently completed their education and are now looking to enter the labour force. To this end, programs such as Greenest City Scholars and those offered by CityStudio are essential for equipping the future workforce with skills and experience that are relevant to green and local food jobs.

In addition, programs that can maximize the workforce by engaging individuals in under-employed segments of the labour supply pool (e.g., single parents, individuals with disabilities, etc.) through more flexible work-from-home arrangements and/or unconventional scheduling should be explored.

Conclusions

Based on the Economic / Employment Impact Model developed as part of this project, the VEC is on track to meet its target of doubling the number of green and local food jobs by 2020 over the 2010 baseline, although significant investment and efforts are required. Specifically, to reach the goal of doubling the number of green and local food jobs over the 2010 baseline, the CoV and the VEC will need to both sustain current efforts across all seven sectors and undertake incremental initiatives with new capital investments.

While GLOBE assessed more than 50 local programs and initiatives as part of this project and integrated many of them into the Model, these initiatives are not a comprehensive set of all programs and initiatives underway within Vancouver or that may exist between now and 2020. There may also be programs and initiatives that currently exist and/or are proposed within the 2020 timeframe that were considered by the Model but do not develop in line with current expectations and modeled assumptions. Periodic review of the initiatives included in the Model and their assumptions against this Roadmap will help to ensure that the CoV and the VEC remain on track to meeting their target and realizing the Greenest City vision to make Vancouver a mecca for green enterprise and job growth.

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1 Introduction

1.1 Background & Project Objectives

In 2010, the City of Vancouver (CoV)² launched its *Greenest City Action Plan 2020* (GCAP 2020), a comprehensive plan to becoming the ‘greenest city’ in the world by 2020. The CoV and Vancouver Economic Commission (VEC) staff are working with City Council, city residents, businesses, other organizations, and all orders of government to implement the GCAP.

The GCAP is divided into ten goal areas, each with a specific 2020 target(s). Together, these targets focus on three overarching areas: carbon, waste, and ecosystems. In addition, one of the key overarching targets within the GCAP goal to secure Vancouver’s international reputation as a mecca of green enterprise is to double the number of green and local food jobs over the 2010 baseline by 2020. By measuring growth in green and local food jobs in Vancouver across these areas, it is possible to get a sense of the relative health of the local green economy. This goal and jobs target has been specifically tasked to the VEC.

A major first step towards this goal was the quantification and estimation of the 2010 baseline of existing green and local food jobs. As no formal green or local food jobs datasets are available from Statistics Canada or other traditional data sources and few common standards exist for measuring the green economy, the VEC has been working since 2010 to:

- Establish a working definition of green and local food jobs;
- Develop a method to reasonably estimate the number of these jobs in the City of Vancouver; and
- Track this number over time to help measure growth in Vancouver’s green economy.

The VEC defines a green job as “an occupation that has a focus on those activities that restore or preserve environmental quality, reduce energy, materials and water consumption, decarbonize the economy, and minimize or altogether avoid the generation of all forms of waste and pollution”. A local food job is defined as “a job involved in the production, retailing, or processing in Vancouver of food that originated in British Columbia.”

In terms of quantifying green jobs, while cities around the world come at it in different ways, many have adopted the methodology applied by the United States Bureau of Labor Statistics (US BLS) as part of its former Green Jobs Initiative.³ According to the US BLS, green jobs are either:

- A. Production Jobs** – Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources; or
- B. Process Jobs** – Jobs in which workers’ duties involve making their establishment’s production processes more environmentally friendly or use fewer natural resources.

² **Note to reader:** Where “CoV” appears in this document, it refers to the municipal government organization of the City of Vancouver. When reference to the city more generally is made, the name “Vancouver” is used.

³ See: <http://www.bls.gov/green/home.htm>

To measure and quantify these jobs, the US BLS has described two approaches:

- 1) The *output approach*, which identifies establishments that produce green goods and services and counts the associated jobs; and
- 2) The *process approach*, which identifies establishments that use environmentally friendly production processes and practices.

As one example, San Francisco, the leader on Siemens' Green City Index for North America, considers a green job to be one that "allows someone to participate in the green economy".⁴ Under this definition for example, construction workers (e.g., carpenter, electrician, gasfitter, etc.) who increasingly work on projects that are verifiably green in nature (i.e., certified to a green building standard and/or with energy performance that is higher than the national building code, with stringent water conservation best practices, with the application of sustainable building materials, etc.), can be counted as green production jobs (as a percentage of their work on green projects in relation to overall work in their field), even though a new job (referred to in this report as an "incremental" job) has not been added to the labour pool overall. These types of jobs are referred to as "transitional" production jobs.

As such, the City of San Francisco does not focus merely on the creation of incremental green jobs but rather on setting environmental performance objectives and creating an enabling framework for local job creation, as well as for the inclusion of the transitional jobs described above.

The VEC has developed its method for classifying and quantifying green and local food jobs in line with the two-pronged approach developed by the US BLS. The VEC also classifies green and local food production jobs into seven sectors at the core of Vancouver's green and local food economy:

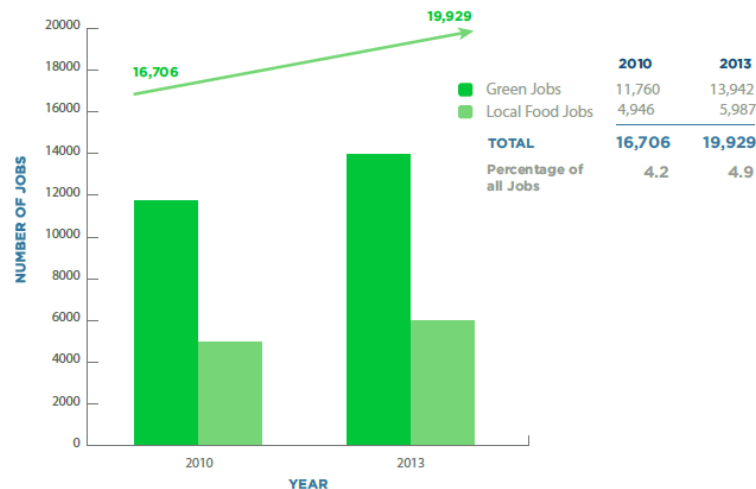
1. Local food;
2. Green building design and construction;
3. Clean technology, alternative energy, and green building products;
4. Green infrastructure, transportation, and planning;
5. Sustainability services and education;
6. Land and water remediation and environmental consulting; and
7. Materials management and recycling.

There is no single approach for creating green jobs in these sectors; each has its own macro and micro economic context and drivers. For example, the construction sector overall was exposed to the 2008 global economic downturn in ways that simply are not relevant for the local food production sector. Even within sectors, there can be considerable variability.

The first green and local food jobs study in Vancouver was undertaken in 2010 and 2011. It included an analysis of Statistics Canada data, a telephone survey of over 450 Vancouver businesses to determine the number of jobs in each of these areas, and a series of interviews with industry experts to validate assumptions. The study was modified to reflect new information and repeated in 2013, concluding with projections for green and local food job growth to 2020.

⁴ See: <http://www.siemens.com/entry/cc/en/greencityindex.htm>

The VEC estimated that in 2010, Vancouver's green and local food economy included approximately 16,700 jobs, equal to approximately 4.2% of all jobs in Vancouver. As illustrated in Figure 1, by 2013, the number of green and local food jobs had increased to 19,930, equal to an increase of 19% over the three-year period (or a 6% compound annual growth rate or CAGR) and a total of 4.9% of all jobs in Vancouver.



Source: Vancouver Economic Commission, 2014

Figure 1: Green and local food jobs growth in the City of Vancouver, 2010-2013.

For the VEC to reach its GCAP target of doubling the number of green and local food jobs by 2020, Vancouver will need to add an additional 13,500 jobs between 2013 and 2020 (equal to a 7.7% CAGR). In order to do this, a coordinated and strategic approach must be adopted by the CoV and the VEC that creates a positive climate for growth for green economy businesses, encourages investment and partnership opportunities, and addresses workforce development and skills gaps given current and future realities.

In order to achieve the 2020 green and local food jobs target, actions can be taken by both the CoV (through incentives, support programs, and regulatory initiatives) and the VEC (through a variety of strategic programs and economic development initiatives) to drive overall business and employment growth in the region by focusing attention on key “pressure points” that may, in turn, lead to job growth in the seven sectors, as well as the transition of conventional occupations to green and local food jobs. Some of these initiatives include:

- Infrastructure investment;
- Policy and regulatory innovation;
- Innovation hubs and incubators;
- Market engagement and pre-procurement strategies;
- Local business retention and expansion programs;
- Technology demonstration programs;
- Business / trade missions (inbound and outbound);
- Leveraging global partnerships and financing / foreign direct investment; and
- Strategic event support.

While the policies, programs, and initiatives identified above have varying degrees of impact on employment growth within the green and local food sectors in Vancouver, it is important for the CoV and the VEC to have a sense of which initiatives provide the greatest return on investment in terms of generating both transitional employment as well as new / incremental jobs.

GLOBE Advisors was commissioned by the VEC in 2014 to develop a *Green and Local Food Jobs Economic Impact Model* ("the Model"), an evaluation tool to help identify the potential impact of various programs, policies, and strategic projects on green job growth within Vancouver to 2020. The Model, in turn, allows for the generation of various employment growth scenarios and for the development of a *Green and Local Food Jobs Roadmap* (i.e., this Roadmap document) that is designed to assist the VEC in prioritizing where its energy and resources are best directed in line with the GCAP 2020 job target, as well as assist with communicating the key decisions to relevant stakeholders.⁵

1.2 The Global Context

A global economic transition is underway that is associated with mega-trend drivers including climate change, widespread biodiversity and ecosystem loss, major demographic dynamics, rising consumption patterns, resource depletion and aging infrastructure that needs to be replaced. At the same time, there is a growing appreciation for the potentially significant business, investment, economic, and employment opportunities that come from the transition to a lower-carbon, resource efficient, and socially inclusive "green" economy.



Source: GLOBE Advisors, 2014

Figure 2: Drivers of the global green economy.

⁵ It is important to note that the focus of the Model, as well as this Roadmap document, focus on *direct production jobs* within the seven green and local food sectors and, more specifically, two types of production jobs: transitional and incremental jobs. Transitional jobs were estimated as a percentage or intensity of green and local food activities within relevant industries. Incremental jobs in relevant industries were estimated based on new / increased investment and capital expenditures from specific programs / initiatives.

The World Economic Forum notes that globally, leaders are seeking business models that decouple revenue growth from primary energy and material input as a hedge against increasing resource depletion and rising costs.⁶ Reports such as the 2009 Stern Review on the Economics of Climate Change⁷ have demonstrated the clear alignment and links between ecological and economic issues by identifying that climate change itself represents a market failure and that taking decisive action on climate change now will be far less costly than to defer actions into the future.

Within this context, many cities (where over half of the world's population now live), are pursuing a range of objectives to mitigate and adapt to climate change and address environmental and social challenges while embracing innovation and investment opportunities.

A recent study by the London School of Economics (LSE) states that urban areas are in many ways ideal “natural units” for driving innovative green economy solutions as a result of their compact form and ability to deliver integrated programs that have a direct and systemic impact on citizens.⁸ The report notes that for a city to justifiably be considered a green economy leader, it must display “competitive advantage in the short- and medium-term, strong levels of environmental performance, and long-term sustainable growth”.

The work by LSE also identified a range of drivers for green urban growth including: urban form, innovation, investment, skills and employment, enterprise, energy and resource effectiveness, low carbon, and environmental quality. Bringing all of these eight drivers into consideration under a lens of economic development can provide real win-win situations for cities that choose to strategically pursue the opportunities.

The Siemens Green City Index researches approximately 120 cities worldwide to determine their environmental and sustainability performance, and has also determined a range of criteria required for successful urban greening. Vancouver, Canada, is ranked number two on the Siemens' North American Green City Index and scores particularly highly on low per-capita carbon emissions, air quality, and environmental governance⁹ (see sidebar). However, globally, Vancouver currently scores lower than green urban leaders such as Copenhagen and Stockholm with scores of 87.3 and 86.7 respectively.

Based on the interviews conducted for this Roadmap project, a number of trends are in evidence among current greenest city leaders around the world. First, the concept of the “green economy” is becoming increasingly mainstream with shifts toward green skill sets and knowledge occurring across all occupations. Green businesses and related jobs are growing (in many cases faster than the economy as a whole) and maturing quickly, becoming increasingly competitive for the current limited level of investment and talent.

**SIDEBAR: Siemens
Green City Ranking for
North America**

1	San Francisco	83.8
2	Vancouver	81.3
3	New York City	79.2
4	Seattle	79.1
5	Denver	73.5
6	Boston	72.6
7	Los Angeles	72.5
8	Washington DC	71.4
9	Toronto	68.4
10	Minneapolis	67.7
11	Chicago	66.9
12	Ottawa	66.8
13	Philadelphia	66.7
14	Calgary	64.8
15	Sacramento	63.7
16	Houston	62.6
17	Dallas	62.3
18	Orlando	61.1
19	Montreal	59.8
20	Charlotte	59.0
21	Atlanta	57.8
22	Miami	57.3
23	Pittsburgh	56.6
24	Phoenix	55.4
25	Cleveland	39.7
26	St Louis	35.1
27	Detroit	28.4

Source:
<http://www.siemens.com/entry/cc/en/greencityindex.htm>

⁶ World Economic Forum (2014), *Towards the Circular Economy: Accelerating the scale-up across global supply chains*. See: http://www3.weforum.org/docs/WEF_ENV_TowardsCircularEconomy_Report_2014.pdf

⁷ See: http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview_report_complete.pdf

⁸ London School of Economics, Green Economy Leader Report: Copenhagen. See: <http://lsecities.net/publications/reports/copenhagen/>

⁹ See: http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/vancouver.pdf

Cities must increasingly act strategically and in collaboration with key stakeholders in order to compete with other leading jurisdictions, ensure that they have the supply of skilled workers, and are able to capture the full economic development opportunities that come with the transition to a greener economy.

Second, the measure of what may be considered green is evolving and the standard is rising in many cases. For example, under the latest iteration of the Vancouver Building Bylaw, the city will have some of the most rigorous building performance standards in North America. However, even these new norms lag behind leading global building energy standards. For example, from the energy performance perspective, a new LEED Platinum building would not meet basic compliance under Swiss building code.¹⁰

As another example, Vancouver's rate of waste diversion is currently around 50%. The CoV and Metro Vancouver collectively have set a target of 70% diversion by 2015, and 80% by 2020. These future goals are far ahead of poor-performing North American cities, but already lag better-performing cities such as Los Angeles and San Francisco whose respective waste diversion rates are 76% and 80%, as well as behind many European leaders. For example, the Netherlands has a landfill ban in place for construction and demolition and overall waste diversion is over 90%. They have also closed their borders to waste exports and impose one of the highest landfill taxes in the EU at over €100 per tonne.¹¹

The lesson from these two examples from an economic development perspective suggest that, while Vancouver is in many ways a green economy leader in North America, best practice policies, programs, and initiatives in other jurisdictions may provide further insights on how Vancouver can improve on its GCAP goals and targets while, at the same time, accelerating transitional green job growth and/or stimulating greater private sector investment which can lead to additional incremental green jobs.

It also suggests that from a definitional stand point, green jobs are a moving target and it will be essential to keep advancing policies and regulations in line with global best practices in order to ensure that green job numbers are not cannibalized as what were considered leading policies / programs in 2010 become increasingly commonplace practices by 2020. This is particularly an issue for the green building sector where Vancouver's progressive building bylaw is resulting in a growing number of transitional green jobs in architecture, design, engineering, and construction.

Third, the development of systems and the achievement of targets that were once considered theoretical are now becoming commonplace. For example, fully functioning industrial symbiosis systems, once the purview of future-minded environmentalists, are active and viable in more than a dozen countries worldwide, and is starting to be explored in Canada through National Industrial Symbiosis Program (NISP) pilots.¹²

Rates of installed solar capacity have also surpassed levels that were once considered stretch goals. In 2014, the world may well exceed 55 gigawatts of new installed solar capacity, for example, and Germany now generates over one-third of its daily electricity from solar and wind sources. According to a 2014 report by Deutsche Bank, by 2015 three-quarters of the world will have retail solar power available at grid parity.¹³

¹⁰ Intep LLC, Brantwood Consulting et al. "Mid Rise Multi-Residential Buildings: Operating & Embodied Energy and Carbon Framework Plan for the City of Vancouver", 2012

¹¹ Dutch Waste Management Association Annual Review 2013

http://www.wastematters.eu/uploads/media/DWMA_Annual_Review_2013.pdf

¹² See NISP Canada website: <http://nispcanada.com/>

¹³ See article: <http://breakingenergy.com/2013/09/05/deutsche-bank-says-solar-is-approaching-grid-parity/>

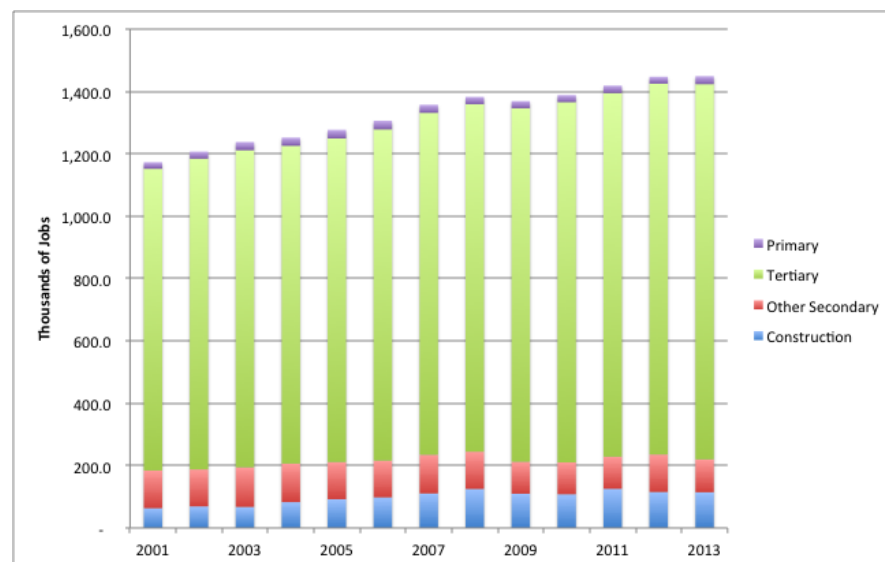
What this third trend indicates is that the evolution of the green economy and related clean technology is happening at an accelerating pace that is often hard to predict. New business models, breakthrough technologies, and other factors can influence on the rate of change and, in turn, the potential for investment and job creation.

Vancouver is influenced by these global trends; however, they must be understood within the local context. For example, the cost of energy in British Columbia is substantially lower than in most European jurisdictions. Combined with Vancouver's temperate climate, this low cost for energy can affect the potential for renewable energy adoption and the business case for deep building retrofits. The Vancouver context is also shaped by issues such as its recovery from the 2008 economic retreat, the age and ownership structure of its building stock, and its local labour market, all of which impact the degree to which green and local food job growth initiatives and supporting programs will be successful. The following sub-section puts into context some of the green economic growth opportunities against Vancouver's labour market realities.

1.3 Green Economy Growth & Labour Market Realities

Vancouver's economy comprises the tertiary (or services) sector; construction; other secondary industries (including manufacturing and utilities); and then the primary sector (including agriculture and extraction industries). Figure 3 shows the relative importance of the tertiary sector to Vancouver's economy, as evidenced by examining employment trends for the Mainland-Southwest (MSW) Development Region.

As illustrated in the figure below, the year-to-year percentage change in the number of jobs in the MSW region has been minimal, dropping 1.0% in 2009 followed by annual growth in the 1.5% to 2.0% range from 2010 to 2012. In 2013, overall employment growth was virtually flat.



Source: BC Stats and Statistics Canada, Labour Force Survey

Figure 3: Employment trends in BC's Mainland Southwest Development Region (2001-2013).

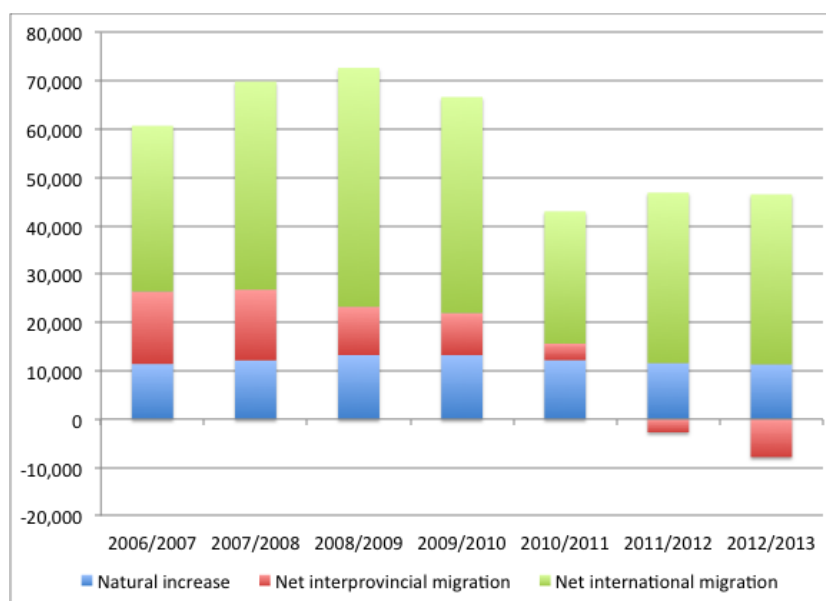
For the CoV to reach its target of doubling the number of green and local food jobs by 2020 over the 2010 baseline, factors that influence on economic growth and demand must be weighed against the variables that impact on overall labour market supply within the region. The most important factors for consideration are outlined in Figure 4. The labour supply variables are particularly relevant for incremental green job growth as opposed to transitional jobs.

Supply Variables	Demand Variables
Population Growth (net migration, births/deaths)	Economic & Industry Growth (GDP, output, investment, etc.)
Participation Rates (age, qualifications, gender)	Service Delivery Needs
Replenishment through educational institutions	Population Mobility
Lifestyle choices (part-time vs. full-time, etc.)	Technology Advances & Process Changes

Source: GLOBE Advisors, 2014

Figure 4: Demand and supply variables impacting on Vancouver's job growth potential.

The most important factor on Vancouver's new job growth potential (i.e., incremental jobs) is changes in population size and demographics. Population growth, especially from immigration abroad, drives growth and prosperity in both the services and the construction sectors. At the provincial level, net immigration is the most important component and driver of population growth; although immigration has slowed recently and in-migration from other provinces is now negative (see Figure 5). For the Vancouver census metropolitan area (CMA), landed immigrants account for an estimated 40% of the overall labour force. Immigrants that landed in the CMA in the last 5 years account for 5% of the labour force.



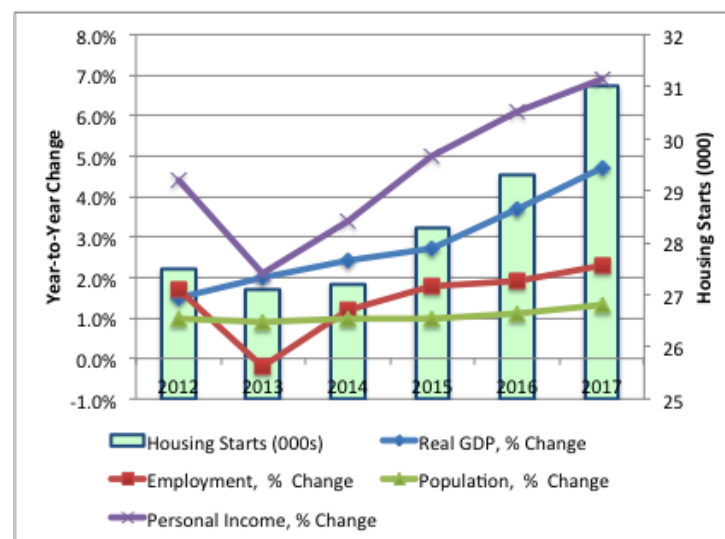
Source: Statistics Canada, Annual Demographic Estimates: Canada, Provinces and Territories (91-215-X)

Figure 5: Components of population growth, British Columbia.

BC Stats, in association with Statistics Canada, have prepared demographic projections to 2020 for the MSW region. The rate of household formation is expected to decline significantly during this period, which will impact strongly on Vancouver's economy that is tied to population growth.

The less-than-robust projected growth in population over the next several years for Vancouver impacts considerably on the residential construction sector. The recent growth in new housing construction should taper off in the coming years and be more reflective of the slowing demographics.

In spite of the poor demographic baseline and outlook, increased incomes could become strong drivers for Vancouver's economy. Credit Union Central has forecast for the province of BC that renovations could be as significant as new housing construction to 2017. Credit Union Central are forecasting optimistic housing construction trends to 2017 based on personal incomes and GDP driving this sector, above and beyond what the slowing demographics reflect on their own (Figure 6).

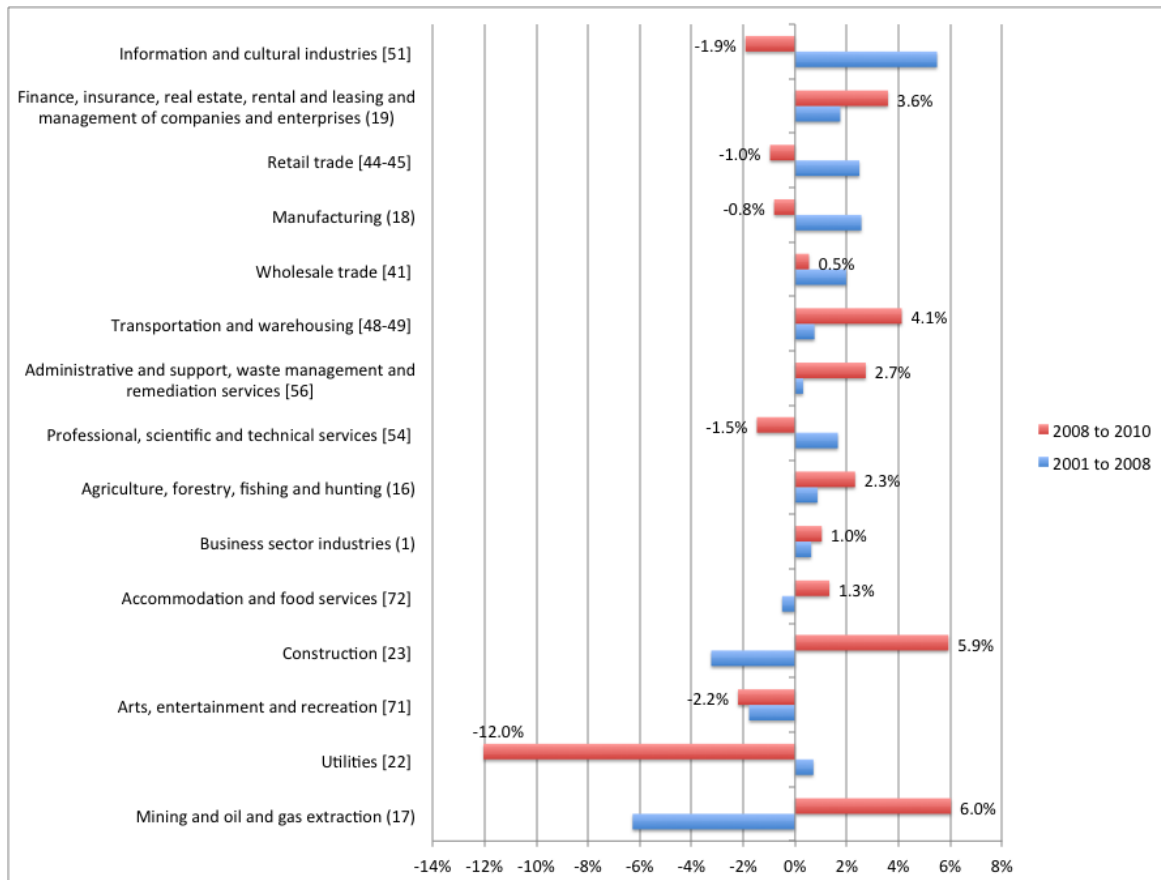


Source: Credit Union Central

Figure 6: Credit Union Central economic forecasts, British Columbia (2012-2017).

This reality is important when considering the green building and construction labour force in Vancouver and the need to ensure that whatever new construction and renovation occurs involves improved energy performance, less demolition waste entering the landfill, and so on. These factors also reinforce the importance of the CoV's progressive building bylaw, the *Energy Efficiency Building Strategy*, the green demolition bylaw, and other related policies and programs.

With respect to other industry sectors (particularly those with strong ties to technology), productivity gains, as well as growing efficiency in business systems and manufacturing, could prove to be positive drivers for Vancouver's green and local food sectors. Labour productivity is measured as real gross domestic product (GDP) per hour worked. Figure 7 shows the top ranking industries in BC from 2001 to 2010 based on labour productivity gains. It shows the time profile of how productively labour is used to generate value-added benefits. Changes in value-added-based labour productivity reflect the joint influence of capital, skill upgrading, and overall productive efficiency. The annual productivity growth metrics reflect both the 2001 to 2008 period and the 2008 to 2010 time frame as the overall rate for the entire 2001 to 2010 period misses the impact of the recession in 2008 and 2009.



Source: Statistics Canada, Table 383-0026 Multifactor productivity and related variables

Figure 7: Labour productivity growth (decline) by industry, British Columbia.

Research and development (R&D) spending can also act as an indicator of investment and potential productivity gains in Vancouver's green economy. Figure 8 illustrates funding provided to the University of British Columbia (UBC) and British Columbia Institute of Technology (BCIT) for those areas of application that best reflect the VEC's green and clean technology sector groups from 2007/08 to 2013/14. During this period, NSERC provided \$51.6 million of related grants, mostly to UBC. This research investment represented 8.7% of total NSERC grants provided to these two Vancouver-based post-secondary institutions.

Institution	Number		Amount		Average Award (\$)
	N	%	\$	%	
British Columbia Institute of Technology	5	0.5%	2,793,345	5.4%	558,669
University of British Columbia	938	99.5%	48,813,903	94.6%	52,040
Subtotal	943	100.0%	51,607,248	100.0%	54,727

Source: NSERC Online Awards Engine

Figure 8: NSERC grants to UBC and BCIT for local food and green research, 2007/08 to 2013/14.

Another indicator of R&D performance can be measured based on investments by Vancouver-based companies listed in the Clean Technology TSX / TSX Venture indices prepared by the TMX Group.¹⁴ This level of investment has been growing on average by approximately 55% and 13% CAGR between 2011 and 2013 for TSX and TSX-V listed companies respectively, to a total of approximately \$78.3 million dollars over that three year period (as illustrated in Figure 9).

Clean Technology Company	Average R&D / Dev 2011 to 2013	CAGR 2011 to 2013	# US Patents Filed
TSX			
Westport Innovations Inc.	\$67,668,459	61.9%	2
Burcon NutraScience Corporation	\$1,845,554	51.7%	0
Synex International Inc.	\$3,561,365	-59.5%	0
BioteQ Environmental Technologies Inc.	\$297,027	1.4%	3
Total TSX	\$73,372,405	55.4%	5
TSX-V			
SmartCool Systems Inc.	\$30,423	-4.4%	0
EnWave Corporation	\$2,553,761	4.6%	4
Naikun Wind Energy Group Inc.	\$79,032	23.0%	0
Sea Breeze Power Corp.	\$1,553,248	33.9%	0
Earthworks Industries Inc.	\$572,357	25.4%	0
Offsetters Climate Solutions Inc.	\$119,138	23.2%	0
Total TSX-V	\$4,907,960	13.1%	4

Source: Company Annual Reports and US Patent Office

Figure 9: Research and development investment by clean technology firms headquartered in the City of Vancouver and listed on the TSX and TSX-V.

It should be noted that while productivity gains can help to grow economic activity within the green and local food sectors, it also has the potential to negatively impact on job growth. For example, the trend toward pre-fabrication in the construction industry means that building projects that would have historically employed local workers may now happen offsite in jurisdictions outside of Vancouver. Similarly, a trend toward process efficiency due to automation and technology integration in some industries has resulted in job layoffs.¹⁵ As such, it will be important for the CoV and the VEC to consider these potential impacts and risks as part of their strategic planning.

Finally, in addition to increasing the amount of new investment leading to incremental jobs in the seven sectors of Vancouver's core green and local food economy, increasing the amount of green activity within existing production jobs within the green and local food sectors (i.e., transitional jobs) can also contribute to reaching the VEC's 2020 GCAP job target.

Transitional jobs will be realized in the building design and construction sector with progressive policies such as the Vancouver Building Bylaw acting as a driver. Another area where transitional jobs are likely to grow are within the local food sector where jobs in Vancouver-based establishments that are serving increasing levels of food produced in BC can be counted as part of the local food supply chain and hence as a transitional jobs. In this example, procurement policies that support the purchase of fresh and locally grown and/or processed food and beverages can act as drivers for growing transitional jobs.

¹⁴ See: http://www.tmxmoney.com/en/sector_profiles/cleantech.html

¹⁵ See article from Huffington Post Business "Canada's Manufacturers Celebrate Recovery by Slashing Jobs", published August 2, 2014: http://www.huffingtonpost.ca/2014/08/02/manufacturing-jobs-canada_n_5644109.html?ir=Business

In summary, the reality of low population growth and related demographic trends means that the overall growth of Vancouver's labour pool will make it a challenge to meet the GCAP target of doubling the number of green and local food jobs by 2020 over the 2010 baseline. However, with an approach that is highly focused on the seven core sectors in order to improve productivity, strategic investments in R&D and infrastructure, and provide supportive policy and programs, the CoV and the VEC can grow demand in specific sectors and for related green and local food occupations at a rate that is much higher than under business as usual conditions. This statement is validated in the section that follows that looks at the results on job growth potential from GLOBE's economic impact modeling.

2 Economic Impact Model Results

2.1 General Comments & Considerations

This section summarizes the results of applying GLOBE's *Green and Local Food Economic Impact Model* (i.e., the Model) that was used to generate employment growth scenarios for this Roadmap project. The modeling is based on combining the "Base Case" scenario with incremental programs and initiatives¹⁶ that research for this project indicated were consistent with the GCAP target to double the number of green and local food jobs by 2020 over the 2010 baseline (as per the methodology outlined in Appendix A).

As part of the Model, GLOBE developed a revised 2010 baseline for green and local food jobs in Vancouver within each of the seven sectors. The baseline was developed in consultation with the VEC using specific North American Industry Classification System (NAICS) codes and relevant green / local food intensity ratios (i.e., the percentage of green / local activity within each industry) to define each of the seven sectors. The total number of Vancouver-based jobs within each industry was sourced from National Household Survey data (2011) published by Statistics Canada to allow for a statistical approach to quantifying job numbers across all seven sectors to 2020.

Based on the revised approach, the Model used a 2010 baseline of 17,230 green and local food jobs, which is slightly higher than the 2010 baseline of 16,700 jobs estimated by the VEC (see Figure 16).

Sector	VEC 2010	Model 2010	Delta (2010)	VEC 2013	Model 2013	Delta (2013)
Local Food	4,946	4,954	8	5,987	5,984	(3)
Green Building & Construction	2,996	3,368	372	4,480	4,954	474
Cleantech & Build. Products	2,956	3,005	49	3,187	3,200	13
Infrastructure & Transportation	2,194	2,284	90	2,603	2,648	45
Sustainability Services	1,600	1,606	6	1,701	1,738	37
Land & Water Remediation	1,437	1,447	10	1,378	1,493	115
Materials Mgt. & Recycling	577	564	(13)	593	594	1
Total	16,706	17,228	522	19,929	20,610	681

Source: GLOBE Advisors, *Green and Local Food Jobs Economic Impact Model*

Figure 16: Model comparison with the VEC's 2010 and 2013 baseline job estimates by sector.

The primary differences are a result of using a higher 2010 baseline for the Green Building and Construction sector (which was higher by approximately 370 jobs due to the inclusion of the interior design industry, i.e., NAICS 5414 – Specialized Design Services), as well as the Model's inclusion of the "interurban and rural bus transportation" industry (NAICS 4852) which was excluded by the VEC and added approximately 70 jobs to the Model's 2010 baseline. As a result, it is projected that the VEC must reach a total of 34,460 green and local food jobs by 2020 if it is to successfully reach its GCAP target of doubling the number of jobs over the 2010 baseline.

¹⁶ Incremental programs and initiatives included in the Model and this Roadmap document are defined as those that include new investments and/or capital expenditures into Vancouver's economy.

It is also important to note that the Model and this Roadmap focus specifically on *direct* jobs. In many cases however, indirect and induced jobs are also likely to be created by the programs and initiatives that are included in the Model. Complementary benefits and synergies may occur as a result of the various programs and initiatives, including carbon / greenhouse gas emission reductions, energy savings, process efficiencies, increased productivity, and climate adaptation and resiliency. These co-benefits are not accounted for by the Model and may have a positive impact on jobs, although in most cases indirectly.

As an example, the current multi-unit residential building retrofit program in Vancouver (i.e., Green Landlords program) is generating direct capital expenditures which are considered by the Model in terms of the impact on new jobs, although the program also has an indirect investment into the economy through the energy savings that are delivered to property owners by the building retrofits and equipment upgrades.

While quantifying the indirect and induced economic and employment impacts is outside of scope for this project, it is reasonable to assume that this Model is conservative and underestimates the full job multipliers that may be created as a result of the various programs and initiatives it assesses. While direct job impacts that are generated in Vancouver remain tied to the local economy, a percentage of the indirect and induced job impacts accrue outside the city's boundaries, either in Metro Vancouver, in other parts of the province, or in other provinces altogether as Statistics Canada multipliers are not intended to wholly represent specific municipalities. Therefore, by not including these indirect and induced job multipliers, GLOBE is likely underestimating the full employment impacts, but chose to err on the side of caution.

Finally, while GLOBE assessed more than 50 local programs and initiatives as part of this project and integrated many of them into the Model, these initiatives are not a comprehensive set of all programs and initiatives underway within Vancouver or that may exist between now and 2020. There may also be programs and initiatives that currently exist and/or are proposed within the 2020 timeframe that were considered by the Model but do not develop in line with current expectations and modelled assumptions. As such, the Model and related scenarios should be considered as flexible tools for informing job growth within Vancouver's green and local food economy. They should be revisited at regular intervals between now and 2020 to ensure that the relevant programs / initiatives and their assumptions remain valid.

2.2 Base Case Growth Scenario

The Base Case job growth scenario comprises business as usual employment growth based on occupational projections developed by WorkBC for the Mainland-Southwest (MSW) Development Region (as part of its *Labour Market Outlook, 2012-2022*¹⁷) and existing trends and policies / regulations that are impacting on transitional jobs in Vancouver's green and local food sectors.¹⁸ Specifically, the Base Case scenario includes the following existing or planned initiatives that are deemed to have an impact on Vancouver's green and local food sectors between 2010 and 2020:

- The UBC-Broadway Corridor Rapid Transit Line development (a \$2.8 billion major project which is included in WorkBC's Labour Market Outlook for 2012-2022);

¹⁷ See WorkBC Labour Market Outlook: <http://www.workbc.ca/statistics/labour-market/labour-market-outlook.aspx>

¹⁸ See the methodology section in Appendix A for greater detail on how the Base Case scenario was developed for each sector.

- The Vancouver Building Bylaw (VBBL) and related rezoning regulations which are impacting on transitional jobs in Vancouver in the areas of architecture, interior design, engineering, construction, and building materials;¹⁹
- Trends and policies that favour the purchasing of local food / beverages in government, institutional facilities, and business establishments, as well as the food processing sector utilizing more local food inputs;
- The trend toward the greening of operations in government, institutions, and businesses (within the seven sectors) and the impact of policies, programs, and standards on this activity;
- The trend toward the growing number of green economy related programs and courses being offered at post-secondary and training institutions within Vancouver's boundaries; and
- The growing trend toward developing infrastructure projects using an environmental and social lens.

Results from the Model (illustrated in Figure 10) show that under the Base Case scenario, a total of 31,645 green and local food jobs would exist in Vancouver by 2020, equal to an increase of 14,415 green and local food jobs over the 2010 baseline (approximately 84% growth over 2010). The Green Building and Construction sector is expected to see the largest growth in jobs by 2020 with an increase of 7,800 jobs (equal to 232% growth over the 2010-2020 period), due largely to the impacts of the VBBL on transitional jobs in the sector.²⁰

Sector	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	% Job Growth 2010-2020	Transitional Growth	BAU Growth
Local Food	4,954	5,256	5,661	5,984	6,434	6,539	7,002	7,190	7,661	7,907	8,432	70%	2624	854
Green Building & Construction	3,368	3,804	4,307	4,954	5,533	6,286	7,080	7,945	9,022	10,107	11,168	232%	6776	1024
Cleantech & Build. Products	3,005	3,050	3,144	3,200	3,289	3,403	3,524	3,646	3,787	3,935	4,090	36%	713	372
Infrastructure & Transportation	2,284	2,352	2,497	2,648	2,736	2,855	2,976	3,100	3,234	3,371	3,512	54%	802	426
Sustainability Services	1,606	1,607	1,683	1,738	1,825	1,851	1,904	1,931	1,992	2,026	2,091	30%	153	332
Land & Water Remediation	1,447	1,447	1,469	1,493	1,517	1,539	1,561	1,584	1,615	1,646	1,678	16%	0	232
Materials Mgt. & Recycling	564	564	579	594	609	618	628	637	648	660	672	19%	0	108
Total	17,228	18,080	19,340	20,610	21,943	23,090	24,675	26,033	27,959	29,653	31,644	84%	11068	3348

Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure 10: Green and local food job growth in Vancouver under the Base Case scenario, 2010-2020.

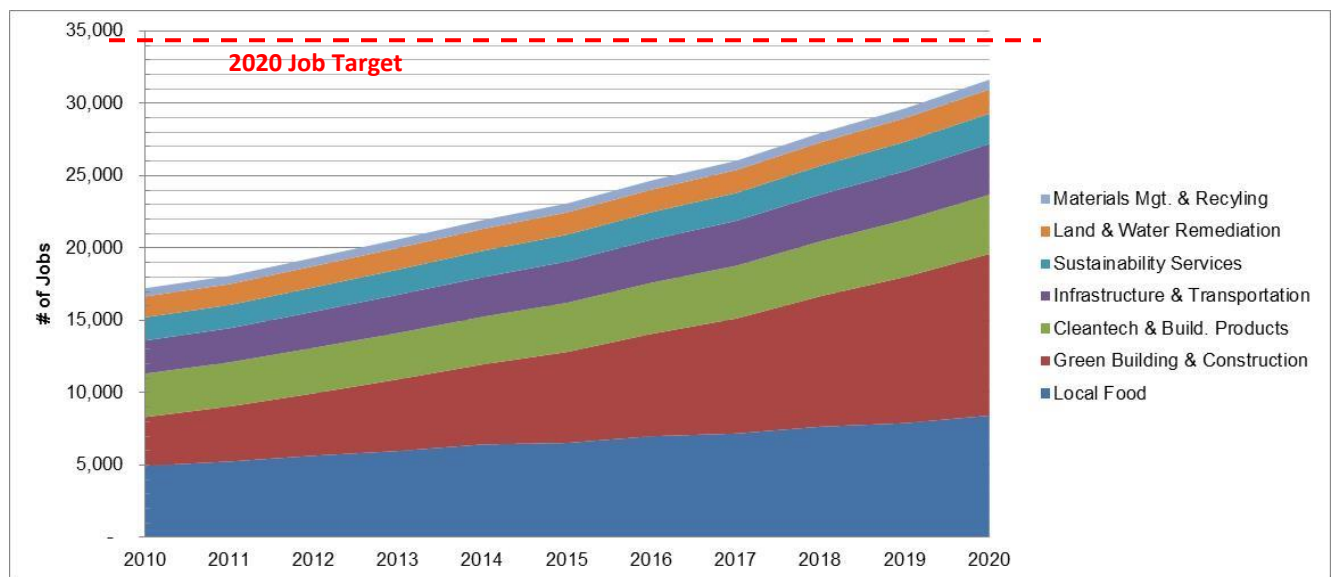
Business as usual employment growth over the 2010-2020 period (based on WorkBC projections) accounts for approximately 3,350 new jobs or 23% of the green and local food job growth. Transitional green and local food employment growth to 2020 is responsible for an estimated 11,070 jobs, equal to 77% of total Base Case job growth.

Combined, the UBC-Broadway Corridor Rapid Transit Line, the VBBL, and local food procurement initiatives have the largest impact on job growth within the Base Case scenario to 2020. A brief description of these three initiatives and their impacts on job growth within the Base Case scenario to 2020, as well as related assumptions, are described in Appendix C.

¹⁹ Read more about the VBBL's impact on transitional jobs in Appendix B, as well as related calculations and assumptions developed to estimate industry intensity ratios.

²⁰ IBID

Based on the results from the Model under the Base Case scenario, Vancouver will fall short of its 2020 GCAP target to double the number of green and local food jobs over the 2010 baseline by approximately 2,810 jobs (see Figure 11 below). As such, it is essential that the CoV and the VEC focus beyond business as usual and transitional job growth to include additional efforts that spur new / incremental capital investment and employment growth by strategically supporting key policies, programs, and initiatives. The following sub-section outlines a number of incremental but impactful initiatives that can help in this respect.



Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure 11: Base Case job growth in Vancouver by sector against the 2020 GCAP job target.

2.3 Incremental Initiatives for Achieving 2020 Jobs Target

As illustrated in the previous sub-section, the Base Case scenario will result in a shortfall of approximately 2,810 green and local food jobs against the 2020 GCAP target. Therefore, to reach the goal of doubling the number of green and local food jobs over the 2010 baseline, the CoV and the VEC will need to both sustain current efforts across all seven sectors and undertake incremental initiatives with new capital investments.

Specifically, the Model shows that by implementing a number of incremental initiatives under the direct control of the CoV and/or the VEC, as well as supporting a handful of other incremental initiatives where the CoV and the VEC have influence, the 2020 GCAP target can be met and potentially exceeded.

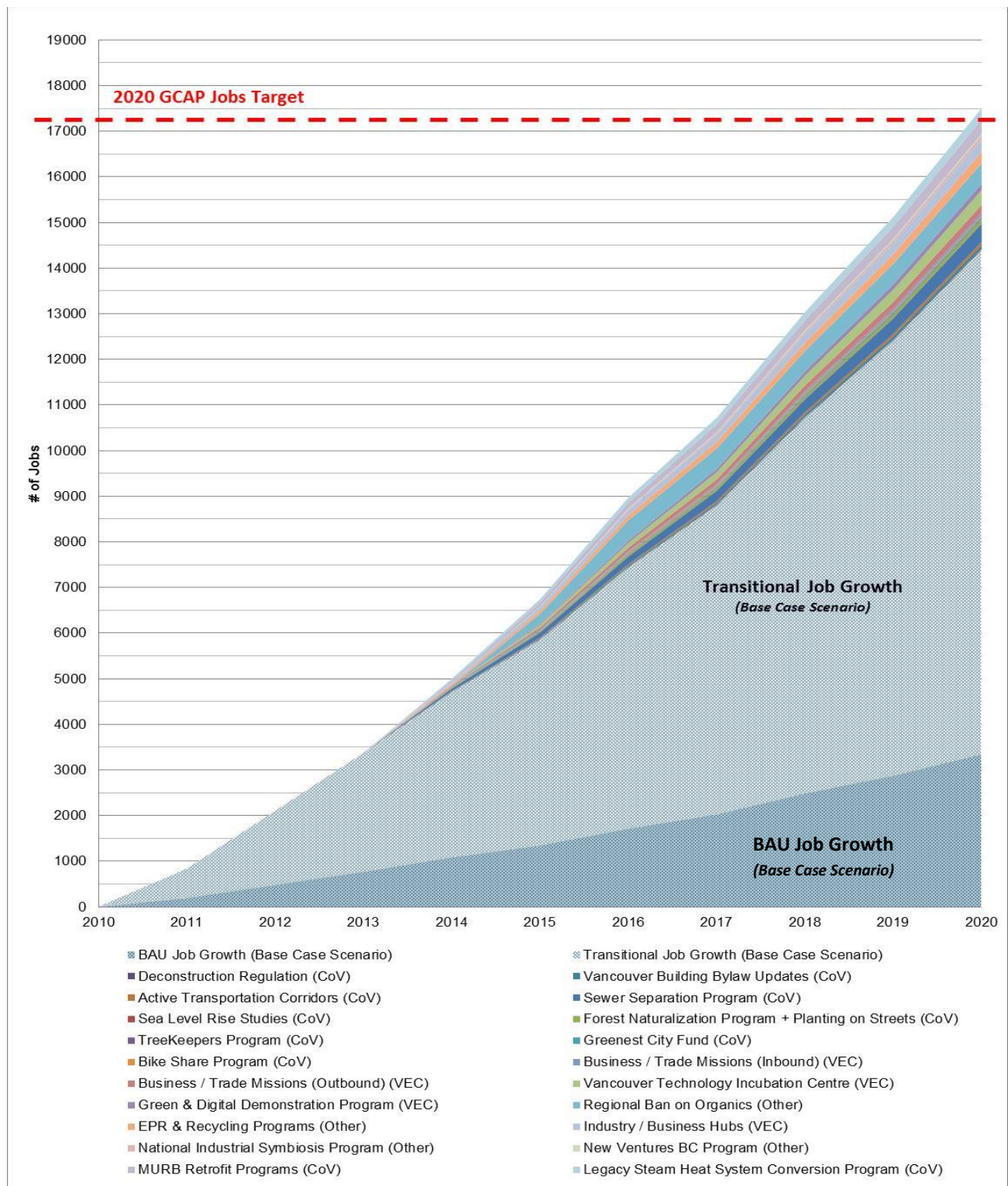
The Model includes 20 programs and initiatives with incremental impacts on employment, 11 of which are under the direct control / lead of the CoV, five under direct control / lead of the VEC, and four under the control / lead of external organizations. The results from this modelling are itemized in the table in Figure 12 and presented graphically in the area chart in Figure 13. Based on the programs incorporated into the Model and the assumptions that were applied, the incremental initiatives will allow for the creation of a total of 3,220 new jobs in Vancouver, bringing the total new jobs by 2020 to 17,640 over the 2010 baseline of 17,230.

The top three incremental initiatives based on job creation potential are: the regional ban on organics; the ongoing sewer separation program; and legacy steam heat conversion program. Together, these three initiatives would create an estimated 1,225 jobs by 2020, equal to 43% of the GCAP target shortfall. A description of the top incremental initiatives included in the Model, as well as the related assumptions, can be found in Appendix C.

Program / Initiative	Control	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
2010 Baseline		17228	17228	17228	17228	17228	17228	17228	17228	17228	17228	17228	
BAU Job Growth (Base Case Scenario)		0	198	491	786	1095	1362	1730	2045	2492	2886	3348	
Transitional Job Growth (Base Case Scenario)		0	654	1621	2597	3620	4500	5718	6760	8239	9539	11068	
Total Base Case Scenario		0	852	2112	3382	4715	5862	7447	8805	10731	12425	14416	
Deconstruction Regulation	(CoV)						4	9	13	18	22	27	CoV Lead
Vancouver Building Bylaw Updates	(CoV)					10	20	30	40	50	60	70	
MURB Retrofit Programs	(CoV)					45	89	134	179	224	268	313	
Legacy Steam Heat System Conversion Program	(CoV)					54	108	162	216	270	324	378	
Active Transportation Corridors	(CoV)					9	18	28	37	46	55	65	
Sewer Separation Program	(CoV)					57	114	170	227	284	341	397	
Sea Level Rise Studies	(CoV)					2	3	5	6	8	9	11	
Forest Naturalization Program + Planting on Streets	(CoV)					14	27	41	54	68	81	95	
TreeKeepers Program	(CoV)					3	6	9	11	14	17	20	
Greenest City Fund	(CoV)					5	9	14	19	23	28	33	
Bike Share Program	(CoV)							25	25	25	25	25	
Industry / Business Hubs	(VEC)					40	80	120	160	200	240	280	VEC Lead
Business / Trade Missions (Inbound)	(VEC)					8	16	25	33	41	49	57	
Business / Trade Missions (Outbound)	(VEC)					25	51	76	101	127	152	177	
Vancouver Technology Incubation Centre	(VEC)						53	106	159	212	265	319	
Green & Digital Demonstration Program	(VEC)						24	48	72	96	120	144	
Regional Ban on Organics	(Other)						224	448	448	448	448	448	External Lead
EPR & Recycling Programs	(Other)					35	71	106	141	176	212	247	
National Industrial Symbiosis Program	(Other)							17	34	51	68	85	
New Ventures BC Program	(Other)					5	9	14	18	23	27	32	
Cumulative Jobs over 2010 (Incremental Only)		0	0	0	0	311	927	1585	1994	2404	2813	3222	
Cumulative Jobs over 2010 (Base Case + Incremental)		0	852	2112	3382	5025	6789	9032	10799	13135	15237	17638	
Total Green and Local Food Jobs		17228	18080	19340	20610	22254	24017	26260	28027	30363	32466	34866	

Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure 12: Cumulative job impacts from various incremental initiatives assessed by the Model to 2020.



Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure 13: Vancouver's cumulative job impacts from various incremental initiatives assessed by the Model, 2010-2020.

3 Roadmap to Meeting Vancouver's 2020 GCAP Jobs Target

Results from the research and modeling provide the basis for a Roadmap, designed to help the CoV and the VEC prioritize where to best direct their efforts and resources in order to reach the GCAP 2020 jobs target, as well as assist with communicating the key decisions to relevant stakeholders. The Roadmap is divided into three parts:

1. The importance of a supportive policy framework for green and local food job growth;
2. The top priority programs / initiatives for reaching the 2020 GCAP jobs target; and
3. Additional supporting programs / initiatives not tied directly to job growth but that are important enablers for green and local job growth.

This section also includes a number of examples of relevant programs and initiatives from other jurisdictions that were considered best-in-class and provide additional insights on how the CoV and the VEC can further improve the impact and job generation potential of their efforts.

3.1 An Enabling Environment for Green & Local Food Job Growth

All of the evidence reviewed suggests that successful green job creation requires a holistic and integrated approach between programs and initiatives. Therefore, an overarching and synergistic policy framework for growing green and local food jobs is vital.

An overarching policy framework should:

- Create a climate that is conducive to investment, growth, and innovation;
- Provide for support and connections through networks, communications, and marketing;
- Develop policies, regulations, and programs to drive demand for green products and services;
- Have a strong focus on retaining existing jobs;
- Engage in attraction based on current strengths;
- Market the assets, create buzz, and educate consumers;
- Ensure a pipeline of skilled workers; and
- Build into it a certain acceptable level of risk and failure.

Such a framework exists in a partial form in Vancouver. For example, the CoV through its *Greenest City Action Plan* (GCAP) and the VEC through its *Economic Action Strategy* are united by a common vision and mission to create sustainable economic development opportunities and jobs for Vancouver residents.

Other overarching strategies within the CoV's policy framework include the:

- Climate Adaptation Strategy;
- Digital Strategy;
- Energy Retrofit Strategy for Existing Buildings;
- Healthy City Strategy;

-
- Housing and Homelessness Strategy;
 - Neighbourhood Energy Strategy;
 - Urban Forest Strategy;
 - Vancouver Food Strategy; and
 - Zero Waste Strategy.

Without the GCAP and supporting strategies and policies for example, CoV departments would risk misalignment and might not be engaged in a holistic fashion to seize the opportunities for addressing regulatory and/or permitting issues that allow for innovative business models to develop.

With the GCAP vision and innovative policy framework, it becomes somewhat embedded in the mandate of CoV staff and creates the operating structure within the CoV's regulatory framework. The GCAP and supporting policies also showcase leadership and serve as a source of inspiration to other government agencies, institutions, the private sector, non-profits, and the community at large.

The development of industry hubs in Vancouver's False Creek Flats is a good example of where a collective approach to policy and regulation / permitting has resulted in co-location business models with real potential for further growth. By bringing together holistic and visionary initiatives such as the Zero Waste Strategy, the Energy Retrofit Strategy for Existing Buildings, and the Green Enterprise Zone, combined with a progressive regulatory environment that includes extended producer responsibility (EPR), the Vancouver Building Bylaw, and deconstruction regulations, innovation and entrepreneurship can thrive and the result can be an increase in jobs. These efforts can be further supported in the future through initiatives such as the National Industrial Symbiosis Program (NISP).

The same approach is essential for young clean technology companies that require a holistic set of policies and programs to help them move from their start-up phase through to commercialization while avoiding the proverbial "valley of death" experienced by so many SMEs.

Although it may be hard to directly quantify the job impacts of the various strategies and policies, it is fair to say that these initiatives are vital in terms of creating a suitable environment that fosters innovation. They are also important drivers for transitional jobs, helping to increase the rate at which all industries and sectors are becoming greener by nature.

Measures to strengthen the existing policy framework could include:

- Consistently applying a "green jobs" lens to all policy and programming in order to maximize the benefits and returns (investment, employment, and otherwise);
- Considering cross-departmental policies, strategies, programs, and initiatives for potential synergies and additional investment, employment, or other benefits; and
- Better information sharing and coordinated approaches to supporting green and local food sector businesses across other levels of government and between other municipalities throughout the Metro Vancouver region.

3.2 Top Priority Initiatives for Reaching the 2020 Jobs Target

This Roadmap outlines below seven top priority areas for reaching the GCAP 2020 goal to double the number of green and local food jobs over the 2010 baseline. By focusing on these areas and related initiatives²¹, the CoV and the VEC have a strong likelihood of success.

Priority 1: Vancouver Building Bylaw & Retrofit Programs

<i>Job Increase (2010-2020): 7,300</i>
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Vancouver's ability to adopt its own building bylaw is unique in British Columbia. This has provided the CoV with the opportunity to be a leader with respect to building regulation, energy efficiency and performance standards, and water and waste considerations. The VBBL's has been considered very progressive relative to other Canadian building codes since its inception in 2008. It was updated in 2010, 2013, and 2014, and additional updates are planned in 2016 and 2019.

Discussions with industry and CoV staff suggest that by 2020, the vast majority (close to 100%) of all buildings under construction in Vancouver will be relatively "green" in nature due to the VBBL's much higher energy, water, waste, and material requirements than other building codes across North America. By 2020, city officials expect that the CoV will have codified into the VBBL so that all institutional, commercial, and industrial (ICI) buildings will be LEED certifiable and all low-rise residential homes (Part 9) will be built to a high national EnerGuide / EnergySTAR equivalent standards, assuming they are built to code.

The VBBL is expected to generate close to 7,000 transitional jobs in Vancouver over the 2010 baseline by 2020 in occupations that include architects, interior designers, engineers, construction trades and builders, and equipment and material suppliers.²² As such, the importance of continuing to ensure the VBBL moves forward and remains ahead of the North American best practice standard is critical for job growth.

In addition, the *Energy Efficiency Retrofit Strategy for Existing Buildings* has the potential to act as a trigger for growing jobs in this space. In particular, if a multi-unit residential building (MURB) retrofit program, building off the existing Green Landlords pilot, can be scaled up and expanded to cover approximately 50 buildings per year (such as by including condominium owners), the potential for growing jobs in Vancouver can be increased by an additional 300 jobs by 2020.

Priority 2: Local Food Initiatives

<i>Job Increase (2010-2020): 2,600</i>
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The economic and employment impact within Vancouver's local food sector has been growing quickly over the last several years²³, due in part to policies and programs that support growth of this sector and related businesses, as well as a growing consumer awareness of the health, economic, and environmental benefits of fresh food that comes from sources close to home. Supported by the *Vancouver Food Strategy* that was passed by City Council in 2013, the sector also benefits from a number of complementary policies and strategy initiatives, including the *Healthy City Strategy*, the *Climate Adaptation Strategy*, and the *Urban Forest Strategy*. Procurement practices and greater integration of local food purchasing within institutions and restaurant / drinking establishments are also having a positive effect.

²¹ See Appendix C for more detailed descriptions of the individual initiatives and related assumptions.

²² Read more about the VBBL's impact on transitional jobs in Appendix B, as well as related calculations and assumptions developed to estimate industry intensity ratios.

²³ The Local Food sector grew at approximately 21% between 2010-2013 (equal to 7% CAGR) based on research published in the VEC's *Green and Local Food Jobs 2014 Update* (p.11). See:

http://www.vancouvereconomic.com/userfiles/file/Attachments/VEC_GreenJobsReport_2014_web.pdf

Key actions within the Food Strategy itself include food production (community gardens, urban farms, and fruit tree planting), food processing and distribution, and food access (including through farmers markets). Farmers markets in BC have generated 147% more sales in 2012 than in 2006 for example.²⁴

Many small-scale farmers within the CoV are making a living off wage and larger farmers are now moving in to the city to inhabit indoor spaces, rooftops, and other under-utilized spaces and plots of land. However, if operations are highly mechanized then many of the jobs will be in the areas of storage, distribution, and retail for example.

The growth of local food procurement and processing is expected to create approximately 2,600 transitional jobs in Vancouver between 2010 and 2020. Additional jobs through the various Food Strategy programs / initiatives are possible.

Finding ways to incentivize capital investments throughout the local food supply chain and creating conditions for early-stage business ideas to get a foothold could allow more growth in this area. The community grants offered by the CoV through the Greenest City Fund that is managed by the Vancouver Foundation are good examples of incentivizing community based projects.

In food processing, economic and employment growth opportunities exist within the food technology space, around food safety and quality assurance / testing, as well as in focused R&D on areas throughout food systems (including value-added products).

Priority 3: Major Transit and Active Transportation Infrastructure	Job Increase (2010-2020): 1,200
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The development of the UBC-Broadway Corridor Rapid Transit Line and Vancouver's active transportation corridors are major components of the CoV's *Transportation 2040 Plan*. Initiatives include developing a SkyTrain line up to UBC and minor transit upgrades, as well as improving walking and cycling infrastructure in Vancouver, including new and refurbished sidewalks, cycling routes and signals, new walkways on False Creek bridges, and public spaces.

The UBC-Broadway Corridor is considered the second largest business and innovation centre in BC, the busiest transit hub in the region, and currently the busiest bus corridor in North America.²⁵ While not under the direct control of the CoV, the Broadway Corridor rapid transit initiative is a significant priority of the Mayor's Council and it will be important for the CoV to continue pushing forward on this project so that Phase 1 construction up to Arbutus Street (with capital expenditures estimated at \$2 billion) can start within the 2020 timeframe.

Collectively, these two green infrastructure initiatives will create close to 1,200 incremental jobs throughout the design, planning, engineering, community engagement, and operational / maintenance phases (not including temporary construction jobs).

²⁴ 2012 Economic and Social Benefits Assessment, BC Association of Farmers' Markets. See: <http://www.bcfarmersmarket.org/sites/default/files/files/BCAFM%20Market%20Benefits%20Final%20Report%20PROVINCE%20Merge%20282%29.pdf>

²⁵ KPMG (2013), The UBC-Broadway Corridor: Unlocking the Economic Potential. See: <http://vancouver.ca/files/cov/KPMG-UBC-Broadway-Corridor-2013-02-26.pdf>

There has been a rapid increase in efforts to support clean technology and green and social venture start-ups in recent years through accelerators, incubators, and other supporting initiatives, both domestically and around the world. Cluster development has been a major priority as cities look to attract investment, innovation, and talent to key industries and sectors.

The VEC has developed a number of supporting programs for businesses in this area. Recently, the VEC has led on a number of economic initiatives tied to Vancouver's *Digital Strategy*, including launching its Green and Digital Demonstration Program (GDDP), working with the CoV on enabling regulations for developing a digital district to give local companies a competitive advantage in this space, and developing a Technology Incubation Centre to be based out of the former police station at 312 Main Street.

The VEC also provides business support services for green and local food businesses with respect to expansion and retention efforts. VEC staff support green firms on real estate related activities including relocation and expansion initiatives, matchmaking / networking, funding opportunities, event sponsorship, and partnership development. The CoV and the VEC's efforts to develop a Green Enterprise Zone on False Creek Flats is encouraging the expansion of a number of industry hubs, focused on a range of sectors from local food to textiles and beverage container recycling.

Furthermore, business / trade missions have good potential to help Vancouver-based companies make connections and expand their market potential and global reach. The VEC / CoV run one major outbound trade / business mission per year, with additional smaller trips throughout the year. In addition, the VEC brings international delegations to Vancouver to facilitate match-making and broker business deals. In 2010, the VEC worked with others in the Metro Vancouver region to organize a highly successful business program surrounding the 2010 Winter Olympic Games that was estimated to generate \$170 million in foreign direct investment for the region in the first year following the program.²⁶ While not all of this activity is green economy focused, a good percentage of it is often targeting environmental and clean technology companies.

Collectively, the development of the VEC's Technology Incubation Centre, the roll out of the GDDP, a continued focus on business / trade missions that support Vancouver-based companies in the green and local food sectors, and ongoing support for the development and expansion of business / industry hubs will create approximately 980 jobs in Vancouver by 2020.

By tracking and measuring the results from these initiatives over time and looking at best practices from similar efforts in other jurisdictions, it may be possible for the VEC to improve their economic impact and job creation potential.

It should be noted that while it is not always possible to link all of the programs and initiatives in this area to direct job creation, many will have indirect impacts on job numbers in Vancouver. As one example, the VEC used to run a business retention program (Business Works) that was helpful for identifying the needs of local businesses. Such a program can go a long way to building relationships with company executives and ensuring that they remain based in Vancouver and that their employees are part of the local workforce.

²⁶ Based on an program impact review by Pricewaterhouse Coopers (PwC).

SIDEBAR: Cleantech Cluster Development, Incubators, and Accelerators

Many cities around the world are actively working to develop their clean technology clusters and support startups through incubator and accelerator programs. Below are a few examples.

Copenhagen's CLEAN - CLEAN is a recent merger between the Copenhagen Cleantech Cluster (CCC) and Lean Energy Cluster. CCC was launched in 2009 by Danish cleantech companies, research institutions, and public organizations with US\$26 million in seed funding from Capital Region of Denmark, Region Zealand, and the European Union Structural and Cohesion Funds. Goals include the creation of 1,000 new jobs in the cleantech sector (which it has surpassed); attracting 25 foreign companies to the cluster; and facilitating the growth of 25 cleantech entrepreneurs. It also works to promote collaboration between public, research and private partners, and foster innovation in procurement.

To support its international focus, the CCC has co-founded and manages the International Cleantech Network. This is an international collaborative platform involving 13 cleantech cluster organizations in Europe, North America, and Asia. CCS' mission is to support Danish companies in bringing their clean technology solutions to city projects around the world. Its approach is to look at integrated solutions to problems associated with urbanization and high population growth, particularly in emerging economies. Thus it seeks to leverage Danish competencies and technologies in areas such as water systems, wind energy, smart grids, smart city solutions, and waste disposal systems and to promote collaboration in these areas.

Finland's Nordic Innovation Accelerator – The Nordic Innovation Accelerator will relay challenges posted by Veolia Environnement (and other partners in the future) to the Acceleration members and they are invited to submit solutions. Each submitted solution will be evaluated and in the end, selected applicants will get invited to interviews and negotiations by the challenge owner. This approach gives Acceleration members direct links to offer their solutions to the right person at the corporate level and will ensure a response in a timely manner. The Nordic Innovation Accelerator team guides members along the way and provides additional support.

MaRS Cleantech – MaRS Cleantech considers itself an “incubator on steroids” and is the largest cleantech incubator in Canada, currently made up of 160 companies with sales in 40 countries. In 2013, it raised \$112 million in capital, \$82 million in revenues, and created over 300 jobs. MaRS consists of Cleantech Venture Services, ArcTern Ventures, and the Advanced Energy Centre that works closely with industry and OEM partners including Siemens and Hydro 1. MaRS acts as a single entry point for large industry OEMs to facilitate connections with the various cleantech companies it supports throughout their early startup phases through to commercialization.

A great deal of the business and new job growth opportunities in the area of waste and recycling are driven by increasingly stringent policies and regulation. Some of these are under the direct control of the CoV while others are not. The economic and employment opportunities come from both the expansion of specific programs that are required to comply with regulations, as well as innovation and entrepreneurship that will spin-off new ventures as circular economy business models emerge.

Under the current recycling regulation, the BC Government requires producers of tires, electronics, and beverage containers to provide extended producer responsibility (EPR) for the lifecycle management of their products, including collection and recycling. The program recently expanded to include printed paper and packaging and construction and demolition materials. Furniture, textiles, carpet, and appliances are expected to be included as part of the Ministry of Environment's EPR Service Plan within the next 5-10 years. Multi-Material BC (MMBC) will be responsible for province-wide packaging and printed paper collection and recycling. The CoV entered into an agreement with MMBC and will continue curbside recycling collection services, as well as to apartments and strata complexes.

New markets are opening up for the recycling products now being collected under the printed paper and packaging EPR program. Vancouver is likely to see further growth as this program matures and with increased competition in the market (e.g., the introduction of Steward Choice as a competitor to MMBC). Further growth in businesses and jobs will come from those involved with collecting and recycling hard to manage items such as mattresses, carpet, and furniture when these EPR regulations take effect. Metro Vancouver and CoV have asked for quicker startup of some of these EPR programs but it will depend somewhat on the provincial government's willingness to support this. While the CoV does not have direct control over these regulations, it can continue to apply pressure for having these programs start sooner.

In addition, with the Metro Vancouver regional ban on the disposal of compostable organics coming into effect in 2015 and the CoV's requirement that all businesses and properties have a food scraps diversion plan in place, there is considerable opportunity for growth in business ventures and jobs within the private sector related to the approximately 4,000 multi-family and 7,200 ICI sector properties who may require some type of food scraps diversion service, whether it be an onsite system or a collection service.

The CoV's Green Demolition Bylaw requires that pre-1940 built homes must recycle or reuse a minimum of 75% of the waste they generate, with the biggest impact on the quantity of wood waste that gets recycled. Job growth may occur when linked to building renovation / retrofits, through the creation of new products from materials, new social ventures, and in the supply chain to support neighbourhood energy conversion projects. A study by the Natural Resources Defense Council (NRDC) in California, for example, found that approximately 4 jobs are created for every 1,000 tons of wood collected, recycled, and reused.²⁷

From an entrepreneurship perspective, innovative organizations in Vancouver are seizing the opportunities in this space. The greenHUB as one example, which is a unique co-location partnership between Recycling Alternative and United We Can, is expecting to grow its 50 FTE jobs by 100% over the next six years to 2020 as a result of incoming EPR regulations.

²⁷ See: <http://www.nrdc.org/recycling/files/green-jobs-ca-recycling-report.pdf>

The Arts Factory / Great Northern Way Scene Shop is another example of an organization that is taking materials from construction and demolition sites, as well as textiles and other products once considered waste, and turning them into scenery, backdrops, and costumes for the Vancouver Opera and local theatre groups.

Industrial ecology initiatives are another area with job growth potential for Vancouver. A 3-year National Industrial Symbiosis Program (NISP) pilot initiative was originally proposed to start in 2015 but is currently on hiatus until the appropriate funding can be secured in order to launch the program in the Metro Vancouver region. The project is based on the highly successful UK model that connects different industries together to find ways to turn waste into resources (see sidebar). Estimates put the cost of a successful Metro Vancouver regional program at approximately \$500,000, with an economic return of \$15 million for the region based on multipliers from the UK model. The CoV and the VEC have the potential to leverage this proven program to grow the collaborative opportunities for businesses in Vancouver in locations such as the proposed Green Enterprise Zone in False Creek Flats.

There are other highly successful waste / resource focused programs in other jurisdictions that the CoV may be able emulate or adopt. San Francisco, for example, has a world-class zero waste program. San Francisco's three bin system, its policies, financial incentives, and extensive outreach to residents and businesses, helped it achieve a diversion rate of 80%, the highest rate of any major city in North America.²⁸ The Department of the Environment has a green jobs program that employs local residents from the city's diverse communities, who educate and inform residents and businesses about zero waste and Department of the Environment programs.²⁹

Collectively, Provincial EPR and recycling regulations, the regional ban on organics, the CoV's Green Demolition Bylaw (deconstruction regulation), and the regional NISP-Canada pilot are estimated to create approximately 805 new jobs in Vancouver by 2020.

SIDEBAR: National Industrial Symbiosis Programme (NISP)

The National Industrial Symbiosis Programme (NISP) is a successful and proven 'engagement' model with industry in multiple countries. NISP enables companies to improve profitability, commercial competitiveness, and environmental performance by recovering and reusing 'wasted' resources.

NISP is a business-led program that engages key industry players on the inside from day one (i.e., senior management at the C-suite level) and, as such, gets greater buy-in than an 'inside-out' model that brings in a consultant to make recommendations that often aren't implemented. Total investment for the NISP England program (April 2005-March 2013) was 40 million Euros and resulted in the following verified economic benefits:

- 10,000+ jobs created
- 1.17 billion Euros in additional sales
- 1.21 billion Euros in cost savings

Source: NISP website (www.nispnetwork.com), NISP economic impact assessment report, and interview with Peter Laybourn, Chief Executive, International Synergies Inc. (October 2, 2014).

²⁸ See: <http://www.sfenvironment.org/news/press-release/mayor-lee-announces-san-francisco-reaches-80-percent-landfill-waste-diversion-leads-all-cities-in-north-america>

²⁹ See: <http://www.sfenvironment.org/education-equity/green-jobs>

Investment in climate adaptation and related green infrastructure is an area of strategic importance to Vancouver, from a job generation angle as well as from a broader resiliency perspective. Vancouver City Council has adopted a comprehensive *Climate Change Adaptation Strategy* that recommends nine primary actions and over 50 supporting actions that the CoV can take to incorporate climate change adaptation measures into new projects and daily operations.

From an investment and employment angle, adaptation work identified in recent sea level rise / coastal flooding impact studies commissioned by the CoV estimated that projects designed to protect properties surrounding the Fraser River from flooding by building dykes will cost several \$100 million. However, interviews for this project with CoV staff suggest that the actual construction work on these initiatives is not likely to begin until after the 2020 timeframe.

More immediately, the Sewer Separation Program involves engineering design / construction projects that are ongoing to 2040. The initial focus has been on the False Creek area but is now shifting to the Fraser River area. The initiative includes significant detailed design and construction work with an ongoing annual capital expenditures budget of approximately \$30 million.

Vancouver's *Urban Forest Strategy* is another initiative in the immediate term that is creating jobs while helping to improve Vancouver's green spaces and canopy cover, providing an ability to sequester carbon, minimize the effect of heat islands, and provide for local food options all at the same time.

Additional opportunities exist to work holistically on cross-policy / program initiatives in this area and tie adaptation initiatives to planning, such as by leveraging the CoV's Digital Strategy to develop smart grid solutions and back-up power for improving resiliency from storms and extreme weather events.

Collectively, the Sewer Separation Program, the coastal flooding studies and related initiatives, and programs under the current *Urban Forest Strategy* will create approximately 520 jobs in Vancouver by 2020.

SIDEBAR: Copenhagen's Climate Adaptation and Cloudburst Plans

Copenhagen's new city-wide Climate Adaptation Program will be starting in early 2015 with projected investments of up to US \$1.4 billion over the next 20 years (equal to 13,000-15,000 new jobs, primarily in construction and planning).

Investment will come from tax payers in Copenhagen through a slight increase in water taxes over the next 20 years to pay for this adaptation infrastructure work. While some push back from residents over the tax increase is expected, city officials are communicating the importance of this work in terms of the benefits: that the work will protect citizens from flooding, sea level rise, and extreme weather events, such as severe cloud bursts which the city has experienced in recent years. In addition, the work is expected to keep insurance premiums from rising and, as such, the financial burden for residents will balance to some degree.

In addition, the city's Cloudburst Plan outlines green / blue infrastructure required to manage and retain increasing storm water flows. Total required investment from 2013-2033 is estimated at US\$0.7 billion.

Source: LSE Cities (2014): Copenhagen Green Economy Leader Report and interview with Lykke Leonardsen, Head of Climate Unit, City of Copenhagen (October 7, 2014).

The GCAP outlines plans for developing multiple district energy facilities by 2020 in order to deliver 11% of Vancouver's total 1.11 million tons of CO₂ reductions by 2020 (equal to 120,000 tonnes CO₂ per year from district energy projects). In 2011, the CoV started to gather input for a strategic approach to neighbourhood energy and developed energy centre guidelines leading to the *Neighbourhood Energy Strategy*.

The Strategy is divided into two core components:

- **Legacy Steam Heat System Conversion Projects** – These projects include the conversion of existing natural gas steam projects to biomass and/or other low-carbon energy sources in (1) Vancouver's downtown core currently owned by Creative Energy (formerly Central Heat) and related projects and (2) systems shared between Vancouver General Hospital and BC Women's / Children's hospitals. These conversion projects are estimated to require \$300-\$400 million in capital expenditures, with the bulk of this work taking place over the next decade.
- **New Neighbourhood Energy Development Projects** – Similar to the Neighbourhood Energy Utility in the former Olympic Village, these projects will be brought forward as part of high-density developments that will unfold in locations across Vancouver, such as along the Cambie Corridor. These projects are more dependent on the development projects they are tied to and, as such, it is assumed that the bulk of these initiatives will take place post-2020, outside of the scope for this Roadmap.

The CoV can continue facilitating the work underway by Creative Energy, various utilities, and developers. It is estimated that the conversion of Vancouver's legacy steam heat systems will create approximately 380 incremental jobs between 2014 and 2020, primarily in design, engineering, planning, and community engagement. A number of jobs will also be created related to energy / feedstock supply and ongoing operations / maintenance. Additional employment generation opportunities exist should some of the new neighbourhood energy development projects be advanced into the 2020 timeframe, although these were not included in the current Model.

3.3 Additional Supporting Programs & Initiatives

While more challenging to quantify in terms of their direct impact on jobs, two additional supporting initiatives / activities are worth a mention for their importance in ensuring that economic and job growth potential is maximized.

Marketing / Branding Programs

Based on experiences in other jurisdictions, effective marketing and branding of a city's efforts in green economy and clean technology development can go a long way to attracting investment, businesses, partnerships, and talent. Of course, it's essential to provide real substance behind this marketing with quality programs and initiatives.

The CoV and the VEC have done a good job gaining exposure for the GCAP and leveraging on events that have taken place in Vancouver in recent years, including the 2010 Winter Olympic Games and the more recent TED Talks event in 2014. The CoV also does a good job with promoting its brand on business missions abroad.

However, there are areas where the CoV and the VEC could do more to promote its core assets and strengths. One example might be the approach taken by cities such as San Francisco with its South of Market (SOMA) district, the Dumbo Tech Triangle in Brooklyn (New York), and Tech City in London (England) to brand their digital media districts and attract businesses to cluster in these areas. The CoV and the VEC are looking to do more to develop their strengths, leverage their Digital Strategy, and the legacy assets from the 2010 Olympics to grow the digital media economy in Gastown as one example.

The City of Amsterdam creates a compelling "Smart City" initiative, having developed an attractively designed and functional website to serve as a platform for sharing of information, collaboration, and marketing (see screenshot in Figure 14).³⁰ The website also serves as a showcase of all of Amsterdam's smart city related initiatives, of which there are more than 685 projects across 5 themes (Living, Working, Mobility, Public Facilities, and Open Data).

The City of Portland was recently featured in an article in the Chicago Tribune for its "We Build Green Cities" brand, which is helping small and mid-sized companies market themselves overseas through the support of the Portland Development Commission.³¹ The US federal government awarded nearly \$300,000 toward Portland's 'green' export effort in September 2014, to be matched 2-to-1 by city funds. The money will go toward forging international partnerships, providing customized market research for local companies, creating a database of business leads, and leading business trips abroad.

Post-Secondary Institutional Initiatives

Vancouver has a wealth of academic and knowledge-based institutions within its boundaries, including six public post-secondary institutions. Leveraging this knowledge and research capacity through student and faculty engagement on GCAP related issues and challenges continues to be a real opportunity area for the CoV.

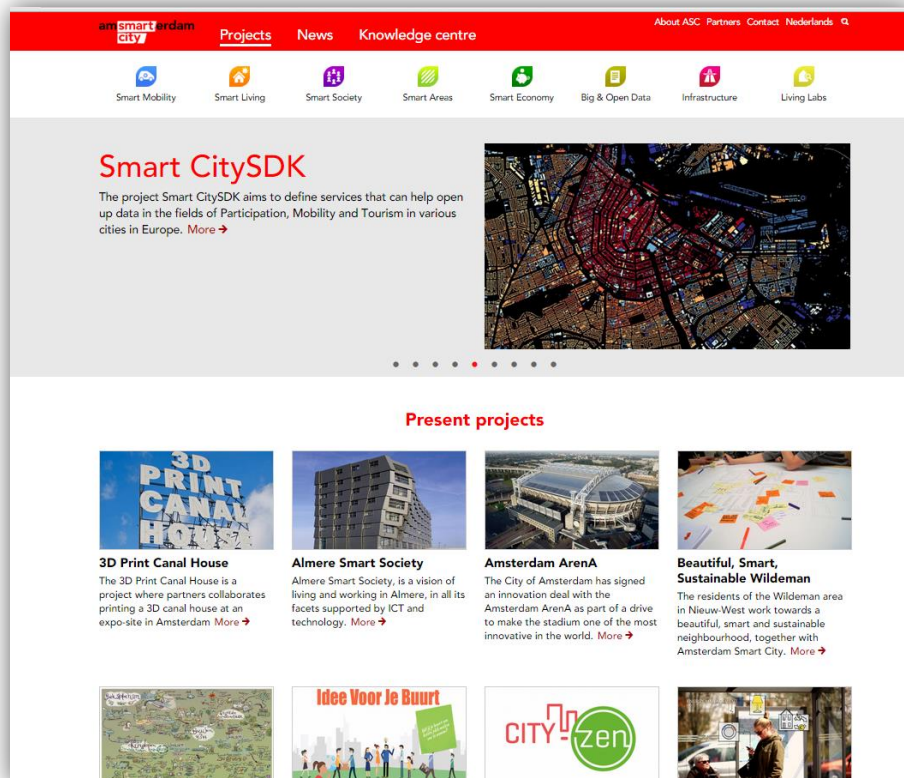
³⁰ See <http://amsterdamsmartcity.com/>

³¹ See Chicago Tribune article "Portland embraces 'green' image to boost exports" from October 21, 2014: <http://www.chicagotribune.com/news/nationworld/ct-portland-1019-biz-20141017-story.html#page=1>

CityStudio for example is an innovation hub under the Cambie Street bridge where CoV staff, university students and faculty, and community members design and execute CoV projects. CityStudio opened its doors in 2011, coming out of the GCAP public engagement process and the “Talk Green to Us” crowd-sourcing platform. The Vancouver Foundation provided 3-years’ worth of pilot funding and its now into its fourth year. Since 2011, CityStudio has engaged over 2,000 students, 75 faculty, 93 community members and professionals, and over 50 CoV staff, contributing over 67 projects and 75,000 hours of project action, skills training, and public sector innovation.

The Greenest City Scholars summer internship program sponsors UBC graduate students to work on sustainability projects with the CoV. In return, UBC receives yard trimmings for its biomass waste-to-energy facility. Up to 18 UBC graduate students per year are partnered with CoV teams and mentors to investigate and implement projects identified under the GCAP. Each Scholar receives \$5,000 to complete 250 hours of work over the summer. The VEC recruits a Greenest City Scholar each year, with one currently working on the Green Enterprise Zone initiative in False Creek Flats.

While difficult to directly correlate to job creation, programs such as CityStudio and Greenest City Scholar are preparing the next generation of workers with the skills sets and experience needed to potentially fill green and local food jobs in Vancouver’s future, the importance of which cannot be overstated.



Source: www.amsterdamsmartcity.com

Figure 14: Screenshot from the Amsterdam Smart City website.

4 Conclusions

Based on the *Green and Local Food Jobs Economic Impact Model* developed as part of this project, the VEC is on track to meeting its target of doubling the number of green and local food jobs by 2020 over the 2010 baseline, although significant investment and efforts will be required.

Under the Base Case scenario that applies occupational projections developed by WorkBC combined with specific trends and policies / regulations that are impacting on transitional green and local food jobs, Vancouver will see approximately 84% growth over its 2010 baseline. Under this scenario, the Green Building Design and Construction sector is expected to see the largest growth in jobs by 2020, due largely to the impacts of the VBBL on transitional green jobs.

Regardless, the Base Case scenario will result in a shortfall of approximately 2,810 green and local food jobs against the 2020 GCAP jobs target. As such, it will be essential for the CoV and the VEC to sustain current efforts across all green and local food sectors, as well as undertake a number of incremental initiatives that involve new capital investments in order to reach its 2020 GCAP target.

Based on the programs incorporated into the Model and the assumptions that were applied, incremental initiatives will allow for the creation of a total of 3,220 new jobs in Vancouver, bringing the total new jobs by 2020 to 17,640 over the 2010 baseline of 17,230 (equal to a total of 34,870 green and local food jobs in Vancouver by 2020).

From the results of the Model, the Roadmap identified three strategic areas of importance for reaching the GCAP 2020 target, as summarized below.

1. The need for a supportive policy framework for green and local food job growth

Planning strategically and holistically in terms of the policy framework will allow employment, as well as other benefits, to be maximized. Combining or integrating GCAP initiatives may, in some instances, lead to new opportunities. For example, overlaying the Digital Strategy to the Climate Adaptation Plan to look at how smart grid technology can help build resiliency around back-up power during extreme weather events could generate new opportunities for investment and jobs and provide opportunities that the two efforts alone would not achieve.

There is also potential to use Vancouver's current economic / sector strengths to focus on global green economy challenges. For example, there is potential to focus Vancouver's strong digital media talent on developing more solutions for industrial energy and process efficiency, as well as in the green building sector to develop software solutions such as 3D visualization and building information modeling (BIM), in order to show leadership on addressing global challenges in areas with significant market demand.

Applying a "green jobs" lens across all CoV activities is important. By considering additional benefits from carbon reduction, energy savings, process efficiency, increased productivity, and climate adaptation / resiliency, the potential for creating additional direct, indirect, and induced jobs exists.

2. A Focus on high priority programs / initiatives for reaching the 2020 GCAP jobs target

Seven top priority areas are outlined in the Roadmap and include:

- The Vancouver Building Bylaw
- Local food initiatives
- Major transit and active transportation infrastructure
- Green business support programs
- Waste / recycling policy and resource recovery
- Climate change adaptation and green infrastructure
- The Neighbourhood Energy Strategy

In some cases, it will be necessary to scale up existing and/or proposed incremental programs; some of which are under the control of the CoV / VEC and others that are not (e.g., the MURB retrofit program, EPR regulations, and the NISP-Canada program). In the latter case, the CoV and the VEC will need to play advocacy roles and/or find ways to contribute financially to ensure these initiatives are effectively delivered. Reviewing best practices from various leading jurisdictions around the world in order to strengthen existing transitional, incremental, and supportive programs can help to ensure that initiatives are optimized for job creation and attraction given the competitive nature of today's global workforce.

3. Consideration of additional supporting programs / initiatives

Additional programs that are not tied directly to job growth but act as enablers are also important. Greater strategic marketing, branding, and promotional efforts can help the CoV / VEC cut through some of the clutter in the global green economy / clean technology race to attract investment and talent.

The projected tightness of the future labour market in BC may require more flexible programs to ensure the adequate supply of workers exists. It is important to consider not only the current labour pool (both employed and unemployed), but also the potential labour pool that is inactive at a given point in time and may later become a source of new supply for filling demand for green and local food jobs. An example might be students who have recently completed their education and are now looking to enter the labour force. To this end, programs such as Greenest City Scholars and those offered by CityStudio are essential for equipping the future workforce with skills and experience that are relevant to green and local food jobs.

In addition, programs that can maximize the workforce by engaging individuals in under-employed segments of the labour supply pool (e.g., single parents, individuals with disabilities, etc.) through more flexible work-from-home arrangements and/or unconventional scheduling should be explored. The city of Calgary's WORKShift program is an excellent example of this.³² WORKShift enables employees to work where and when they are most effective; to think outside the office. Organizations that have embraced these programs see "triple bottom-line" benefits: they can see a marked return on investment through savings in real estate costs; increased employee productivity, attraction, and retention; and a significant reduction in their organization's carbon footprint.

Periodic review of the initiatives included in the Model and their assumptions against this Roadmap will help to ensure that the CoV and the VEC remain on track to meeting their target and realizing the Greenest City vision to make Vancouver a mecca for green enterprise and job growth.

³² See: <http://www.calgaryeconomicdevelopment.com/workforce-management/workshift>

Appendix A: Methodology

This section outlines the methodology by which the tasks and sub-tasks were carried out for this project in three Phases between August 2014 and November 2014. The methodology includes: a literature review; primary research; economic impact modeling based on a set of macro- and micro-economic and employment indicators; and the preparation of a *Green and Local Food Jobs Roadmap*, as outlined in more detail below.

Activities
Phase 1: Research, Data Collection, and Analysis
<ol style="list-style-type: none">1. Scan of existing best practices and approaches from other leading jurisdictions.2. Development of “business as usual” and “base case” labour demand and supply projections.3. Estimation of cost and employment ROI for green economy programs / initiatives.4. Interviews with subject-matter experts, program administrators, and other key stakeholders.
Phase 2: Development of Green and Local Food Jobs Model
<ol style="list-style-type: none">1. Develop and test <i>Green and Local Food Jobs Economic Impact Model</i>.
Phase 3: Development of Green and Local Food Jobs Roadmap
<ol style="list-style-type: none">1. Develop Strategic Roadmap and Summary Report.

Phase 1: Research, Data Collection & Analysis

1. Review of Best Practice Programs and Initiatives from Other Leading Jurisdictions

GLOBE reviewed its existing databases and secondary sources with a specific focus on identifying best practices and approaches relevant to the CoV’s GCAP goal of doubling the number of green and local food jobs by 202 over the 2010 baseline. The review of GLOBE’s databases was supplemented by a scan of additional information and resources available online and through various external sources and databases.

GLOBE conducted a high-level scan of leading “green cities” and best practice programs and initiatives from across Canada, the United States, Europe, and select international jurisdictions (including Singapore and Australia). Sources reviewed to identify leading jurisdictions / cities included:

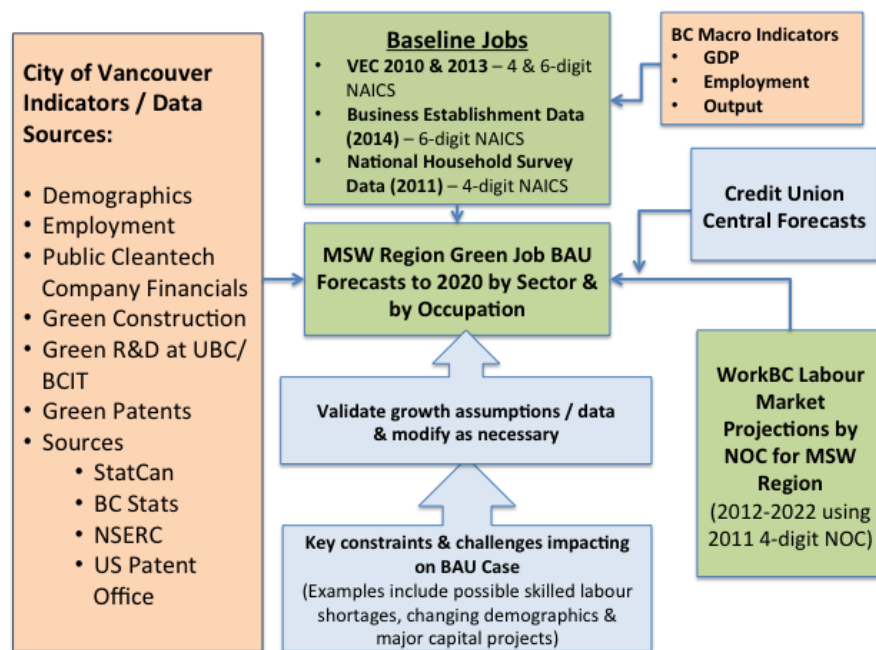
- [C40 Cities Climate Leadership Group](#)
- [Urban Sustainability Directors Network](#)
- [Brookings Institution’s Clean Economy Profiles by Metro Area](#)
- [Rockefeller Foundation’s 100 Resilient Cities](#)
- [ICLEI – Local Governments for Sustainability](#)
- [Clean Edge’s Cleantech Leadership Metro Index \(2014\)](#)
- [Corporate Knights’ Greenest Cities \(2013\)](#)
- [Partners for Climate Protection National Measures Report \(2013\)](#)
- [Siemens’ Green City Index](#)
- [Green Living Canada’s Greenest Cities list](#)
- [Organic Gardening Green Cities list](#)
- [OECD Green Growth in Cities initiative](#)

Specific consideration was given to cities with similar geographies, demographics, industrial clusters, and economic strengths to those related to the jurisdiction of Vancouver. The initial scan identified 27 cities which were reviewed in closer detail in terms of relevant programs, policies, projects, and investment attraction / economic development initiatives and their respective abilities to accelerate green and local food jobs in those jurisdictions. Particular attention was paid to employment returns based on program costs, as well as effective policies, incentives, and regulatory initiatives at the municipal level.

Based on this research, GLOBE undertook a more extensive examination of 10 programs that were considered most relevant to Vancouver's efforts. The selection was based on an "Analysis Matrix", developed in consultation with the VEC. The examination also included identifying key departments and individuals within the various municipalities and other relevant supporting organizations that were then short-listed for possible interviews and/or future research. See Appendix D for a list of "best practice programs" from various leading green cities from around the world.

2. Development of Business as Usual and Base Case Labour Market Projections

The first step to support the development of the *Green and Local Food Jobs Economic Impact Model* was to gather relevant data for Vancouver, Metro Vancouver, the Mainland-Southwest (MSW) Development Region, and the Province of British Columbia in order to establish "business as usual" (BAU) industry-specific demand and labour supply projections (as outlined in Figure 15). Understanding the BAU demand and supply projections to 2020 enabled GLOBE Advisors to estimate the incremental green and local food jobs that the CoV / VEC could potentially generate through targeted initiatives, as well as identify potential constraints that may exist due to labour demand or supply issues.



Source: GLOBE Advisors, 2014

Figure 15: Flow chart to developing 'business as usual' labour demand and supply projections.

GLOBE, in consultation with the VEC, mapped out North American Industry Classification System (NAICS) codes at the 4-digit level in line with the seven green and local food sectors and estimated intensity ratios based on earlier and new research by GLOBE and the VEC from the 2010 and 2013 green and local food job baseline estimates.

GLOBE engaged Statistics Canada to provide a custom tabulation of the 2011 National Household Survey (NHS) data at the City of Vancouver municipality level. The NHS data provided a custom tabulation at the 4-digit NAICS code level that allowed for a validation of the green and local food job baselines for 2010 and 2013, providing the total number of employees by relevant industry within the seven sectors.

GLOBE analyzed the current and emerging economic drivers that are expected to impact on the demand for green and local food jobs over the next decade, including investments in key sectors and population demographics. GLOBE also examined selected economic forecasts and projections such as statistical trends for the larger Metro Vancouver and MSW regions, as well as for the province of BC, bearing in mind that data for the MSW region, Metro Vancouver, and the province of BC is more readily available. These forecasts included reports by WorkBC, Credit Union Central, major private sector banks, the Bank of Canada, and the BC Business Council.

Based on past trends and input from leading experts on the current and potential future trends for BC's economy, various leading indicators including GDP and employment were assessed as to their potential to drive Vancouver's economy over the next decade.

After discussing the provincial and, more specifically the MSW region's detailed employment forecasts with leading economists in the Provincial Government and within WorkBC, GLOBE concluded that the detailed WorkBC employment forecasts for the MSW region by occupation best represent the BAU growth rates that are relevant to Vancouver. These WorkBC occupational projections were validated by examining BC Stats population projections for the MSW region to 2020 and by comparing the WorkBC growth trends to those developed by Credit Union Central, CMHC for housing starts, and other discussions with senior economists from the Bank of Canada local office and the BC Business Council.

These macro growth rates were examined in terms of their influence on the growth potential of selected green-related "micro-economic" indicators that were collected for Vancouver and the larger Metro Vancouver region (based on the availability of data). This included reviewing in detail the VEC's *Green & Local Food Jobs 2014 Update Report*. Micro-economic indicators that were used to measure growth and economic impacts on Vancouver's green economy and related jobs included:

- Growth in revenues and the balance sheets of public cleantech companies located in Vancouver that are listed on the TSX and TSX-V³³;
- Green technology-related patents issued by Vancouver-based companies;
- Research and development expenditures by UBC and BCIT;
- Green building certifications and performance data and major projects (proposed and under construction) within Vancouver's boundaries;
- Trends for sustainable construction based on "greening" building codes;

³³ See: http://www.tmx.com/en/pdf/Cleantech_Sector_Sheet.pdf

-
- Changing food consumption patterns toward sourcing more local and sustainable food options, which can be measured through procurement practices of local food providers and public institutions (healthcare sector, post-secondary institutions, etc.); and
 - Growth of local farmer's markets.

On the labour market supply side, the WorkBC projections include regional demographics, immigration and emigration rates, attrition rates, post-secondary completion and apprenticeship rates, and other factors that will impact on Vancouver's supply of labour in green and local food occupations over the next decade.

Leading indicators for Vancouver and for the MSW region were assessed in terms of their growth rate potential based on historical trends, recent developments, and current data. A growth rate scenario (both rate and level) was developed for each indicator. These scenarios were combined with the labour supply analysis to provide an estimate of the employment growth potential for relevant green and local food occupations in Vancouver over the next decade under the base case scenario.

3. Estimate Cost and Employment ROI for Green Economy Programs / Initiatives

GLOBE identified a list of more than 50 relevant initiatives (including CoV and VEC strategies, policies / regulations, and programs, as well as a select number of economic related initiatives by other stakeholders in the region where the CoV / VEC has some influence) that may impact on economic investment and job growth in Vancouver's green and local food sectors within the 2020 timeframe.

Specifically, GLOBE estimated:

- The capital and/or operating costs for each program / initiative (based on capital and human resource requirements). These estimates were based primarily on work with and data from the CoV / VEC.
- For each program / initiative, the employment that may be generated through these activities and/or may reasonably be expected in the future, based on secondary research and consultation with subject-matter experts.

These two estimates resulted in an "order of magnitude" calculation of the employment returns from investing in each program / initiative. In some cases where programs were new to the CoV / VEC and no historical economic or employment data was available, established programs in other jurisdictions were used as a proxy and applied to Vancouver's context with careful consideration. .

From this analysis, the economic impact of the various "incremental" green and local food programs and initiatives were estimated and "best fit" employment multipliers were identified and integrated into the Economic Impact Model in Phase 2. For a full list of the programs that were assessed as part of this project, refer to Appendix F.

4. Interview Subject-Matter Experts and Program Administrators

In addition to developing data sets and information from secondary and statistical sources, GLOBE interviewed and consulted with key informants and subject-matter experts to explore economic / industry trends, as well as outcomes from current and previous green economy and clean technology related programs, projects, policies, and initiatives.

Twenty key informant interviews were conducted with experts residing in Vancouver and an additional 11 interviews with individuals from other jurisdictions as per the review of “best practice” program examples described above. The key informant interviews were designed to validate and refine the key drivers, assumptions, and gathered economic and employment data and metrics related to specific programs wherever possible.

The interviews built on GLOBE’s research and recent consultations with senior executives, directors, and human resource professionals from more than 100 green economy and clean technology companies in BC.

The interviews were approximately 30 minutes in duration and were conducted by telephone, or in-person where feasible. Questionnaires for the interview process were developed by GLOBE and the key points were summarized following the interviews. For the full list of individuals interviewed, please refer to Appendix E.

Phase 2: Development of the Green & Local Food Jobs Economic Impact Model

Based on the secondary research, collected data, interviews, and the key assumptions developed through the tasks outlined above, GLOBE developed a simple yet responsive and flexible Excel-based model for internal use by VEC staff to compare various green and local food job growth scenarios.

The model consists of three key components:

- 1) The baseline and “base case” growth projections for each of the 7 green and local food sectors;
- 2) The list of “incremental” programs / initiatives that are creating new capital investments and as such, new jobs in various sectors; and
- 3) The integration of the base case projections with incremental programs / initiatives to generate various scenarios and analyze the impact of incremental programs over the Base Case in order to realize the CoV’s 2020 green and local food jobs target.

It should be noted that the Model used a 2010 baseline of 17,230 green and local food jobs, which is slightly higher than the 2010 baseline of 16,700 jobs estimated by the VEC (see Figure 16).

Sector	VEC 2010	Model 2010	Delta (2010)	VEC 2013	Model 2013	Delta (2013)
Local Food	4,946	4,954	8	5,987	5,984	(3)
Green Building & Construction	2,996	3,368	372	4,480	4,954	474
Cleantech & Build. Products	2,956	3,005	49	3,187	3,200	13
Infrastructure & Transportation	2,194	2,284	90	2,603	2,648	45
Sustainability Services	1,600	1,606	6	1,701	1,738	37
Land & Water Remediation	1,437	1,447	10	1,378	1,493	115
Materials Mgt. & Recycling	577	564	(13)	593	594	1
Total	16,706	17,228	522	19,929	20,610	681

Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure 16: Model comparison with the VEC's 2010 and 2013 baseline job estimates by sector.

The primary differences are a result of using a higher 2010 baseline for the Green Building and Construction sector (which was higher by approximately 370 jobs due to the inclusion of the interior design industry, i.e., NAICS 5414 – Specialized Design Services), as well as the Model's inclusion of the "interurban and rural bus transportation" industry (NAICS 4852) which was excluded by the VEC and added approximately 70 jobs to the Model's 2010 baseline. As a result, it is projected that the CoV must reach a total of 34,460 green and local food jobs by 2020 if it is to successfully reach its GCAP target of doubling the number of jobs over the 2010 baseline.

1. Developing the Base Case Growth Projections

The model incorporates relevant employment baseline data for Vancouver for all relevant NAICS codes (at the four digit level) in line with the seven green and local food job sectors (obtained from a custom tabulation of National Household Survey 2011 data for the city of Vancouver).

The baseline employment data for the years 2010-2013 was multiplied by the actual average occupational growth rates over that period for the MSW region, based on BC Stats reporting data extracted from the Labour Force Survey. For future years, the individual industry growth rates were estimated by taking the projected average annual growth rates for the top 10 occupations (at the 3 digit NOC level) for a given industry for two periods: 2014-2016 and 2017-2020. These occupational forecasts were based on the latest Labour Market Outlook projections (2012-2022) for the Mainland Southwest region developed by WorkBC³⁴.

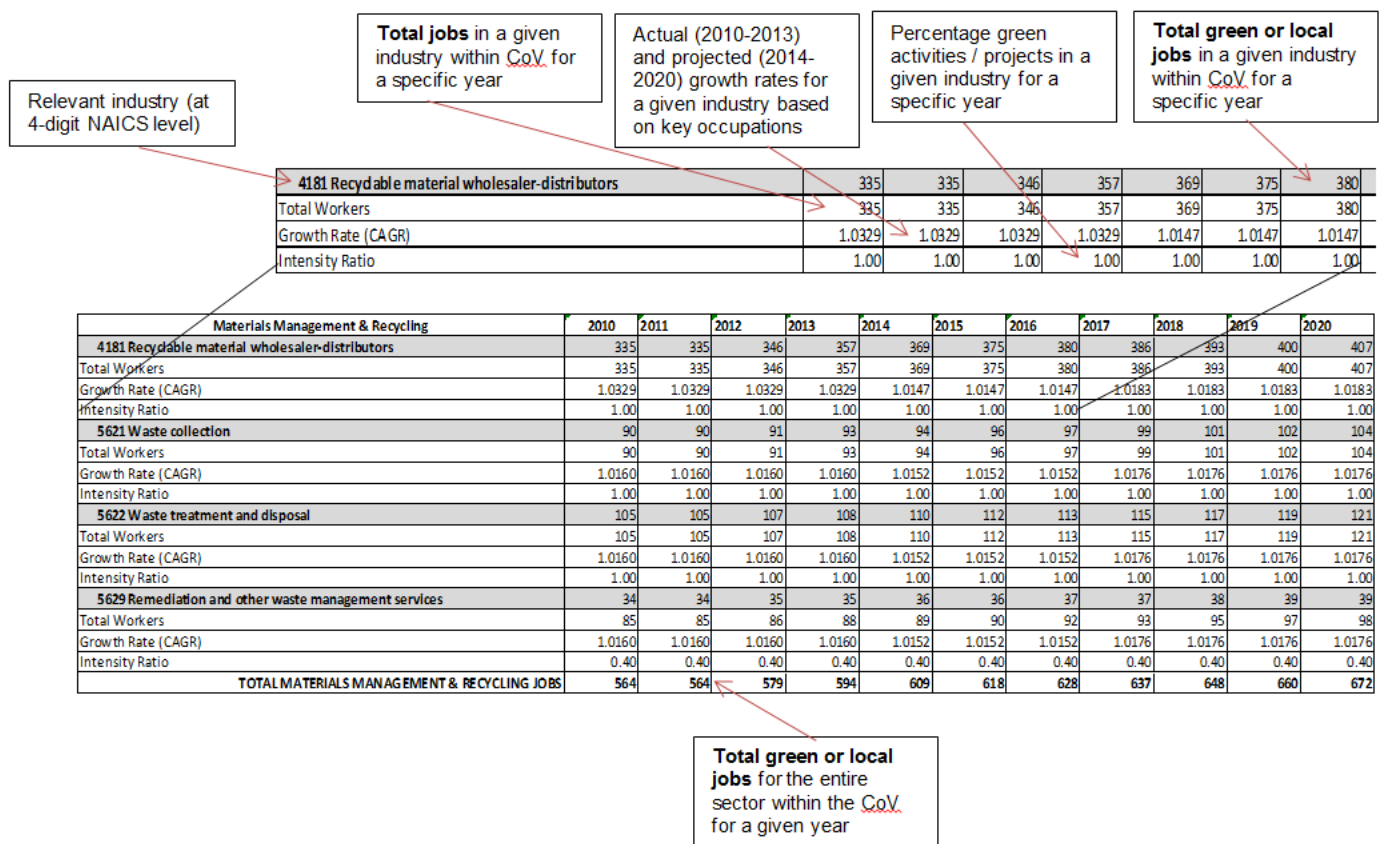
To estimate the number of green (or local food) jobs related to a specific industry, the baseline employment data for each of the relevant four digit NAICS was then multiplied by the relevant intensity ratio (i.e., concentration of workers in a given industry code that are involved with green and/or local

³⁴ It should be noted that WorkBC occupational forecasts take into account the UBC Rapid Transit Line infrastructure project over the 2014-2020 time period (a \$2.8B project listed in the BC Major Project Inventory) and as such, this project is included in employment growth projections as part of the "base case".

food activities or projects) for a given year from 2010 to 2020. The intensity ratios of certain industries were increased over time based on the growing the number of green activities or projects in specific areas, influenced by key programs, policies, and initiatives including:

- Impact of the Vancouver Building Bylaw on the green building and construction sector, as well as related materials and products (see Appendix B for the analysis and assumptions behind how these intensity ratios were increased over time).
- Impact of other programs focused on “transitional” jobs, including those influenced by:
 - Sustainable procurement programs on the local food sector;
 - The CoV’s green operations, civic zero waste, and green fleet programs; and
 - Increasing levels of related programing by the provincial and federal government, as well as post-secondary education / training institutions in Vancouver.

Finally, to estimate the total number of green and local food jobs within each of the seven sectors, the total number of green or local food jobs for each four digit NAICS code was calculated for every year from 2010 to 2020. An example is provided in the Figure 17 for the “Water, sewage, and other systems” industry (NAICS code 2213) from the Land and Water Remediation and Environmental Consulting sector. This information was then plotted on an area chart to illustrate the relative number of jobs for each of the seven sectors and job growth to 2020 under the Base Case scenario.



Source: GLOBE Advisors, Green and Local Food Jobs Economic Impact Model

Figure 17: Screenshot of the Base Case scenario for the Materials Management and Recycling sector.

2. Integrating the List of Incremental Programs and Initiatives

Based on the research that was conducted in Phase 1 on the more than 50 initiatives (described above), 26 were integrated directly into the Model and a list of 20 initiatives were identified as having direct potential to impact on new capital investment in Vancouver to some degree by 2020 and were incorporated into the Model as incremental initiatives.

Of the 20 incremental initiatives, 11 were deemed as under the lead control / responsibility of the CoV, five were deemed to be under the lead of the VEC, and four under the lead / control of other external stakeholders, although the CoV has some influence over them, either politically and/or financially. The UBC-Broadway Corridor rapid transit line project is also considered to generate incremental capital investment but was included in WorkBC's occupational forecasts and was therefore excluded from the incremental initiatives to avoid double counting.

The economic impact from each of these incremental initiatives was estimated, including the sectors and industries that these initiatives were most likely to impact on. The estimated total economic investment for each initiative to 2020 was then multiplied by the "best fit" employment multipliers³⁵ for those initiatives and the total job impact was assessed through the Model.

Where major infrastructure investment programs / initiatives were included in the Model³⁶, GLOBE did not count the construction jobs as part of the green job total. Instead, professional services and other green job related activities (engineering, planning, design, manufacturing, installation, stakeholder engagement, educational services) were estimated based on Statistics Canada's Input Output Industry Codes table for Engineering Construction (BS23C)³⁷ and the estimated percentage of these activities (equal to 21%) was multiplied by the total economic investment related to that project multiplied by the blended direct employment multiplier of 6.76. Estimated employment related to ongoing project operations / maintenance (if relevant) was added to this total to estimate the full direct employment impact associated with these major green infrastructure projects.

In a few cases where the estimating the total economic investment of an initiative was not feasible or possible, a multiplier was not used. In these instances, the total incremental jobs created by those initiatives on an annual basis were estimated based on interviews with program administrators and/or subject matter experts running similar programs in other jurisdictions (e.g., the total job impact from Vancouver's Green and Digital Demonstration program).

All assumptions are clearly identified and calculations laid out in the Model's supporting worksheet documentation.

³⁵ Statistics Canada BC Input Output Multipliers 2010 Catalogue no. 15F0046XDB

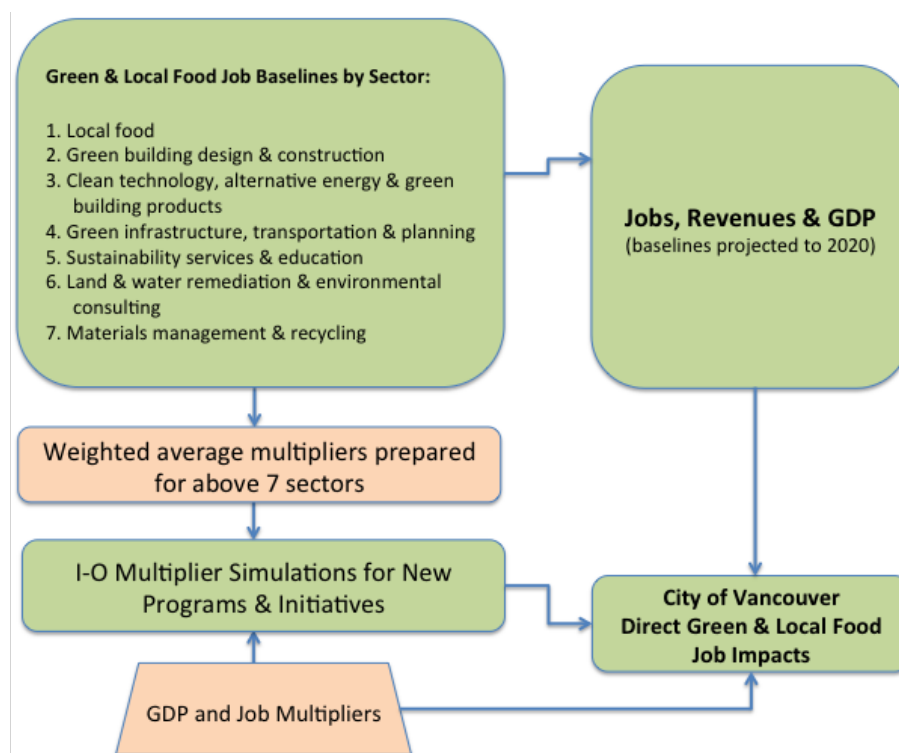
³⁶ Programs / initiatives include: the UBC-Broadway Corridor Rapid Transit Line project, the development of Vancouver's Active Transportation Corridors, Sewer Separation Strategy projects, and Legacy Steam Heat System Conversion projects.

³⁷ See: http://www.statcan.gc.ca/nea-cen/classification/io_ind-es_ind/cat-eng.htm

3. Scenario Generation through the Integration of Base Case with Incremental Initiatives

The Economic Impact Model (the Model) is linked to programs and initiatives and allows for the generation of realistic employment scenarios based on program selection, actions undertaken, and resources invested by the CoV / VEC. The Model is designed so that incremental initiatives can be layered on top of the Base Case scenario. Each incremental initiative can either be included in the Model and displayed in an area chart, or removed from the graph in order to see its specific impact on jobs (on an annual basis from 2010 to 2020, as well as in comparison to the overall 2020 GCAP green and local food jobs target).

The Model examined potential job, GDP, and Output multipliers for various green industries based on Statistics Canada's most recent Input-Output Model (see Figure 18). These multipliers provide a valuable tool by which to estimate and project the potential impacts of programs and tools that will attract and leverage both domestic and international investment and business operations by the CoV.



Source: GLOBE Advisors, 2014

Figure 18: Green and local food jobs economic impact model diagram.

Phase 3: Development of Green & Local Food Jobs Roadmap

Based on the Model, GLOBE developed a strategic Roadmap that examined how existing programs and initiatives in Vancouver should be leveraged to achieve the GCAP target of doubling the number of green and local food jobs by 2020 over 2010 levels. The Roadmap:

- Summarizes the results from the Economic Impact Model on the various green and local food job sectors;
- Describes the ROI that the various initiatives will likely have in terms of growing the green and local food jobs in the City of Vancouver;
- Summarizes leading best practices from other jurisdictions of relevance to the City of Vancouver;
- Recommends areas where investment is most likely to yield results in terms of green and local food jobs; and
- Maps out a scenario for reaching the GCAP target of doubling the number of green and local food jobs in Vancouver by 2020.

The Roadmap is supported by a PowerPoint presentation that illustrates options based on time, resources, budget, and other considerations.

Appendix B: Intensity Ratio Analysis

Green Building & Construction Sector Analysis

The definition of green building jobs has not been standardized. At a minimum, green building jobs comprise those functions which support the improvement of building energy efficiency performance³⁸. The green building jobs that are included in the original VEC plan that will be counted as 100% green (i.e., do not have an intensity factor applied) are those involved with:

- Building energy and environmental performance optimization and improvement;
- On-site water collection and treatment;
- Installation and operation of renewable energy systems;
- Installation and operation of building products with low environmental footprint or health benefits (such as green roofs);
- Design and installation of features and systems which create and enhance the value of ecosystem services, food production (operation of food production is captured elsewhere);
- Green building consulting services (energy modelling, rating system documentation, LCA specialist, commissioning, etc.); and
- Building deconstruction and disassembly, C&D waste management, materials salvage and re-purposing, production of secondary materials, etc.

Text Box: Snapshot of City of Vancouver building stock

There are approximately 90,000 buildings in the City of Vancouver, including:

- 77,000 detached houses, duplexes, etc. with 106,000 residential units
- 5,700 apartment and condominium properties with 174,000 residential units with an estimated 131 million square feet (12 million m²) of floor area (assuming that the average floor area for an apartment or condo is about 750 square feet (70 m²)).
- 5,200 commercial and institutional properties with an estimated 114 million square feet (11 million m²) of floor area
- There are 422 large commercial buildings and 725 large MURBS over 50,000sf (5,000m²)
- Within the 5,200 commercial and institutional properties, there are approximately 1,000 public sector buildings including schools, health facilities, colleges, recreation centres, libraries, and government offices
- 250 industrial facilities

By the end of 2013, there were:

- 63 LEED certified buildings - 17 million square feet (1.6 million m²) gross floor area
- 146 LEED registered projects - 36 million square feet (3.4 million m²) gross floor area).
- 57 BOMA certified buildings - at least 6 million square feet (0.5 million m²) gross floor area

In terms of new development:

- Since the mid-1990's, residential construction has accounted for over 70% of the value of annual building permits.
- In 2013, 821 new single-family homes were built which comprises only 15% of the total number of new residential units.

Altogether, these green buildings comprise about 2.5 percent of the total number of ICI MURB buildings in Vancouver and about 24 percent of gross floor area. Although data is not available for the amount of floor area certified under BOMA BEST, it is assumed that an average project will be at least 100,000 square feet (9,000m²) because the program is predominately taken up by the owners of large ICI/MURB buildings.

Sources: "Energy Retrofit Strategy for Existing Buildings" report to City of Vancouver Council by Sean Pander, June 2014, CAGBC, USGBC, BOMA

³⁸ "Jobs, Justice, Climate: building a green economy for BC", Columbia Institute, 2010. http://www.columbiainstitute.ca/sites/default/files/attachments/REVISED_FINAL_Columbia_green_jobs_nov2010.pdf

However, the potential of the building industry to generate green jobs is much greater as “traditional” building design and construction jobs transition into green jobs by 2020 on the basis of certain regulatory, economic, and other factors.

These jobs constitute the core activities involved in building design, construction, and operation such as architects, engineers, contractors, and trades (including plumbers, carpenters, and electricians). They also include the building materials manufacturing sector (that are part of the “Clean Technology, Alternative Energy, and Green Building Products” sector), as well as materials recycling, reprocessing, and re-use (that are part of the “Materials Management and Recycling” sector).

Combined, these “transitional” jobs could account for a large proportion of the green job growth potential within the green building related sectors. In fact, the USGBC estimates that in the U.S., a national commitment to green building has the potential to generate 2.5 million American jobs. These transitional jobs can be measured based on increasing “intensity factors” or percentages of the workforce engaged on green building related projects and working with related products and equipment.

Evidence exists based on qualitative interviews and research conducted by GLOBE Advisors and others over the last several years that the amount of time spent on green building projects and activities by staff in building sector companies has been growing quickly. As one example, a 2014 survey by McGraw Hill Construction for the Canada Green Building Council on green building trends in Canada found that the percentage of firms doing over 30% of their work on green projects grew by 50% over the three-year period from 2011-2014.³⁹ This trend is expected to become more marked in the near future, with the largest percentage of growth expected for firms doing more than 60% of their work on green projects, with half of the firms that participated in the survey expecting to be at that level by 2017.

As such, it is reasonable to assume that, for a City like Vancouver at the forefront of this transition, 100% or greater growth in intensity factors (i.e., time spent by existing staff working on green building projects, products / technology / materials, and related activities) could occur within existing firms between the 2013 baseline and 2020.

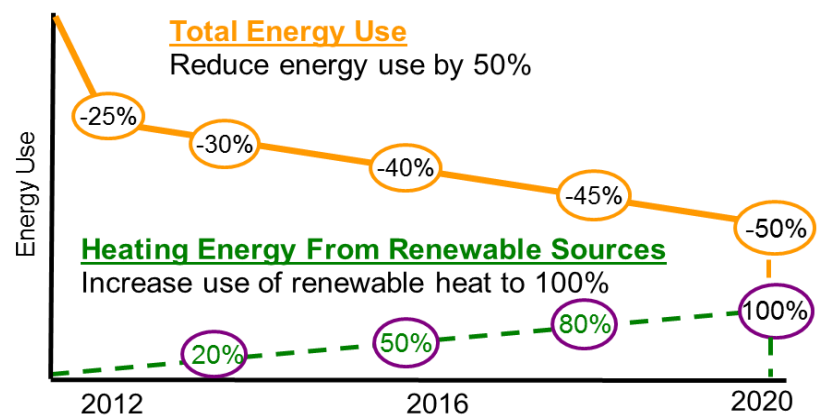
Going forward, these transitional jobs will be highly impacted by the following drivers:

- The stringency of regulatory performance requirements (i.e. the VBBL) and supportive workforce related training / certification programs compared to provincial and national standards;
- The amount green building project and technology / product work undertaken by Vancouver-based firms and “exported” to other regions.

³⁹ McGraw Hill Construction (2014): *Canada Green Building Trends: Benefits driving the new and retrofit market* (p.11). Download: <http://www.cagbc.org/cagbcdocs/resources/CaGBC%20McGraw%20Hill%20Cdn%20Market%20Study.pdf>

Architects, Engineers & Designers

Under the Vancouver Charter, the City is able to implement building energy and environmental performance regulations ahead of provincial and national standards. Steered by the 2020 Greenest City Action Plan vision, the City has laid out a roadmap of progressively more stringent energy and climate targets in order to realize the goal of “all new buildings to be carbon neutral in operations and all existing buildings to be 20% more energy efficient by 2020” (see Figure 19).



Source: City of Vancouver Sustainability Group

Figure 19: City of Vancouver regulatory road map to carbon neutral buildings by 2020

An interview with City Sustainability staff confirmed that the pace and scope of Vancouver Building Bylaw (VBBL) updates are currently on track with the GCAP vision (see Figure 20). For example, for large ICI and MURBs, there are now tighter energy performance requirements based on ASHRAE 90.1 (2010) which results in better performance than the BC Building Code.

Figure 20: Vancouver Greenest City Action Plan indicator for green buildings (source, City of Vancouver)

Indicator	Baseline	2013	% change	2020 target
Total tonnes of community CO ₂ e from residential and commercial buildings	1,145,000 tCO ₂ e (2007)	1,110,000 tCO ₂ e	-3%	916,000 tCO ₂ e

There is also a requirement for energy use intensity (EUI) and CO₂ emission statements on building permit applications⁴⁰. The green building rezoning requirements require LEED Gold, plus prescribed and enhanced energy and water performance and the higher building policy requires projects to achieve at least 30% better than ASHRAE 90.1 (2010) with EUI targets in the region of 115kWh (site energy). Large sites are required to undertake feasibility studies for district energy potential. Amendments to Part 10 of the VBBL stipulate energy efficiency upgrades for renovations based on prescribed policy “triggers”.

⁴⁰ Energy requirements, forms, and checklists for large and retail / commercial buildings, City of Vancouver <http://vancouver.ca/home-property-development/large-building-energy-requirements-forms-checklists.aspx>.

For houses and small structures, the Green Homes requirements are already in place and the expectation is that by 2020, new homes will be constructed to a standard equivalent to Passivhaus. However, architectural and engineering services are only required on large projects that fall under Part 3 of the BC Building Code or on large houses over 4,000sf (although engineers may be brought in on an as-needs basis for any size or type of structure). Interior designers' work conforms closely with architects and can be considered to evolve in the same way.

It is the opinion of the City Sustainability Group that the sustainability regulations contained within the VBBL will continue to be more progressive than others in Canada and that by 2020, professional consultants will have to adopt a wide range of world-class sustainability-related expertise in order to deliver project designs capable of meeting these standards. For the purpose of calculating green building jobs, this suggests that 100% architecture, engineering, and other jobs related to projects being designed for construction in the City of Vancouver can be counted as green jobs by 2020.

"British Columbia has the most stringent environmental measures in place, followed by Manitoba, Alberta, and Saskatchewan. [the City of] Vancouver has one of the most environmentally rigorous building bylaws in North America. The bylaw is enabled under a provincial statute, the Vancouver Charter. The City of Vancouver has put mandatory environmental regulations into its code since 2006 and it requires all new one- and two-family homes to have, for example, energy saving windows, R-12 under-slab insulation, dual-flush toilets and be equipped for electric cars.

Additionally, all new commercial developments need to adhere to a US-based energy consumption standard called ASHRAE (Advanced Energy Design Guides) 90.1. Since implementation, Vancouver has seen more than a 20% reduction in the carbon footprint of its new buildings, making them nearly 25% more energy efficient than Canada's minimum national requirements (Paperny 2012)."⁴¹

In effect, the current suite of policies, programs, and regulations in place and the trajectory proposed by the City are moving the industry forward in manner that will achieve the GCAP green jobs goals for the architects, engineers, and interior designers.

It is assumed that on average, 25% of the total workload in a typical Vancouver-based professional design consultancy is on projects that will be built in the City of Vancouver (interview, Kevin Hanvey, Principal, Omicron). The majority of work completed outside of the City of Vancouver is in the Lower Mainland and in other regions of BC. A few (but limited) number of large firms also undertake work in other provinces and countries.

The projected market penetration of green building rating systems such as LEED has been used to determine the green intensity factor for the work conducted by Vancouver-based firms outside of the City of Vancouver. The USGBC and CaGBC both state that their intention is to, at best, target the "top 25 percent"⁴² of projects. In 2012, about 600 (15%) of Canada's 4,000 LEED projects were in BC. Given that 146 (3.6%) are in the City of Vancouver, about 450 are elsewhere in the province: an extremely small number compared to the overall number of buildings in BC. Currently it is therefore estimated that, at best, 5% of the workload outside of the City of Vancouver is on green buildings (3.75% of total workload).

⁴¹ "The Missing Link: Constructive Ideas for Improving Urban Environmental Performance in Western Canada", the Canada West Foundation, December 2013.

⁴² For example, as stated in the U.S. LEED Homes rating system introduction.

Clearly, there is considerable opportunity to increase the number of LEED buildings in BC and elsewhere in Canada given the projected pace of the general construction economy. For example, CMHC forecasts that the number of housing starts in Vancouver CMA will grow by 3.1% 1.4% in 2014, by in 2015 and by 2.5% in 2016⁴³.

Although it is difficult to predict the pace of update of the BC Building Code and the rate of adoption of green building solutions in other jurisdictions, a conservative expectation is that by 2020, the pace of uptake will continue to increase and the rest of BC will be where Vancouver is in 2014 where 3% of building projects and 24% of gross floor area will be green. Project teams are assembled on a per building basis, although the larger the project the more members of the team so to arrive at an intensity factor, it is reasonable to find the mid-way point between the two to arrive at an intensity factor of 13.5% for work outside the city of Vancouver by 2020 (the average of 3% and 24% is 13.5%). This rate can be buttressed by the fact that Vancouver's emerging reputation as a green centre of excellence is resulting in a few large firms locate their green experts in Vancouver (such as Perkins and Will, Integral Engineering). The intensity of green building activity in these firms is therefore proportionally larger.

NAICS Codes	Intensity factor	
	2013 baseline	2020
Architects, Engineers, Designers		
2372 Land subdivision	0.03	0.03
5413 Architectural, engineering and related services	0.28	0.35
5414 Specialized design services	0.18	0.30
Interior designers	0.28	0.35
Industrial designers	0.05	0.05

Summary of assumptions

- Land subdivision – no change
- All new architecture / design work in Vancouver will be green based on targets within the VBBL by 2020 and commitment to continuously update in order to achieve a regulatory framework for carbon neutral new construction by 2020.
- Architectural, engineering and related services in 2013 = [25% (CoV workload) x 100% (intensity factor)] + [75% (non-CoV workload) x 5% (intensity factor)] for a total intensity factor of 28%
- Architectural, engineering and related services by 2020 = [25% (CoV workload) x 100% (intensity factor)] + [75% (non-CoV workload) x 13.5% (intensity factor)] for a total intensity factor of 35%
- Specialized design services include interior designers and industrial designers. It is assumed that interior designers experience the same intensity factors as architects, but no change is anticipated for industrial designers.

⁴³ CMHC Housing Market Outlook, British Columbia Highlights, Spring 2014, http://www.cmhc-schl.gc.ca/odpub/esub/65442/65442_2014_Q04.pdf?fr=1415043253815

Construction & Trades

General contracting and trade companies become involved in a green building once the project design is complete. This means that there is generally a 1-2 year time lag between when the design is commissioned and the project starts construction. Of the construction and trade jobs located in the City of Vancouver, those related to residential energy and plumbing systems will have to have transitioned by 2020 to incorporate systems such as solar hot water, HRVs, and heat pumps. House framers will need to understand how to air seal and create highly insulated building envelopes. However, most of the other trades will remain largely unaffected.

The market for larger projects is very competitive, and companies will strive to limit potential change that could place them at a disadvantage (at least in the short term). They may invest in training key employees such as project managers and superintendents on green building techniques but the contracted crews will not perceive a great deal of change in their roles and responsibilities until after 2020. These workers comprise less than 10% of the total workforce on a construction site.

General contracting and trade companies in BC are primarily SMEs which function within a highly fragmented and specialized industry. Some trades, such as gas fitters and electricians, are regulated by the BC Safety Authority⁴⁴ and as such, the type of work they undertake is highly controlled.

Training for contractors and trades is overseen by the Industrial Training Authority (ITA BC) which is responsible for apprenticeship training curricula. The course outlines are updated every 5 years or so and are driven primarily by cross-country compatibility efforts to facilitate trade mobility between provinces. There are currently no regulations which require contractors and trades to complete ongoing professional development. The trades that are motivated to take courses are those affected by the entry of new products (such as HRVs, heat pumps, etc.) but many workers can go through their entire career without any formal training whatsoever.

Therefore, framing and finish carpenters, plumbers, gas fitters, electricians, and hydronic technicians will be predominately green by 2020, but many trades will remain unchanged. For example, painters and flooring installers may be using greener products, the procedures remain exactly the same.

There are few credentials by which to identify a green builder. Of those that do exist, there are no registered R2000 home builders and there are 10 BuiltGreen registered home building companies located in the City of Vancouver. However, just because they are registered as green builders does not mean that their work is exclusively so and the value of these designations in determining green jobs is low.

There are some potentially important developments that could bolster the transition of a number of traditional jobs to green jobs. For example, the BC Wood First initiative, has invested in the development of a range of new products (such as Cross Laminated Timber, Laminated Veneer Lumber, etc.), practices (such as high-rise wood design) and approaches (such as pre-fabrication and pre-assembly that not only articulates BC wood as a low carbon material but will see the construction of innovative wood structures (an 18 storey project is in development at UBC) that will result in lowering the environmental footprint of buildings. The construction of high-rise wood projects will result in a significant number of traditional construction jobs transitioning to green jobs. However, it is unlikely that the effects of these developments will not be felt until after 2020.

⁴⁴ <http://safetyauthority.ca/regulations/gas>

Other initiatives, such as the “Green Plumber” program, a 2-day workshop in Vancouver that saw more than 65 plumbers participate, have the potential to help with the greening of existing trades, particularly if programs such as these can be scaled up, linked to some form of certification, and/or potentially be made a requirement for working within the City of Vancouver that could be linked to licensing for builders and trades.

The construction industry is hampered by its traditionally low level of productivity and as labour shortages become increasingly acute, effort to improve productivity will increase. Technological evolution coupled with owners’ on-going demand for more effective processes that result in better, faster, less costly and less adversarial construction projects are driving significant and rapid change in the way projects are delivered.

Taking cues from the auto industry, contractors are starting to “think like manufacturers” in the way they approach the management of information, scheduling, personnel and processes. “Lean construction”, off-site construction, and integrated project delivery are all emerging as ways to improve productivity, and are gaining popularity in other countries. The impact of these processes is to dramatically reduce the number of workers required per construction project. For example, the 100,000 sf 10 storey CREE Lifecycle office building in Austria⁴⁵ was built with just 10 workers.

There is the risk that these practices will have a significant dampening effect on construction job growth, however it is unlikely that such an impact will be felt prior to 2020.

NAICS Code	Intensity factor	
	2013 baseline	2020
Construction and Trades		
2361 Residential building construction	0.13	0.50
2362 Non-residential building construction	0.17	0.50
2371 Utility system construction	0.10	0.10
2379 Other heavy and civil engineering construction	0.09	0.09
2381 Foundation, structure, and building exterior contractors	0.14	0.50
2382 Building equipment contractors	0.17	0.50
Plumbers	0.17	0.50
Gas fitters	0.17	0.50
Electricians	0.17	0.50
HVAC technicians	0.17	0.50
Hydronic technicians	0.17	0.50
All others	0.17	0.50
2383 Building finishing contractors	0.14	0.30
2389 Other specialty trade contractors	0.14	0.30

⁴⁵ <http://www.lifecyclehub.com>

Summary of assumptions

- While new construction in the City of Vancouver will be close to 100% green by 2020 based on VBBL requirements, a lag time exists between design and actual work on the ground. As such, the overall intensity factor for jobs in residential and non-residential construction (including general contractors and carpenters) will grow to a total 50%.
- Building equipment contractors such as plumbers, gas fitters will have substantially transitioned to green jobs, however the nature of their work is highly regulated so the tangible impacts of change will be dampened. It is assumed that 50% of the work for these trades will be green by 2020 with the remaining work transitioning toward 100% beyond 2020.
- The nature of utility system and heavy / civil engineering construction jobs, as well as building finishing contractors and other specialty trade contractors, are less involved in aspects of green building and, as such, their intensity ratios will grow at a slower rate overall based on the estimated amount of green building related activity.

Suppliers (Equipment & Materials)

Currently, the potential for growth in green jobs within green building product suppliers is governed by the demand from geographic markets that extend far beyond the City of Vancouver. The global construction market as a whole is forecast to grow by over 70% between 2012 and 2025⁴⁶. The global green building industry totalled over \$553 billion in 2009 and is expected to grow by 10.8% annually through 2015. Assuming this growth rate continued for another 5 years, the total growth between 2015 and 2020 would equate to 50%. The outlook for Vancouver-based manufacturers is therefore, in theory, quite good. Particularly if they are large enough to access export markets and if recovery in the US continues.

For those companies that serve the Vancouver market, there are some potentially important developments that could bolster the transition of a number of traditional jobs to green jobs should local markets less positively than global expectations. However, it is unlikely that the effects of these developments will not be felt until after 2020.

For suppliers of wood products, the BC government, via the *BC Wood First* initiative, has invested in the development of a range of new products (such as Cross Laminated Timber, Laminated Veneer Lumber, etc.), practices (such as high-rise wood design), and approaches (such as pre-fabrication and pre-assembly that not only articulates BC wood as a low carbon material but will see the construction of innovative wood structures (an 18 storey project is in development at UBC) that will result in lowering the environmental footprint of buildings.

Currently, 38% of Canada's forests are certified under a 3rd party forestry management scheme. With the adoption of the latest versions of LEED, the selection of materials using life cycle assessment (LCA) will become increasingly common which will further drive the uptake of wood products to achieve sustainable building objectives.

⁴⁶ Global Construction 2025; Global Construction Perspectives and Oxford Economics (July 2013)

Further, as the City gets closer to its GCAP goals associated with building operations, the embodied environmental impacts of the materials employed to deliver projects will become increasingly important. Indeed, the City's Sustainability Group is familiar with the various impacts of materials choice on its climate goals.⁴⁷ The implementation of a carbon-based building policy which includes the impacts of materials on a life-cycle basis would be an important step on driving the transition of traditional manufacturing to green jobs in general, and those associated with wood product processing, assembly and installation in particular could be significant.

The construction industry is not only a major producer of waste materials (which provides a number of green jobs) but also has the potential to be a primary consumer of products derived from secondary materials. Efforts to manage the quality and reliability of products made from waste materials (such as recycled aggregates, gypsum, etc.), will result in the transition of regular manufacturing jobs to green jobs as industries move towards a circular economy of sustainable production and consumption. Metro Vancouver has initiated a Municipal Waste Research Collaborative to support major manufactures (wood and cement) in optimizing their products for a circular economy.

Policies which enable such waste products to be accepted and adopted by the construction industry (for example the use of product-labelling schemes) will encourage the transition of construction materials manufacturing jobs to green jobs. The overall environmental impact of materials will be reduced by the use of secondary materials and this information will be provided in Environmental Product Declarations (EPDs).

The concrete industry has also been innovating a range of new products such as Portland limestone cement (PLC) which reduces the carbon footprint of cement, the use of recycled aggregates and the increased proportion of supplementary cementing materials (SCMs). The gypsum industry is similarly developing a range of new products using "artificial gypsum".

As the VBBL transitions to Passivhaus-type projects, the value proposition for pre-assembly and pre-fabrication becomes increasingly compelling in order to deliver the air-tightness and thermal performance.

Equipment supplies are transitioning to green products quickly. For example, lighting manufacturers are shifting to LED, induction and other forms of energy efficient technologies as encouraged by BC Hydro. FortisBC is promoting high efficiency boilers and furnaces and on-demand hot water heaters. From 2000 to 2007, CANSIA estimated that the Canadian solar thermal market grew at an average annual rate of 16%. Assuming this rate continued, this is equivalent to a 5-year growth rate of 81%. In Canada, the ground source heat pump market has grown at a rate of 10-15% annually between 2000 and 2009 (a 5-year growth rate of between 45–75% (GeoExchange BC).

⁴⁷ Intep LLC, Brantwood Consulting et al. "Mid Rise Multi-Residential Buildings: Operating & Embodied Energy and Carbon Framework Plan for the City of Vancouver", 2012

NAICS Code	Intensity factor	
	2013 baseline	2020
Suppliers (Equipment and Materials)		
3141 Textile furnishings mills	0.11	0.22
3212 Veneer, plywood and engineered wood product manufacturing	0.50	0.70
3219 Prefabricated Home Manufacturing	0.50	0.70
3255 Paint, coating and adhesive manufacturing	0.11	0.22
3271 Clay product and refractory manufacturing	0.11	0.22
3273 Cement and concrete product manufacturing	0.11	0.22
3274 Lime and gypsum product manufacturing	0.11	0.22
3279 Other non-metallic mineral product manufacturing	0.11	0.22
3323 Architectural and structural manufacturing	0.11	0.22
3324 Boiler, tank and shipping container manufacturing	0.20	0.40
3334 Ventilation, heating, air-conditioning and commercial refrigeration equipment manufacturing	0.03	0.06
3351 Electric lighting equipment manufacturing	0.20	0.40
3353 Electrical equipment manufacturing	0.10	0.20
3359 Other electrical equipment and component manufacturing	0.20	0.40
3372 Office furniture (including fixtures) manufacturing	0.25	0.50
3379 Other furniture-related product manufacturing	0.11	0.22

Summary of assumptions

- The intensity factors for all green building supplier industries (i.e., the amount of time spent by existing workers on green building related products / equipment / materials) will increase by 100% on average by 2020 over the 2013 baseline (unless they were at a 50% intensity factor in 2013 already).
- Manufacturers and suppliers of wood-related products will transition to green jobs by 2020 on account of the sustainable management practices employed by BC wood product producers.

Appendix C: Overview of Top Job Generating Initiatives

Top Job Generating Initiatives Under the Base Case Scenario

Base Case Initiative 1: Vancouver Building Bylaw & Rezoning Regulations⁴⁸

- **Overview:** The current Vancouver Building Bylaw (VBBL) has adopted the 2012 British Columbia Building Code (based on the 2010 National Building Code of Canada) as the base document. In September 2013, City Council approved updates to the VBBL which required energy efficiency improvements as a permit condition for building renovations and directed staff to develop recommendations for City Council consideration on energy reporting requirements for larger buildings as part of a Building Retrofit Strategy. Current targets require that all new buildings constructed from 2020 onward to be carbon neutral in operations and a reduction of energy use and GHG emissions in existing buildings of 20% below 2007 levels by 2020.
- **Overall Responsibility:** City of Vancouver
- **Job Impact by Sector:** The VBBL has the potential to create nearly **7,000 transitional jobs** between 2010 and 2020 in the *Green Building Design and Construction* sector, as well as the *Clean Technology, Alternative Energy, and Green Building Products* sector.
- **Assumptions:** By 2020, the VBBL will continue to lead North America as a progressive building bylaw to the level that every building starting construction in Vancouver can be considered a “green” building in terms of its energy performance, water usage, and with respect to materials. It is assumed that by 2020:
 - All architects, engineers, and designers working on new buildings in Vancouver can be counted as green jobs (equal to approximately 35% of all those working in these occupations will be green jobs by 2020 based on work load specific to Vancouver).
 - Construction and trades will experience a lag time before they are working exclusively on green buildings and their skill sets catch up due to the delay between design and construction phases (equal to approximately 50% of relevant construction trades and occupations will be green jobs by 2020);
 - The intensity factors for all green building supplier industries (i.e., the amount of time spent by existing workers on green building related products / equipment / materials) will increase by 100% on average by 2020 over the 2013 baseline (unless they were at a 50% intensity factor in 2013 already).
 - Manufacturers and suppliers of wood-related products will transition to green jobs by 2020 on account of the sustainable management practices employed by BC wood product producers.

Base Case Initiative 2: Local Food Procurement

- **Overview:** The procurement of local food by not only the CoV and the Parks Board as part of its Sustainable Procurement policy but also by institutions in the region is a significant driver of growth for the local food sector.

⁴⁸ Link to CoV's webpage on the VBBL: <http://vancouver.ca/your-government/vancouver-building-bylaw.aspx>

Growing efforts by post-secondary institutions including UBC, the Greater Vancouver Food Bank Society, and the Vancouver School Board are impacting on local producers, processors, and suppliers. In addition, local establishments are increasingly adopting local food and beverage items to their menus in support of urban farms and a growing number of local micro-breweries and distilleries.

- **Overall Responsibility:** Shared between City of Vancouver and other organizations.
- **Job Impact by Sector:** The growth of local food procurement is expected to create approximately **2,600 transitional jobs** in Vancouver between 2010 and 2020, predominantly in the *Local Food* sector.
- **Assumptions:** The growth trends for local food procurement between 2010 and 2013 will continue to 2020. It is assumed that:
 - The procurement of local (BC-based) food will continue growing across government, institutions, and food / beverage establishments within Vancouver at approximately 1% CAGR.
 - BC-based micro-breweries and farms will supply their products to Vancouver-based restaurant and drinking establishments at a growing rate of approximately 1% CAGR.

Base Case Initiative 3: UBC-Broadway Corridor Rapid Transit Line⁴⁹

- **Overview:** The development of the UBC-Broadway Corridor Rapid Transit Line is a major component of the CoV's *Transportation 2040 Plan* and a significant priority of the Mayor's Council. It includes developing a SkyTrain line up to UBC, as well as some minor bus route upgrades. The UBC-Broadway Corridor is currently the busiest bus corridor in North America.
- **Overall Responsibility:** Translink, with proposed funding support from the federal, provincial, and municipal government.
- **Job Impact by Sector:** The Broadway Corridor Rapid Transit Line has the potential to create approximately **1,135 incremental jobs** in planning, design, engineering, manufacturing, educational services, community engagement, and operations / maintenance between 2014 and 2020, predominantly in the *Green Infrastructure, Transportation, and Planning* sector.⁵⁰
- **Assumptions:** WorkBC has included this major project (valued at approximately \$2.8 billion) into its occupational projections for the Mainland Southwest region to 2022 and it is therefore embedded in the "Base Case" scenario by default. It is assumed that:
 - Funding will be confirmed and construction will have started by 2018.
 - The capital cost for the rapid transit line project up to Arbutus Street (Phase 1) is estimated at approximately \$2 billion and will be completed by 2023 (equal to \$800 million by 2020).
 - Professional services and other green job-related activities tied to this project (e.g., engineering, planning, design, manufacturing, installation, stakeholder engagement, educational services, etc.) are estimated based on Statistics Canada's Input Output Industry Codes table for Engineering Construction (BS23C) and the relative percentage of these activities (equal to 21%) was multiplied by the total economic investment in Vancouver to 2020 related to this project, and then multiplied by a blended direct employment multiplier of 6.76 to estimate the green job impact.

⁴⁹ Link to CoV's webpage on Broadway SkyTrain extension: <http://vancouver.ca/streets-transportation/ubc-line-rapid-transit-study.aspx>

⁵⁰ Note that construction jobs for the rapid transit line project are temporary in nature and, as such, are not included in the final job total within the Base Case scenario, although the project is considered in terms of the overall growth rates for key occupations by WorkBC.

Top Job Generating Incremental Initiatives Under CoV Control

CoV Incremental Initiative 1: Sewer Separation Strategy⁵¹

- **Overview:** The Sewer Separation Strategy involves engineering design / construction projects that are ongoing to 2040. The initial focus has been on False Creek area but it is now shifting to the Fraser River area. The work includes extensive amounts of detailed design and construction work with an annual capital expenditures budget of approximately \$30 million.
- **Overall Responsibility:** City of Vancouver
- **Job Impact by Sector:** It is estimated that ongoing work related to the Sewer Separation Strategy will create approximately **397 incremental jobs** in planning, design, engineering, manufacturing, educational services, and stakeholder engagement between 2013 and 2020, predominantly in the *Green Infrastructure, Transportation, and Planning* sector.
- **Assumptions:** It is assumed that:
 - The \$27.5 million annual capital budget from the CoV will continue to 2020.
 - The annual operational / staffing budget is approximately \$9.8 million and this will continue to 2020.
 - Federal government funding support to this work is approximately \$5 million per year and will continue to 2020.
 - Professional services and other green job-related activities tied to this project (e.g., engineering, planning, design, manufacturing, installation, stakeholder engagement, educational services, etc.) are estimated based on Statistics Canada's Input Output Industry Codes table for Engineering Construction (BS23C) and the relative percentage of these activities (equal to 21%) was multiplied by the total economic investment in Vancouver to 2020 related to this project, and then multiplied by a blended direct employment multiplier of 6.76 to estimate the green job impact.

CoV Incremental Initiative 2: Legacy Steam Heat System Conversion Program

- **Overview:** The Legacy Steam Heat System Conversion initiative is a component of the CoV's *Neighbourhood Energy Strategy* which includes conversion of existing natural gas legacy steam infrastructure to wood waste biomass in (1) downtown core (Central Heat) and related projects, as well as (2) systems shared between Vancouver General Hospital and BC Women's / Children's hospital. There is currently lots of work in the planning / feasibility stages under way and \$10M million for the expansion of the energy centre and new infrastructure to connect 10 to 15 new buildings in the Southeast False Creek Neighbourhood Energy Utility in the CoV's next Capital Plan (2015-2018). The total capital costs required for the downtown core and VGH / Women's hospitals conversion projects is in the range of \$300-\$400M, mostly in construction / engineering related jobs, as well as a handful related to supply chain for system design, energy supply, and ongoing operations / maintenance.
- **Overall Responsibility:** Creative Energy with support from City of Vancouver

⁵¹ Link to CoV's webpage on its sewer separation work: <http://vancouver.ca/home-property-development/separating-sewage-from-rainwater.aspx>

- **Job Impact by Sector:** It is estimated that the conversion of the CoV's legacy steam heat systems will create approximately **378 incremental jobs** in planning, design, engineering, manufacturing, installation, educational services, community engagement, and operations / maintenance between 2014 and 2020, predominantly in the *Green Infrastructure, Transportation, and Planning* sector and to lesser degrees in the *Clean Technology, Alternative Energy, and Green Building Products* as well as the *Green Building Design and Construction* sectors.
- **Assumptions:** It is assumed that:
 - The conversion projects will require approximately \$200 million in capital expenditures between 2015 and 2020, broken out annually as \$33 million / year.
 - The conversion projects will be "green" in nature in that they will be replacing natural gas with lower carbon fuel sources (e.g., wood waste).
 - Professional services and other green job-related activities tied to this project (e.g., engineering, planning, design, manufacturing, installation, stakeholder engagement, educational services, etc.) are estimated based on Statistics Canada's Input Output Industry Codes table for Engineering Construction (BS23C) and the relative percentage of these activities (equal to 21%) was multiplied by the total economic investment in Vancouver to 2020 related to this project, and then multiplied by a blended direct employment multiplier of 6.76 to estimate the green job impact.

CoV Incremental Initiative 3: MURB Retrofit Program

- **Overview:** A component of the *Energy Retrofit Strategy for Existing Buildings* and the *VBBL*, the current Green Landlords program was funded in part by FortisBC, Vancity, and the CoV and focuses on high-efficiency boiler and furnace replacements in multi-unit residential buildings (MURBS) in Vancouver. The current program is working with owners of residential rental buildings (landlords) to upgrade natural gas heating / hot water systems and has the potential to be expanded to condo owners in the future. There are currently 5,750 MURBs in CoV of which, about 725 account for 64% of the floor space.
- **Overall Responsibility:** Utilities with support from City of Vancouver and Vancity
- **Job Impact by Sector:** It is estimated that an expansion of the current MURBS retrofit program will create approximately **313 incremental jobs** between 2014 and 2020, predominantly in the *Green Building Design and Construction* sector and to lesser degrees in the *Clean Technology, Alternative Energy, and Green Building Products* as well as the *Sustainability Services and Education* sectors.
- **Assumptions:** Based on discussions with the CoV and the current Green Landlords program administrator, it is assumed that:
 - Proponents successfully scale up the program in order to retrofit on average 50 MURB buildings per year in Vancouver between 2015 and 2020.
 - The cost to run such a program is in the range of \$500,000 (based on average program cost of \$10,000 / property), generating approximately \$5 million in economic investment in equipment and capital expenditures (not including energy savings, which can add substantially to the economic benefits and indirect / induced job potential).

CoV Incremental Initiative 4: Urban Forest Strategy⁵²

- **Overview:** The Urban Forest Strategy started in 2011 as a priority item under GCAP and was supported through motions approved by the Park Board and Council in 2012. In April 2014, Council voted to approve the Strategy, which included an update to the Protection of Trees Bylaw. The Strategy includes plans to plant 150,000 trees by 2020 by planting in City parks and streets, as well as on private property through its innovative TreeKeepers program. Approximately \$6.8 million has been earmarked in the CoV's next Capital Plan Budget (2015-2018) for the Urban Forest Strategy (planting, maintenance, and education).
- **Overall Responsibility:** City of Vancouver (Parks Board)
- **Job Impact by Sector:** It is estimated that investments by the CoV in its Urban Forest Strategy related programs will create approximately **115 incremental jobs** between 2014 and 2020, predominantly in the *Sustainability Services and Education* sector and, to a lesser degree, in the *Local Food* sector due to the planting and maintenance of fruit trees.
- **Assumptions:** It is assumed that:
 - The CoV will invest approximately \$1.375 million / year in capital between 2014-2020 to its Urban Forest Strategy programs.
 - Parks Board staff operational budgets related to implementing the Urban Forest Strategy are equal to approximately \$960,000 / year (12 FTE staff at \$80K / year on average).
 - Between 25%-30% of the total annual capital expenditure is lost to nurseries outside of Vancouver boundaries.

CoV Incremental Initiative 5: Vancouver Building Bylaw + Green Demolition Bylaw⁵³

- **Overview:** The current Vancouver Building Bylaw (VBBL) has adopted the 2012 British Columbia Building Code (based on the 2010 National Building Code of Canada) as the base document. In September 2013, City Council approved updates to the VBBL which required energy efficiency improvements as a permit condition for building renovations and directed staff to develop recommendations for City Council consideration on energy reporting requirements for larger buildings as part of a Building Retrofit Strategy. Current targets require that all new buildings constructed from 2020 onward to be carbon neutral in operations and a reduction of energy use and GHG emissions in existing buildings of 20% below 2007 levels by 2020.

Pre-1940 built homes must recycle or reuse a minimum of 75% of the waste they generate, the biggest impact will be the quantity of wood waste that gets recycled. On average, 3 homes are demolished in Vancouver every day, with 1/3 (33%) being pre-1940s. Demolition permits are only issued when there is commitment (i.e., building permit) for new construction. Job growth may occur when linked to building renovation / retrofits (especially for MURBs), through the creation of new products from materials, new social ventures, and in the supply chain to support neighbourhood energy conversion projects.

- **Overall Responsibility:** City of Vancouver

⁵² Link to CoV's webpage on its Urban Forest Strategy: <http://vancouver.ca/home-property-development/urban-forest-strategy.aspx>

⁵³ Link to CoV's webpage on its Urban Forest Strategy: <http://vancouver.ca/home-property-development/urban-forest-strategy.aspx>

- **Job Impact by Sector:** It is estimated that the VBBL and the CoV's Green Demolition Bylaw will create approximately **107 incremental jobs** between 2014 and 2020, predominantly in the *Sustainability Services and Education* sector and, to a lesser degree, in the *Green Building and Construction* and the *Materials Management and Recycling* sectors.
- **Assumptions:** It is assumed that:
 - Approximately 10 new energy advisory / modeling related green jobs per year will be added in Vancouver between 2015 and 2020 as a result of progressive updates / amendments to VBBL.
 - The level of homes being demolished / deconstructed under this Vancouver bylaw will average 1 per day to 2020 (equal to approximately 365 per year).
 - Demolition costs range between \$8,000-\$15,000 per project in Vancouver and the incremental cost to recycle 75% of the demolition waste is in the order of 15%-25% of the overall cost of the demolition project, equal to \$1,200-\$3,750.
 - The additional cost to deconstruct a house as per the demolition waste recycling regulation will add an additional approximately \$2,500 in incremental costs to the demolition work (primarily in terms of increased time required). These costs will be carried by the property owner as fees paid to the demolition contractor / general contractor.

CoV Incremental Initiative 6: Active Transportation Corridors⁵⁴

- **Overview:** The CoV's "Active Transportation Corridors" are a component of the *Transportation 2040 Plan* related to walking and cycling infrastructure upgrades, including new and refurbished sidewalks, cycling routes and signals, new walkways on False Creek Bridges, and public spaces. Approximately \$24 million has been earmarked in the CoV's next Capital Plan Budget (2015-2018) for walking and cycling infrastructure. This will include a plan and phasing for the 3 False Creek bridges for pedestrian and protected bike lane improvements, equal to \$6 million per year over that four year period. The CoV primarily provides these investments through Development Cost Levies (DCL) and Community Amenity Contributions (CAC).
- **Overall Responsibility:** City of Vancouver
- **Job Impact by Sector:** It is estimated that investments by the CoV in its Active Transportation Corridors will create approximately **65 incremental jobs** in planning, design, engineering, manufacturing, educational services, community engagement, and operations / maintenance between 2015 and 2020, predominantly in the *Green Infrastructure, Transportation, and Planning* sector, as well as the *Sustainability Services and Education* sector to a lesser degree.
- **Assumptions:** It is assumed that:
 - It is anticipated that future capital plans would have similar investments in active transportation corridor infrastructure upgrades, equal to approximately \$6 million / year between 2014-2020.
 - Professional services and other green job-related activities tied to this project (e.g., engineering, planning, design, manufacturing, installation, stakeholder engagement, educational services, etc.) are estimated based on Statistics Canada's Input Output Industry Codes table for Engineering Construction (BS23C) and the relative percentage of these activities (equal to 21%) was multiplied by the total economic investment in Vancouver to 2020 related to this project, and then multiplied by a blended direct employment multiplier of 6.76 to estimate the green job impact.

⁵⁴ Link to CoV's bulletin its Green Demolition Bylaw: <http://former.vancouver.ca/commsvcs/Bylaws/bulletin/D008.pdf>

Top Job Generating Incremental Initiatives Under VEC Control

VEC Incremental Initiative 1: Industry / Business Hubs

- **Overview:** Numerous “industrial / business hubs” are either in operation or proposed for the False Creek Flats light industrial area / Green Enterprise Zone (e.g., greenHUB, Scene Shop, Food hub, Textile hub, etc.). Growth of these hubs in the GEZ will result from increased collaborative opportunities in closed loop, re-purposing, and remanufacturing opportunities based on materials collected and processed at the various hubs. The collaborative, co-location model with recycling materials is expected to nurture spin-off innovations in materials recovery, re-manufacturing and closed loop production.
- **Overall Responsibility:** Various private / non-profit organizations with support from City of Vancouver and the Vancouver Economic Commission
- **Job Impact by Sector:** It is estimated that growth and expansion of the various industry / business hubs in the CoV, particularly in the Green Enterprise Zone, will create approximately **280 incremental jobs** between 2014 and 2020 across all seven green and local food sectors.
- **Assumptions:** Based on discussions with the CoV and various hub operators / business owners, it is assumed that:
 - 5 hubs will exist in Vancouver by 2015 with an average of 40 FTE jobs each.
 - Employment within these 5 hubs will grow by 100% (i.e., double) by 2020 through policy-regulatory drivers, collaborative synergies, new business ventures, and support from VEC / CoV.

VEC Incremental Initiative 2: Business / Trade Missions

- **Overview:** The VEC / CoV runs one major outbound trade / business mission per year, with additional smaller trips to events on an annual basis. The VEC organized outbound delegations to Shanghai in 2010, London in 2012, China in 2013 (CCCA; Mayor’s program), and to the US in 2014 (CleanTech Forum; VERGE). In addition, the VEC brings international delegations to the City to facilitate match-making and broker business deals. In 2010, the VEC worked with others in the Metro Vancouver region to organize a successful Business Program surrounding the 2010 Winter Olympics.⁵⁵
- **Overall Responsibility:** Vancouver Economic Commission
- **Job Impact by Sector:** It is estimated that Business / Trade Missions (both outbound and inbound) will create approximately **234 incremental jobs** between 2013 and 2020 across all seven green and local food sectors.

⁵⁵ A PwC economic impact report estimated that approximately \$170 million in foreign direct investment was generated in the first year following the 2010 Olympic Business Program’s wrap-up.

- **Assumptions:** It is assumed that:
 - For outbound business missions, \$5M in total direct new deals for Vancouver companies is generated per outbound mission (X 1 trip per year). In addition, an average of 5-10 MoUs are signed with Vancouver companies per outbound mission, equal to \$5M / year in future revenues. Of the \$10M in deals per year for Vancouver companies, 50% can be attributed to green / local food related companies.
 - Foreign direct investment in Vancouver related to inbound trade missions is equal to \$3.92M per year of which, 50% can be attributed to green and local food sectors (based on results of 2010 Business Program economic impact assessment which showed the \$1.54M program returned \$111 to the Metro Vancouver region for every \$1 spent and assuming that average years are 25% as effective as the 2010 program in terms of the leverage ratio for the VEC).

VEC Incremental Initiative 3: Green and Digital Demonstration Program⁵⁶

- **Overview:** The Green and Digital Demonstration Program (GDDP) provides support to entrepreneurs and start-ups in Vancouver's clean technology and digital sectors. Participants in the program are given the opportunity to gain temporary access to City-owned assets (e.g. buildings, streets or vehicles) for technology demonstrations and proof-of-concept trials. The VEC received support from Council in July 2014 to deliver the GDDP and plans to align it with the existing Digital Strategy and utilize digital infrastructure for smart city / greenest city outcomes. The program is intended to accelerate job growth and help companies with the commercialization process with a significant focus on media and potential customer exposure for successful projects.
- **Overall Responsibility:** Vancouver Economic Commission
- **Job Impact by Sector:** It is estimated that the VEC's GDDP will create approximately **144 incremental jobs** between 2015 and 2020, predominantly in the *Clean Technology, Alternative Energy, and Green Building Products* sector.
- **Assumptions:** Based on secondary and primary research to examine the impact of similar demonstration programs in North America and Europe, it is assumed that:
 - Approximately 3 FTE jobs are created per company with a demonstration product as a direct result their involvement in the GDDP.
 - Eight new companies per year will demonstrate their technology as part of the GDDP, starting in 2015 through to 2020.

⁵⁶ Link to VEC's webpage on the GDDP: <http://www.vancouvereconomic.com/page/green-and-digital-demonstration-program-gddp>

VEC Incremental Initiative 4: Vancouver Technology Incubation Centre

- **Overview:** The VEC has partnered with Vancity to deliver incubation and acceleration business development services for early-stage technology and social innovation companies. These services will be delivered within a building owned by the CoV located at 312 Main Street in downtown Vancouver (with approximately 100,000 square feet) by various program delivery partners (yet to be confirmed).
- **Overall Responsibility:** Vancouver Economic Commission
- **Job Impact by Sector:** It is estimated that the Vancouver Technology Incubation Centre will create approximately **319 incremental jobs** between 2015 and 2020, predominantly in the *Clean Technology, Alternative Energy, and Green Building Products* as well as the *Sustainability Services and Education* sectors.
- **Assumptions:** Based on secondary and primary research to examine the impact of similar business accelerator / incubator programs in North America, it is assumed that:
 - Six program delivery partners will each engage with 15 companies based out of the Technology Incubation Centre, equal to 90 companies engaged in the various programs per year.
 - The average company engaged in the programs offered at the Technology Incubation Centre will create approximately 2 incremental job per year.
 - A leverage ratio will be approximately \$4.80 for every \$1 of program spend.
 - The total program spend will be approximately \$3.2 million per year.
 - 50% of companies based out of the Technology Incubation Centre will be related to the green and local food sectors.

Top Job Generating Incremental Initiatives Under External Control

External Incremental Initiative 1: Regional Ban on Organics

- **Overview:** With the Metro Vancouver region's upcoming ban on the disposal of compostable organics in 2015 and the CoV's requirement that all businesses and properties have a food scraps diversion plan in place, there is considerable opportunity for growth in business ventures and jobs within the private sector related to the approximately 4,000 multi-family and 7,200 ICI properties who may require some type of food scraps diversion service, whether it be an onsite system or a collection service.
- **Overall Responsibility:** Metro Vancouver with support from City of Vancouver
- **Job Impact by Sector:** It is estimated that Metro Vancouver's regional ban on organics will create approximately **448 incremental jobs** by 2020, predominantly in the *Materials Management and Recycling* sector and to lesser degrees in the *Sustainability Services and Education*, the *Local Food*, and the *Clean Technology, Alternative Energy, and Green Building Products* sectors.
- **Assumptions:** Private sector currently offers food scrap collection and is expanding its infrastructure to cover the buildings not covered by the CoV within the city's boundaries. It is assumed that:
 - For every 50 MURB / ICI properties that are now serviced in Vancouver per week as a result of the regional ban on organics results in 2 new jobs created.
 - 11,200 new MURB and ICI properties within Vancouver will require organics collection and/or support resulting in approximately 224 new jobs created per year over the first 2 years of the regulation's implementation (2015-2016).

External Incremental Initiative 2: EPR & Recycling Programs

- **Overview:** Under the current recycling regulation, the BC Government requires producers of tires, electronics, and beverage containers to provide extended producer responsibility (EPR) for the lifecycle management of their products, including collection and recycling. The program recently expanded to include printed paper and packaging and construction and demolition materials. Furniture, textiles, carpet, and appliances are expected to be included as part of the Ministry of Environment's EPR Service Plan within next 5-10 years. Multi-Material BC (MMBC) will be responsible for province-wide packaging and printed paper collection and recycling. The CoV entered into an agreement with MMBC and will continue recycling collection services curbside as well as apartments and strata complexes.

New markets are opening up for the recycling products now being collected under the printed paper and packaging EPR program. Further growth in businesses and jobs will come from those involved with collecting and recycling hard to manage items such as mattresses, carpet, and furniture when these EPR regulations take effect. Metro Vancouver and CoV have asked for quicker startup of some of these EPR programs but it will depend somewhat on the provincial government's willingness to support this. While the CoV does not have direct control over these regulations, it can continue to apply pressure for having these programs start sooner.
- **Overall Responsibility:** Province of BC (Ministry of Environment), with support from MMBC, Metro Vancouver, and City of Vancouver

- **Job Impact by Sector:** It is estimated that incoming EPR and recycling initiatives will create approximately **247 incremental jobs** by 2020, predominantly in the *Materials Management and Recycling* sector and to lesser degrees in the *Sustainability Services and Education* and the *Clean Technology, Alternative Energy, and Green Building Products* sectors.
- **Assumptions:** It is assumed that:
 - The CoV's residential recycling collection programs will grow at approximately 1% per year between 2014 and 2020, growing the number of jobs for collection and recycling material distributors within Vancouver by approximately 7% by 2020 over total jobs in this sector in 2013.
 - The quantity of materials for recycling (not including items collected through residential programs) will grow by approximately 50% by 2020 over 2013 due to expanded EPR programs, growing the number of jobs for collection and recycling material distributors within Vancouver by an additional 30% by 2020 over total jobs in this sector in 2013.

External Incremental Initiative 3: National Industrial Symbiosis Program (Metro Vancouver Pilot)⁵⁷
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- **Overview:** Light House and One Earth will implement a 3-year pilot program National Industrial Symbiosis Program (NISP) Canada, initially operating in the Metro Vancouver region and will apply the successful NISP-England model. Estimates by founder of NISP puts the cost of a successful Metro Vancouver regional program at approximately \$500,000 with an economic return of \$15 million for the region (based on UK model multipliers). The CoV / VEC has the potential to leverage this successful program to grow the collaborative opportunities for businesses within the CoV in locations such as the proposed Green Enterprise Zone in False Creek Flats.
- **Overall Responsibility:** Light House Sustainable Building Centre with support from One Earth and Metro Vancouver
- **Job Impact by Sector:** It is estimated that the NISP-Canada Pilot in Metro Vancouver will create approximately **85 incremental jobs** for the CoV between 2015 and 2020 across all seven green and local food sectors.
- **Assumptions:** Based on discussions with the founder of the NISP program who has successfully run the program in more than 20 countries to date, it is assumed that:
 - The leverage ratios / economic multipliers for the UK model are similar to those that will exist for the Metro Vancouver region.
 - Approximately 25% of the economic benefits for the Metro Vancouver based program will be realized by companies located within the CoV.
 - The program's economic benefits will be realized within the first 6-12 months after program start-up in 2016 and will continue to be realized while the program is in operation.

⁵⁷ Link to the NISP-Canada website: <http://nispcanada.com/>

Appendix D: Summary of International “Best Practice” Initiatives

BUILDING CODE REQUIREMENTS / STANDARDS

Zurich, Switzerland

Best in Class

[Zurich's 2000-Watt Society](#)

Ten years ago, the vision of a "2000-Watt Society" was developed at the Swiss Federal Institute of Technology (ETH) in Zürich. It is a model for energy policy which demonstrates how it is possible to consume only as much energy as worldwide energy reserves permit and which is justifiable in terms of the impact on the environment. It is possible when every person in every society limits their energy consumption to a maximum of 2000 watts. Almost all new constructions such as housing estates, school buildings and retirement homes, correspond to the Minergie Standard (for low-energy housing). Buildings in Switzerland are, on average, 90 percent more efficient than in Vancouver. In addition, all solid waste is diverted from landfills, going either to waste-to-energy solutions or into the production of secondary materials.

Oslo, Norway

Top Program

[Municipal PassivHaus Standard](#)

Oslo City Council set a standard that by 2014, all new municipal buildings must be in the Passivhaus standard or equivalent.

BUILDING RETROFIT PROGRAMS

New York, NY

Best in Class

[PlaNYC & GGBP / One City Built to Last](#)

Since 2007, New York City has been addressing energy efficiency and other environmental challenges through PlaNYC, the city's comprehensive long-term sustainability strategy. PlaNYC includes the Greener, Greater Buildings Plan (GGBP), the most far-reaching energy efficiency legislation in the US, which promotes efficiency through stronger energy codes, while mandating benchmarking, energy audits, and retro-commissioning.

The GGBP targets energy efficiency in existing buildings over 50,000 sq ft (4,645 sq metres). The Plan, which was enacted in 2009, includes a new energy code for New York City; a requirement that large buildings annually benchmark their energy performance; that every ten years these buildings conduct an energy audit and perform retro-commissioning; and that by 2025, the lighting in the non-residential space be upgraded to meet code and large commercial tenants be provided with sub-meters. The GGBP is designed to ensure that information about energy is provided to decision-makers and that the most cost effective energy efficiency measures are pursued. The GGBP is expected to reduce GHG emissions by almost 5 per cent. By 2030, the GGBP is projected to generate over \$7 billion in net savings.

In 2014, the NYC released a new plan and roadmap called One City Built to Last which sets an 80% GHG reduction target by 2050 and is leading to new programs and inter-departmental goals / methods largely focused on built environment and retrofits.

Copenhagen, Denmark

Top Program

[Copenhagen's CPH 2025 Climate Plan \(2012\)](#)

Copenhagen has a Plan to achieve carbon neutrality by 2025. Approximately US \$37-46 billion of private investment is expected in the broad categories of energy production, energy consumption, and mobility up to 2025, irrespective of Copenhagen's policy choices. The carbon-neutral plan is expected to yield an additional US \$3.7-4.6 billion and US \$0.5 billion respectively from the private sector and municipal government. This added investment includes approximately \$10 billion for energy efficiency retrofits.

ECO-DISTRICT DEVELOPMENT

Copenhagen, Denmark

Best in Class

[Nordhavn](#)

Nordhavn is a major urban development underway to be a leading model for integrated urban design and a test bed of green innovation (including energy storage, smart grid, and efficient building technologies).

Portland, OR

Top Program

[Portland Eco-District](#)

EcoDistricts (formerly Portland Sustainability Institute, PoSI) in partnership with the City of Portland, launched the EcoDistricts initiative, a comprehensive enabling strategy to accelerate neighborhood-scale sustainability that integrates building and infrastructure projects with community and individual action. An EcoDistrict is a neighborhood or district with a broad commitment to accelerate neighborhood-scale sustainability where members commit to achieving ambitious performance goals, guide district investment and community action, and track their results over time. The five pilot EcoDistricts in Portland include Lents, Gateway, South Waterfront, Lloyd District, and South of Market.

CLEANTECH CLUSTER DEVELOPMENT

Copenhagen, Denmark

Best in Class

[CLEAN / Copenhagen Cleantech Cluster](#)

CLEAN is a recent merger between the Copenhagen Cleantech Cluster (CCC) and Lean Energy Cluster. CCC was launched in 2009 by Danish cleantech companies, research institutions, and public organizations with US\$26 million in seed funding from Capital Region of Denmark, Region Zealand, and the European Union Structural and Cohesion Funds. Goals include the creation of 1,000 new jobs in the cleantech sector (which it has surpassed); attracting 25 foreign companies to the cluster; and facilitating the growth of 25 cleantech entrepreneurs. It also works to promote collaboration between public, research and private partners, and foster innovation in procurement.

To support its international focus, the CCC has co-founded and manages the International Cleantech Network. This is an international collaborative platform involving 13 cleantech cluster organizations in Europe, North America, and Asia. CCS' mission is to support Danish companies in bringing their clean technology solutions to city projects around the world. Its approach is to look at integrated solutions to problems associated with urbanization and high population growth, particularly in emerging economies. Thus it seeks to leverage Danish competencies and technologies in areas such as water systems, wind energy, smart grids, smart city solutions, and waste disposal systems and to promote collaboration in these areas.

Helsinki, Finland

Top Program

[Nordic Innovation Accelerator](#)

The Nordic Innovation Accelerator will relay challenges posted by Veolia Environnement (and other partners in the future) to the Acceleration members. Members are invited to submit solutions. Each submitted solution will be evaluated and in the end, selected applicants will get invited to interviews and negotiations by the challenge owner. This approach gives Acceleration members direct links to offer their solutions to the right person at the corporate level and will ensure a response in a timely manner. The Nordic Innovation Accelerator team guides members along the way and provides additional support.

Portland, OR

Top Program

[PDC Strategy Cleantech Cluster](#)

The Portland Development Commission (PDC) has researched best practices of supporting successful clusters, and has adopted a framework as a guide to implementing its cluster plan for clean technology using a six-point framework.

INCUBATOR / ACCELERATOR PROGRAMS

Boston, MA <i>Best in Class</i>	<u>MassChallenge</u> MassChallenge is the world's largest startup competition and accelerator program. Primary activities include running an annual global accelerator program and startup competition, documenting and organizing key resources, and organizing training and networking events.
London, England <i>Top Program</i>	<u>SETsquared</u> The SETsquared Partnership is the enterprise collaboration between five leading research-intensive universities that operate five business accelerator centres: Bath, Bristol, Exeter, Southampton, and Surrey. Established in 2003 and funded by the Higher Education Innovation Fund (HEIF), the Partnership is a focus for enterprise activity and new business creation for the five university partners. In 2012, SETsquared helped companies raise £34 million.
Toronto, ON <i>Top Program</i>	<u>MaRS Cleantech</u> MaRS Cleantech considers itself an “incubator on steroids” and is the largest cleantech incubator in Canada, currently made up of 160 companies with sales in 40 countries. In 2013, it raised \$112 million in capital, \$82 million in revenues, and created over 300 jobs. MaRS consists of Cleantech Venture Services, ArcTern Ventures, and the Advanced Energy Centre that works closely with industry and OEM partners including Siemens and Hydro 1.
Helsinki, Finland <i>Top Program</i>	<u>Startup Sauna</u> Startup Sauna began in 2012 through 57 serial entrepreneurs and investors. Its a co-working space is the meeting point for aspiring entrepreneurs in Northern Europe. The 1,500 square meter industry hall is open for everybody to work in – no membership or previous ties to Startup Sauna are required. Involved with running a 5-week accelerator program for the most promising start-ups, Slush conference for startups and investors, and Startup Life internship program sending students /graduates to startup the best startups around the world.

DEMONSTRATION PROGRAMS

Copenhagen, Denmark <i>Best in Class</i>	<u>Copenhagen Demonstration Project Program</u> Program has a big focus on smart cities and integrating technology to solve municipal management problems, improve quality of life, and meet carbon / climate targets. Projects include a smart lighting demonstration project (see link) and a solar demonstration site in Valby, one of Copenhagen's 10 districts.
San Jose, CA <i>Top Program</i>	<u>ProspectSV</u> San Jose launched Prospect Silicon Valley to promote new business formation and job creation in cleantech. The program will support entrepreneurs, startups, and others through the demonstration of cleantech solutions that can help San Jose and other cities in solving environmental issues.
New York, NY <i>Top Program</i>	<u>Smart Grid Demo at Brooklyn Army Terminal</u> The project was launched in 2014 in a historical building. The 4 million sq ft facility is managed by NYCEDC and contains a variety of light industrial companies. NYCEDC have run a number of tours from public and private sector to visit installation and the project is allowing for the sharing across departments and sectors to explore incentive structures and address challenges related to building code. The technologies featured in the project come from all over although opportunities exist for local companies on the software side to build on top of the equipment and technology.

SMART CITY INITIATIVES

Amsterdam, Netherlands*Best in Class***Amsterdam Smart City Initiative**

A partnership between business, authorities, research institutions, and the public. 685 projects in 5 themes (Living, Working, Mobility, Public Facilities, Open Data). Amsterdam Smart City (ASC) is a unique partnership between businesses, authorities, research institutions and the people of Amsterdam to develop the Amsterdam Metropolitan Area into a smart city through: Open Platform; Testing; Urban Living Lab

Amsterdam Smart City was initiated by the Amsterdam Economic Board, the City of Amsterdam, Liander and KPN. It has grown into a broad platform, with more than 70 partners that are involved in a variety of projects focusing on energy transition and open connectivity. ASC is all about the total sum of testing innovative products and services, understanding the behaviour of the residents and users of the Amsterdam Metropolitan Area and sustainable economic investments. The ultimate goal of all activities is to contribute positively towards achieving CO2 emission targets, as well as aiding the economic development of the Amsterdam Metropolitan Area.

Bristol, England*Top Program***Bristol Smart City Lab**

Bristol is considered the UK's 'smartest city' and has the strongest creative industries sector of any large urban area in the UK excluding London. As part of a £75m joint experiment carried out by the city council and the University of Bristol, the old Rediffusion infrastructure, which runs for 100 miles under the streets, is being fitted out with superfast, high-capacity fibre funded under the government's super-connected cities program.

TRANSIT / CYCLING INFRASTRUCTURE INITIATIVES

Copenhagen, Denmark*Best in Class***Green Urban Mobility**

Includes land-use and transport policy, density and mixed-use standards, parking regulations, road investment and cycling infrastructure; Also includes a Bicycle Strategy (2011-2025) and an Action Plan for Green Mobility that features- 25 selected initiatives.

Portland, OR*Top Program***Portland's Bicycle Plan for 2030**

The Portland Bicycle Plan for 2030 was adopted unanimously by Portland's City Council on February 11, 2010. Key principles of the Portland Bicycle Plan for 2030 include a focus on attracting new riders; strengthening bicycle policies; forming a denser bikeway network; increasing bicycle parking; expanding programs to support bicycling; and increasing funding for bicycle facilities.

ZERO WASTE / RESOURCE RECOVERY INITIATIVES

San Francisco, CA

Best in Class

[San Francisco Zero Waste Program](#)

San Francisco has a world-class zero waste program. The City's 3 bin system, policies, financial incentives, and extensive outreach to residents and businesses, helped San Francisco achieve the highest diversion rate of any major city in North America. San Francisco diverts 80% (1,593,830 tons diverted in 2010) of its discards from the landfill.

The Department of the Environment has a green jobs program that employs local residents from the city's diverse communities, who educate and inform residents and businesses about zero waste and Department of the Environment programs.

London, England (Regional)

Top Program

[National Industrial Symbiosis Program \(NISP\)](#)

NISP is a successful and proven 'engagement' model with industry in multiple countries. It's a business-led program that engages key industry players from day one from the inside (with management, C-suite, etc.) so gets greater buy-in than an 'inside-out' model that brings in a consultant to make recommendations that often aren't implemented. Total investment for the NISP England program (April 2005-March 2013) was 40 million Euros. Verified economic benefits included 10,000+ jobs created, 1.17 billion Euros in additional sales, and 1.21 billion Euros in cost savings.

Chicago, IL

Top Program

[Chicago's Waste to Profit Network](#)

The City of Chicago re-launched its award winning network in 2014 with a re-organized structure geared for sustainable growth. The US Business Council for Sustainable Development brings a nation-wide approach to the previously regional model, as well as custom developed and proven technology to support data collection, analysis, reporting, and project collaboration.

GREEN / SUSTAINABLE PROCURMENT

Copenhagen, Denmark

Best in Class

[Copenhagen's Green Public Procurement](#)

Adopted by City Council in 2011 and is at the heart of Copenhagen's purchasing strategy (City spends US \$1.6 billion annually). Aiming to procure 90% organic food by 2015 (already procures more than 75% organic due to the 2012 target).

In addition, the Danish Ministry of the Environment and Denmark's three largest municipalities (Copenhagen, Aarhus, and Odense) entered into the Partnership for Green Public Procurement in 2006. Since then, other municipalities have joined the partnership. It now includes Copenhagen, Aarhus, Odense, Herning, Egedal, and Sønderborg municipalities as well as the Ministry of the Environment. The Danish municipalities are responsible for the majority – approximately two thirds – of public procurement. As authority bodies close to the Danish public, municipalities are well placed to lead the way in buying the most environmentally-friendly products.

Portland, OR

Top Program

[Portland Sustainable Procurement Policy](#)

This policy was passed in 2004, years ahead of most other cities. Portland has a long track record and experience. Multi-faceted program includes training, specifications for numerous products programs, online tools and resources and dedicated staff. Approach has been customized according to product in question.

CLIMATE ADAPTATION & RESILIENCY INFRASTRUCTURE

Copenhagen, Denmark <i>Best in Class</i>	<u>Copenhagen's Climate Adaptation Plan & Cloudburst Management Plan</u> A new city-wide Adaptation Program will start in early 2015 with projected investments of up to US \$1.4 billion over the next 20 years. This will create an anticipated 13,000-15,000 new jobs, primarily in the construction and planning phases. Investment will come from taxpayers in Copenhagen, primarily through water taxes which will go up slightly over the next 20 years to pay for this adaptation infrastructure investment. In addition, the Cloudburst Plan outlines green / blue infrastructure required to manage and retain increasing stormwater flows. Total required investment from 2013-2033 is estimated at US\$0.7 billion.
Washington, DC <i>Top Program</i>	<u>Green Roof Program</u> Washington, DC, is the US leader in green roof implementation as measured by square meters of installed green roofs. The 2013-2014 incentive program ended in August 2014. This program provided a green roof rebate base funding of \$7 per square feet and up to \$10 per square foot in targeted sub-watersheds. No cap on the size of projects eligible for the rebate. Properties of all sizes including residential, commercial and institutional could apply.
New York, NY <i>Top Program</i>	<u>Resiliency Innovations for a Stronger Economy (RISE): NYC Program</u> New York City received several tranches of federal funding (community development block grants) after Hurricane Sandy, equal to approximately \$3 billion. The funding is for making infrastructure improvements and make repairs to homes and business. \$30 million was set aside to stimulate innovation in the area of 'resiliency' and bring in technologies to help in this area. NYCEDC is currently evaluating 27 projects as finalists that may be funded to go forward – will announce winners later in 2014 / early 2015. The idea is to get new technology demonstrated in NYC within small businesses to show resiliency – looking at technologies that are scalable and have real market demand in New York state. The program may be replicated or expanded in the future (e.g., beyond small business sector) as the model for sourcing new technology is proving to be a great process for procurement.
Portland, OR <i>Top Program</i>	<u>Grey-to-Green</u> A five-year Environmental Services initiative between 2008-2013 with other city bureaus and community partners to boost green infrastructure in Portland. The Grey to Green initiative and Environmental Services' ongoing investment in green infrastructure projects and programs helps implement the Portland Watershed Management Plan, protect existing sewer and stormwater infrastructure, and meet other city goals.

BUSINESS / TRADE / WORKFORCE PROGRAMS

Philadelphia, PA

Best in Class

[Sustainable Business Tax Credit](#)

Philadelphia offers a tax break for B Corporation businesses located in the City of Philadelphia that are classified as certified sustainable businesses once they are certified as B Corporations. Once certified, businesses remain eligible to receive Sustainable Business Tax Credits each year that such tax credits are available. For tax years 2012 through 2017, an eligible business can receive a tax credit of \$4,000, which may only be used against the tax based upon annual receipts. The B Corp methodology itself has strong focus on local job creation.

Calgary, AB

Top Program

[WORKshift Program](#)

WORKshift enables employees to work where and when they are most effective. Organizations that have embraced these programs report “triple bottom-line” benefits and a return on investment through savings in real estate costs; increased employee productivity, attraction and retention, and a significant reduction in their organizations’ carbon footprint.

New York, NY

Top Program

[World to NYC](#)

Through a competitive selection process, the World to NYC – Global Industry Challenge brings the most innovative later stage and established startups from around the world to NYC. While they are in New York, each company gets an inside look into the city’s ecosystem in a specific area of focus and begins to build partnerships with local and national firms along with relevant community groups.

In the past, the program was run on a geographic basis but in 2014, the NYC Economic Development Corp. started running ‘theme’ based programs based on activities that are already going on within a sector or area. The first time was in Spring 2014 with “new manufacturing” (rapid prototyping, 3D-printing); in Fall 2014, the program was focused on “Smart Sustainable Cities” that also focused on State opportunities in energy where there is budget to be spent on projects. The reason for switching to this theme approach makes it more focused, cohesive, and as such, it achieves better outcomes.

MARKETING INITIATIVES

Portland, OR

Best in Class

[We Build Green Cities](#)

The City of Portland was recently featured in an article in the Chicago Tribune for its “We Build Green Cities” brand, which is helping small and mid-sized companies market themselves overseas through the support of the Portland Development Commission. The US federal government awarded nearly \$300,000 toward Portland’s “green” export effort in September 2014 toward forging international partnerships, providing customized market research for local companies, creating a database of business leads and leading business trips abroad.

Amsterdam, Netherlands

Top Program

[Amsterdam Smart City Website & Branding](#)

The City of Amsterdam has done a great job with its “Smart City” initiative, having developed an attractively designed and functional website to serve as a platform for sharing of information, collaboration, and marketing. The website also serves as a showcase of all of its smart city related projects of which there are more than 685 projects across 5 themes (Living, Working, Mobility, Public Facilities, and Open Data).

Chicago, IL

Top Program

[Built in Chicago Online Hub for Startups](#)

An online hub for Chicago’s startup community, offering member and company listings, a blog, events, job postings, and more.

Appendix E: Interview List

Below is a list of individuals / organizations interviewed as part of the research for this project.

Name	Title	Organization
Local (City of Vancouver / Lower Mainland)		
James Donaldson	CEO	BC Food Processors Association
Bill Tam	President & CEO	BCTIA / Centre4Growth
Chris Higgins	Green Building Planner	City of Vancouver
Chris Baber	Manager, Neighbourhood Energy	City of Vancouver
Chris Underwood	Manager, Solid Waste Management	City of Vancouver
Brad Badelt	Senior Sustainability Specialist	City of Vancouver
Katherine Isaac	Planner (Urban Forest Strategy)	City of Vancouver
Rachael Carroll	Category Manager, Supply Chain Management	City of Vancouver
Wendy Mendes	Planner (Urban Food Systems)	City of Vancouver
Steve Brown	Project Manager, Transportation Plan	City of Vancouver
Loralee Delbrouck	Sustainability Strategy Advisor	City of Vancouver
Sean Pander	Assistant Director, Sustainability	City of Vancouver
Lena Soots	Program Manager	CityStudio
Neil Huff	Managing Director	Foresight Cleantech Accelerator
Jordan Fisher	Principal	FRESCo
Kevin Hanvey	Principal & Director of Architecture	Omicron
Louise Schwarz	Co-Founder	Recycling Alternative
Bryan Buggy	Director, Strategic Initiatives & Sector Development	Vancouver Economic Commission
John McPherson	Sector Development Manager, Cleantech	Vancouver Economic Commission
Juvarya Veltkamp	Green Economy Specialist	Vancouver Economic Commission
Other Jurisdictions		
Tom Rand	Managing Partner / Senior Advisor	Acttern Ventures / MaRS Discovery District
Lykke Leonardsen	Head of Climate Unit	City of Copenhagen
Michael Armstrong	Senior Sustainability Manager	City of Portland
Deborah Raphael	Director, Department of Environment	City of San Francisco
Stephen Reiling	Environmental Protection Specialist, District Department of the Environment	City of Washington, DC
Stephan Tanner	Principal	City of Zurich (Intep Integrated Planning LLC)
Michael Johansen	Head of Business Development	CLEAN / Copenhagen Cleantech Cluster (CCC)
Peter Laybourne	Chief Executive	International Synergies
David Gilford	VP & Director, Center for Economic Transformation	NYC Economic Development Corp.
Amy Nagy	Business Development Coordinator	Portland Development Commission
Reena Brilliot	Business Development Officers	San Jose Environmental Business Center

Appendix F: List of Green & Food Job Programs / Initiatives

Below is a list of the programs and initiatives underway or proposed within the City of Vancouver's boundaries that relate to its green and local food economy. These initiatives were examined in detail as to their potential for directly impacting on employment in terms of both incremental and transitional jobs.

Program Name	Description	Program / Policy-Regulation / Strategy / Initiative	Responsibility (CoV / VEC / Other)	Current Status of Initiative – Year started	Job Impact (Incremental / Transitional / Minimal Growth)
Active Transportation Corridors	Component of the Transportation 2040 Plan related to walking and cycling infrastructure upgrades, including new and refurbished sidewalks, cycling routes and signals, new walkways on False Creek Bridges, and public spaces.	Initiative	CoV	Ongoing	Both - Included as Incremental Initiative in Model
Bike Share Program	In 2015, the City will launch a network of shared bicycles available for short-term use for a fee. Council approved a five-year contract with Alta in July 2013, provided that Alta meets the sponsorship and lending agreement requirements. The company has yet to meet the requirements to get this program up and running.	Program	CoV	Proposed	Incremental - included as Incremental Initiative in Model
Deconstruction Regulation	Pre-1940s homes must be deconstructed and must recycle or reuse 75% of waste. On average 3 homes are demolished in Vancouver every day, with 40% being pre-1940s. Demolition permits are only issued when there is commitment (i.e. building permit) for new construction. Job growth may occur when linked to building renovation / retrofits (esp. MURBs), through the creation of new products from materials, new social ventures, and in the supply chain to support neighbourhood energy conversion projects.	Policy-Regulation	CoV	Implemented <i>(2011 - pilot program 2014 - regulation adopted)</i>	Both - Included as Incremental Initiative in Model
Sea Level Rise Impact Studies	Phase 1: Hired NorthWest Hydraulic Consultants to do flood mapping of the CoV under sea level rise scenarios (\$500K project). Phase 2: Just starting to use the info about flooding to review options to adapt/ respond to those impacts (\$250K). Will be going out to an external advisory group in early 2015 and to public after that. § Further design work would take place before 2020 but unlikely that any construction will break ground before 2020.	Initiative	CoV	Ongoing - 2014	Incremental - included as Incremental Initiative in Model

Sewer Separation Strategy	Sewers Separation Strategy is ongoing to 2040. This is an engineering design / construction project. Have focused on False Creek area but now shifting to Fraser River area. Lots of detailed design and construction work – not a lot of feasibility/ high level planning to do as a detailed roadmap already exists.	Initiative	CoV	Ongoing	Incremental - included as Incremental Initiative in Model
Vancouver Food Strategy Programs**	Program includes community gardens, farmer's markets, urban farming, value-added food processing / production	Strategy	CoV	Ongoing - 2013	Incremental - included as Incremental Initiative in Model
Forest Naturalization Program + Planting on Streets	Program components of Urban Forest Strategy focused on planting trees under existing forests and succession planning in parks, as well as planting on city streets and related stewardship to meet target of planting 150,000 trees by 2020. Facilitating with NGO partners to do some of this work. Includes some planting of fruit trees.	Program	CoV (Parks Board)	Ongoing - 2014	Incremental - included as Incremental Initiative in Model
TreeKeepers Program	Program component of Urban Forest Strategy focused on planting trees on private property and related stewardship / education to meet target of planting 150,000 trees by 2020 (bulk of the work under this strategy). Facilitating with NGO partners to do some of this work.	Program	CoV (Parks Board) + Other (TreeKeepers)	Ongoing - 2014	Incremental - included as Incremental Initiative in Model
MURBS Retrofit Programs (Green Landlord / Condo Programs)	A component of the Energy Retrofit Strategy for Existing Buildings and the VBBL. Landlord BC program is funded by FortisBC for high-efficiency boiler and furnace replacements in MURBs in Lower Mainland. Program is working with owners of residential rental buildings (landlords) to upgrade natural gas heating / hot water systems (no electrical so no BC Hydro involvement).	Program	CoV + Others (utilities, Vancity)	Ongoing - 2014	Both - Included as Incremental Initiative in Model
Greenest City Fund	The Greenest City Fund is a four-year, \$2 million fund that supports community-led green projects in Vancouver. Funded by the City of Vancouver and Vancouver Foundation, the Greenest City Fund comprises three granting programs: Generation Green Grants, which fund youth-led projects; Neighbourhood Small Grants, which fund projects created by Vancouver residents that benefit their neighbourhood; and Community Grants, which fund Vancouver projects led by community-based charitable organizations.	Program	CoV + Vancouver Foundation	Ongoing - 2012	Incremental - included as Incremental Initiative in Model

Business / Trade Missions (Inbound)	VEC brings international delegations into CoV to facilitate match-making, broker business deals, etc.	Program	VEC	Ongoing	Incremental - included as Incremental Initiative in Model
Business / Trade Missions (Outbound)	VEC / CoV runs 1 major outbound trade / business missions per year, with additional smaller trips to events, etc. VEC organized delegations to Shanghai in 2010, London in 2012, China in 2013 (CCCA; Mayor's program); and US (CleanTech Forum; VERGE).	Program	VEC	Ongoing	Incremental - included as Incremental Initiative in Model
Green & Digital Demonstration Program	VEC received support from Council July 2014 to deliver this program. Plan to align with existing Digital Strategy and utilize digital infrastructure for smart city/green city outcomes. The program is intended to accelerate job growth and help companies in the commercialization process with a significant focus on PR for successful projects.	Program	VEC	Ongoing - 2014	Incremental - included as Incremental Initiative in Model
Vancouver Technology Incubation Centre	The VEC has partnered with VanCity to deliver incubation and acceleration business development services for early-stage technology and social innovation companies. These services will be delivered within a building owned by the City located at 312 Main Street in downtown Vancouver.	Program	VEC	Under Development - 2013	Incremental - included as Incremental Initiative in Model
Vancouver Building Bylaw (VBBL)	<p>The current VBBL (2014 Building Bylaw) has adopted the 2012 British Columbia Building Code (based on the 2010 National Building Code of Canada) as the base document.</p> <p>In September 2013, City Council approved updates to the VBBL which required energy efficiency improvements as a permit condition for building renovations and directed staff to develop recommendations for City Council consideration on energy reporting requirements for larger buildings as part of a Building Retrofit Strategy.</p> <p>Current targets require that all new buildings constructed from 2020 onward to be carbon neutral in operations and a reduction of energy use and GHG emissions in existing buildings of 20% below 2007 levels by 2020.</p>	Policy-Regulation	CoV	Ongoing (since June 2008 - latest update in 2014)	Both - included in Base Case

Rezoning Regulations	In June 2008, Council approved the EcoDensity / EcoCity Revised Charter and Initial Actions. The current rezoning policy for sustainable large developments will help to achieve several innovative sustainable features on developments that have large sites (over 8000 m ²) and development floor areas (over 45,000 m ²). The Affordable Housing Strategy includes an interim rezoning policy whereby maximum of 20 rezoning applications will be considered for rental or below value MURBs.	Policy-Regulation	CoV	Ongoing - 2008	Transitional - included in Base Case
Sustainable Procurement Program	<p>The City has adopted a corporate procurement policy that embeds sustainability and ethical (SE) considerations into the procurement process rather than having them as an add-on or separate policy. The SE elements of the policy are being phased in over time.</p> <p>The CoV is working with Local Food Plus to develop a baseline, pilot projects, and an action plan for increasing local and sustainably produced food purchased by City facilities. A number of City facilities already purchase some amounts of local and sustainable food, but increasing this at City facilities such as the Carnegie Center will be a great opportunity to build our local food demand and support our local food farmers.</p>	Policy-Regulation	CoV + Other	Ongoing - 2012	Transitional - included in Base Case
Civic Zero Waste Program	<p>The City has hired its first Corporate Zero Waste Officer to implement a comprehensive waste diversion program in City facilities such as offices, theatres, libraries and police departments. This comprehensive waste diversion program will include:</p> <ol style="list-style-type: none"> 1. Multi-stream recycling 2. Full-scale composting 3. Detailed data for all waste streams generated for all facilities <p>Targets for the program are:</p> <ul style="list-style-type: none"> - Divert 80% waste from Corporate Facilities by 2015; 90% by 2020 - Divert 60% waste from Recreation Facilities by 2015; 70% by 2020 - Overall waste reduction (including diverted streams) by 10% by 2020 	Program	CoV	Ongoing -2012	Transitional - included in Base Case

Industry / Business Hubs	Numerous hubs are either in operation or proposed for the False Creek Flats light industrial area / Green Enterprise Zone. Example include: greenHUB, Scene Shop, Food hub, and a textile hub. Growth of hubs in GEZ will result from increased collaboration in closed loop, re-purposing, remanufacturing activities related to circular economy, based on materials collected and processed at the various hubs. The collaborative, co-location model with recycling materials is expected to nurture spin-off innovations in materials recovery, re-manufacturing and closed loop production.	Initiative	Other	Ongoing	Incremental - included as Incremental Initiative in Model
Legacy Steam Heat System Conversion Program	Component of Neighbourhood Energy Strategy which includes conversion of existing natural gas legacy steam projects to biomass to be powered from wood waste in (1) downtown core (Central Heat) and related projects, as well as (2) systems shared between Vancouver General Hospital and BC Women's / Children's hospital.	Initiative	Other	Under Development - 2012	Both - Included as Incremental Initiative in Model
National Industrial Symbiosis Program (NISP) (Metro Vancouver Pilot)	Light House and One Earth will implement a 3-year pilot program NISP Canada, initially operating in Metro Vancouver following the successful NISP-England model.	Program	Other	Under Development - 2014	Incremental - included as Incremental Initiative in Model
New Ventures BC Program	The BCIC-New Ventures Competition gives early-stage tech entrepreneurs education, mentorship, and exposure to help build a successful venture. Participants attend 12 education and networking events, work with mentors, and compete in 3 rounds of judging until 10 remain to compete for over \$300,000 in cash and prizes.	Program	Other	Ongoing - 2001	Incremental - included as Incremental Initiative in Model
Regional Ban on Organics	With the Metro Vancouver region's upcoming ban on the disposal of compostable organics in 2015 and the City's requirement that all businesses and properties have a food scraps diversion plan in place, there is considerable opportunity for growth in business ventures and jobs within the private sector related to the approximately 4,000 multi-family and 7,200 ICI properties who may require some type of food scraps diversion service, whether it be an onsite system or a collection service.	Policy-Regulation	Other	Under Development - 2015	Incremental - included as Incremental Initiative in Model

EPR & Recycling Programs	<p>Under the Recycling Regulation, BC Govt. requires producers of tires, electronics, and beverage containers to provide EPR for the lifecycle management of their products, including collection and recycling. The program is expanding to include printed paper and packaging (PPP) (in May 2014) and construction and demolition materials, furniture, textiles and carpet, and appliances within MoE's Service Plan within next 5-10 years.</p> <p>Multi-Material BC (MMBC) will be responsible for province-wide packaging and printed paper collection and recycling and will contract with local governments and qualified agencies to provide curbside collection. The City of Vancouver entered into an agreement with Multi-Material BC (MMBC) and will continue recycling collection services curbside as well as apartments and strata complexes.</p>	Policy-Regulation	Other (Province of BC, Min. of Environment)	Ongoing - 2008	Incremental - included as Incremental Initiative in Model
Broadway Corridor Rapid Transit +Public Transit Infrastructure Improvements	<p>Major component of the Transportation 2040 Plan that is focused on Broadway Corridor Rapid transit and some minor bus route upgrades – considered the CoV's top priority for transportation. Currently the project is with Mayor's Council and will be going to referendum. The CoV is putting in staff time in order to try and move it forward.</p> <p>Essentially an underground extension of the current SkyTrain line. Phase 1 will go as far as Arbutus St. Also some effort to increase the B-line bus services along this route, as well as 3 other routes in the short term. Would create an increase in the number of bus drivers, infrastructure maintenance, bus maintenance / repairs, etc.</p> <p>Will take 5-7 years to design and construct so won't be in place by 2020. Construction will be well underway by 2020. Capital cost for the entire project in the range of \$2 Billion to develop up to Arbutus – total project is valued at \$2.8B according to Major Projects Inventory over 7 year period. Funding would come from Federal, Provincial, Municipal, Translink, and other sources.</p>	Initiative	Other (TransLink, CoV, Province, Federal)	Under Development - 2014-2022	Incremental - Included in Base Case
Appliance Energy Efficiency Standards	<p>The Province's Energy Efficiency Act (EEA) sets energy performance standards for devices that use, control or affect the use of energy such as:</p> <ul style="list-style-type: none"> - Household appliances (washers, fridges); - Heating systems (furnaces, boilers, heat pumps); - Cooling systems (air conditioners); - Lighting (ballasts and fluorescent bulbs); and - Some industrial equipment (motors and transformers). 	Policy-Regulation	Other (BC Provincial Government)		Transitional - included in Base Case

Climate Adaptation Strategy Broken out into relevant initiatives	<p>Vancouver City Council has adopted a comprehensive climate change adaptation strategy to ensure that Vancouver remains a liveable and resilient city in the face of climate change.</p> <p>The landmark strategy recommends nine primary actions and over 50 supporting actions that the City of Vancouver can take to incorporate climate change adaptation measures into new projects and daily operations for all City business.</p> <p>Phase 2 of the Coastal Flood Risk Assessment (CFRA) is currently underway and will identify and prioritize ways to improve the City's ability to adapt and recover quickly from flooding events.</p>	Strategy	CoV	Ongoing	Incremental - included in specific programs / initiatives
Energy Retrofit Strategy for Existing Buildings Broken out into relevant initiatives	<p>City council approved the building retrofit strategy in June 2014. The Strategy introduced tools and resources to encourage home energy upgrades. The building retrofit strategy will leverage existing programs and create a coordinated and comprehensive approach for encouraging energy upgrades for both residential and commercial buildings.</p> <p>The Strategy outlines 17 CoV actions to support voluntary GHG emissions reductions in four building stock segments: Large Industry, Large Commercial, Large MURBs, and Detached Houses.</p>	Strategy	CoV	Ongoing	Incremental - included in specific programs / initiatives
EV Charging Station Program	<p>The CoV is trialing public charging stations at community centres, shopping malls, curbs, and other locations throughout the city. In 2013, the City updated its building bylaw so that 10% of stalls in mixed-use and commercial buildings must be ready for electric vehicles. CoV is also working with BC Hydro to install a Fast Charger that can charge vehicles in less than 30 minutes. It will be one of 13 Fast Chargers in BC. CoV is partnering with telecommunications companies to provide electric vehicle charging at sites where new cellular infrastructure is installed.</p>	Policy-Regulation + Program	CoV	Ongoing - 2008	Minimal Growth Expected
Event Greening Program	<p>As part of an organization's permit application process to the CoV to host a public event, applicants must fill in a green event form that explains how they plan to manage waste and hold a more sustainable event. CoV provides a "Green Events Planning Guide" to help with the planning process.</p>	Program	CoV	Ongoing - 2008	Minimal Growth Expected

Green Bin Program	The Green Bin Program allows residents in houses, duplexes, and some multi-unit residential buildings to add their food scraps to their Green Bins. In April 2010, the City launched the first phase of the program by allowing residents to add uncooked fruit and vegetable scraps, coffee filters, and tea bags in their Green Bins. In January 2014, multi-unit residential buildings with City collection services joined the Green Bin Program.	Program	CoV	Ongoing - 2010	Minimal Growth Expected
Green Fleet Program	Includes 2 broad areas of action: 1. Green Technology - Nearly all of the City's diesel-powered vehicles use biodiesel, a fuel made from canola oil, a renewable resource. 85% of the fleet uses B5 (5% biodiesel) and 15% of the fleet uses B20 (20% biodiesel). - The City now has the biggest municipal electric vehicle fleet in Canada with 27 electric vehicles (26 Mitsubishi iMiEVS and one Nissan Leaf). 2. Training & Operations - Comprehensive driver training program to reduce idling and wasteful fuel use - Idle cut-offs and "no air conditioning" policy - Car sharing contract with Co-operative Auto Network for a pool of vehicles for staff use. - Scrap metal, oil, battery, and tire recycling programs - In-house servicing / maintenance and management of the fleet.	Program	CoV	Ongoing - 2008	Minimal Growth Expected
Healthy City Strategy Covered by other programs	The Healthy City Strategy (2014-2025) is currently in development. It will be a long-term, integrated plan for healthier people, healthier places, and a healthier planet. Draft document was presented to City Council in June 2014 and the first 3-year action plan is currently under development. Key areas: healthy children, affordable housing, sustainable food systems, high-quality health services, adequate income, safety and security, strong social connections, active living, lifelong learning, expressing diversity, accessibility/travel, livable environment.	Strategy	CoV	Under Development - 2014	Incremental - included in specific programs / initiatives

Landfill Gas Capture Optimization Program	<p>The Vancouver Landfill is located in Delta, BC and owned / operated by CoV. It has voluntarily captured LFG since 1991.</p> <p>The capital budget (~ \$1.8M 2013) fluctuates each year based on need. Its rather capital intensive in terms of putting in new gas well and progressively capping the landfill. There are about 6 consultants usually on planning teams (~1 CoV, ~2 North Van and ~3 US)</p> <p>The operating budget (~0.5M 2013) supports a Landfill gas collection operations team working for CoV (1 fulltime Ops supervisors and 3 technicians) who work on a daily bases to build and maintain the LFG collection system. They are supported by the Landfill Operations Manager as also a few other North American organizations who provide equipment service and support.</p>	Program	CoV	Ongoing - 2012	Minimal Growth Expected
Neighbourhood Energy Strategy Broken out into relevant initiatives	<p>Neighbourhood energy systems use low-carbon renewable energy sources, such as biofuels and sewage waste heat. The end result will be environmentally friendly, cost-competitive heat and hot water in high-density neighbourhoods.</p> <p>GCAP outlines plans for developing multiple district energy plants by 2020 in order to deliver 11% of Vancouver's total 1.11 million tonnes of CO2 reductions by 2020 (equal to 120,000 tonnes CO2 per year from district energy projects).</p> <p>In 2010, the False Creek Neighbourhood Energy Utility (NEU) began operation, providing environmentally friendly heat and hot water for new buildings in Southeast False Creek, including the Olympic Village.</p> <p>In 2011, CoV started to gather input for a strategic approach to neighbourhood energy, and energy centre guidelines. Consultations included Vancouver Coastal Health, Metro Vancouver, property developers, the David Suzuki Foundation, BC Hydro, and the University of British Columbia.</p>	Strategy	CoV	Under Development - 2011	Incremental - included in specific programs / initiatives
Street Food Vending Permits	<p>Since 2010, Council has been expanding the options for food permits to include more diverse and nutritious choices, and more accessible locations. There are now over 100 food trucks, carts, and vendors permitted to sell food on Vancouver streets. The City uses a scoring system to award new permits to street food vendors. Top scoring applicants will be awarded new permits, which are issued on May 1 every year. Permits cost \$1,140 and are valid for 1 year until April 30.</p>	Policy-Regulation	CoV	Ongoing - 2010	Minimal Growth Expected

Transportation 2040 Plan Broken out into relevant initiatives	<p>Transportation 2040 is a long-term strategic vision for the city that will help guide transportation and land use decisions and public investments for the years ahead.</p> <p>After two years of extensive consultation with the engagement of over 18,000 citizens, Vancouver City Council voted on Oct. 31, 2012 to approve the new Transportation 2040 Plan.</p>	Strategy	CoV	Ongoing - 2012	Incremental - included in specific programs / initiatives
Urban Forest Strategy Broken out into relevant initiatives	<p>The Urban Forest Strategy started in 2011 as a priority item under the Greenest City 2020 Action Plan. The strategy was supported through motions approved by the Park Board and Council in 2012.</p> <p>In April 2014, Council voted to approve the Urban Forest Strategy, which includes an update to the Protection of Trees Bylaw. The City currently has plans, bylaws, and policies governing trees across different departments.</p> <p>The Strategy includes plans to plant 150,000 trees by 2020, increase Vancouver's tree canopy cover, and develop an integrated urban forest inventory system.</p>	Strategy	CoV	Ongoing - 2014	Incremental - included in specific programs / initiatives
Zero Waste Strategy	<p>Under the Greenest City 2020 Action Plan, the City has set a target to reduce solid waste going to the landfill or incinerator by 50% from 2008 levels.</p> <p>To achieve this goal, the City is committed to:</p> <ol style="list-style-type: none"> 1. Expanding the existing citywide Green Bin Program to allow the collection of all household food waste; 2. Developing education and enforcement programs to keep recyclables out of the waste stream; 3. Advocating for more Extended Producer Responsibility programs for packaging; 4. Developing a building deconstruction program. 	Strategy	CoV	Ongoing	Incremental - included in specific programs / initiatives

Greenest City Scholar Program	<p>The Greenest City Scholars internship program sponsors UBC graduate students to work on a sustainability project with the City of Vancouver. In return UBC receive yard trimmings for the Nexterra waste to energy facility.</p> <p>UBC graduate students are partnered with city staff and mentors to investigate and implement projects identified as important to the Greenest City 2020 Action Plan. Each Scholar receives \$5,000 to complete 250 hours of work over the summer. VEC recruits a Greenest City Scholar each year.</p>	Program	CoV + UBC	Ongoing - 2012	Incremental - included in specific programs / initiatives
Green Business Support Program	Focused on expansion and retention efforts. VEC staff support green firms through relocation / real estate / expansion support; matchmaking, funding opportunities, event sponsorship, partnership development, etc. VEC used to run a Business Retention Program called 'BusinessWorks'.	Program	VEC	Ongoing	Incremental – Not included in Model
Marketing & Branding Program	New marketing and branding program to attract capital. VEC received support from Council July 2014 to deliver this new program.	Program	VEC	Under Development - 2014	Incremental – Not included in Model
Green Enterprise Zone	<p>VEC plans to create a Green Enterprise Zone in the False Creek Flats. This area will showcase green innovation, feature green buildings and infrastructure, support sustainability-related industries, attract new green capital, and evolve to become 'the greenest place to work in the world'.</p> <p>Also working to deliver an Economic Action Plan as part of CoV's Local Area Plan for False Creek Flats. Local Area Plan for the False Creek Flats is a test case for applying a systematic approach to create solutions-based codes. VEC is leading economic components of CoV's plan (postponed from Oct 2013 to Jan 2015). Current activities include: developing metrics; survey of businesses; baseline study; outreach to green clusters; prep for launch. More formal process that includes multiple City departments in the conversation is required.</p> <p>Currently working to facilitate creation of a local brand identity for the False Creek Flats businesses and a GEZ. VEC engaged Centre for Digital Media students to create web tool www.falscecreekflats.com. A broader communications plan is under development.</p>	Program	VEC	Under Development - 2012	Both - included in specific programs / initiatives

Vancouver Digital Strategy Broken out into relevant initiatives	Digital Strategy has 4 goals with 9 initiatives. The goals are: 1. Citizens and businesses can easily interact with the City through digital channels - develop digital platforms, expand open data program, promote activity through communications / engagement tools 2. Robust digital infrastructure built through strategic investments and partnerships - expand digital access throughout the City 3. A global leader in supporting innovation and growth of the digital economy - establish digital incubation program, favourable regulatory environment, support proof of concept program (VEC initiatives) 4. A mature, citizen-centric digital culture - establish digital services governance, mobile workforce strategy	Strategy	VEC	Ongoing - 2013	Both - included in specific programs / initiatives
Vancouver Economic Action Strategy Covered in individual projects	VEC's Economic Action Strategy takes into consideration relevant global and local influences, while focusing on three critical aspects of managing the economy: 1. A Healthy Climate for Growth and Prosperity; 2. Support for Local Business, New Investment and Global Trade; 3. A Focus on People — Attracting and Retaining Human Capital.	Strategy	VEC	Ongoing - 2011	Incremental - included in specific programs / initiatives
Early Market Engagement Strategy	This is a program area that is yet to be developed. It would essentially be a pre-procurement program to help inform local suppliers / businesses of upcoming opportunities to supply to the CoV in order to prepare them ahead of time and improve their chances for success.	Program	VEC + CoV	Proposed - 2012	Both – not included in Model
Enabling Regulations for Digital Districts in CoV	This is a component of Vancouver's Digital Strategy that is focused on clustering the digital sector / businesses in key locations by unlocking Vancouver's digital assets / infrastructure and give companies a competitive advantage to compete globally. Vancouver has real assets: for example, the 2010 Olympics left behind a legacy of digital assets at convention centre, police station, and Sea-to-Sky highway that can be used as part of the strategy. Requires working with CoV planning department for zoning and land use but not there yet.	Policy-Regulation	VEC + CoV	Proposed - 2012	Both – not included in Model

CityStudio	CityStudio Vancouver is an innovation hub inside under Cambie St. Bridge where staff, university students and community members design and execute projects on the ground.	Program	Other	Ongoing - 2011	Incremental - included in specific programs / initiatives
Green Plumber Program	Workshops will be led by Doug Kirk and Sam Steele, who both have extensive plumbing and teaching experience. 67 Plumbers attended the 2-day workshop in Vancouver.	Program	Other	Implemented - 2013	Transitional – not included in Model
Waste Diversion Targets (Metro Vancouver) Broken out into relevant initiatives	70% diversion by 2015 / 80% by 2020 (up from 55% in 2010 for the Metro Van region)	Policy-Regulation	Other (Metro Vancouver)	Ongoing	Incremental - included in specific programs / initiatives