



GREEN ECONOMY WORKING PAPER #4

VANCOUVER'S GREEN ECONOMY

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VANCOUVER
ECONOMIC COMMISSION



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Mayor Gregor Robertson and Tim Cole with USGBC • photo: City of Vancouver

This paper has been produced as part of a series of working papers intended to further discussion on the green economy in Vancouver. Developed in support of VEC's work in support of the City of Vancouver's Greenest City Action Team, the papers have been produced by consultants and researchers, and do not necessarily reflect the views of the VEC or its stakeholders. These papers will be used to inform the strategies put forward by the Green Economy working group. Findings will be continuously refined as understanding of the green economy progresses.

cover photo: City of Vancouver

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This report represents VEC's research between July 2010 and March 2011. Since then, data has been updated and refined by further work.

In particular:

1. A separate study of local food jobs was undertaken that provided a more concrete number than the initial estimate in this report.
2. The Greenest City Action Plan, and the potential jobs created, were refined and adapted as public feedback was incorporated and staff undertook further research. The final GCAP represents all the additional work done, and can be found at: <http://vancouver.ca/ctyclerk/cclerk/20110712/documents/rr1.pdf>

1. INTRODUCTION



Study Scope

This white paper aims to quantify the number of green jobs in the City of Vancouver, identify market trends, and provide projections for the growth in green jobs to 2020. It builds on initial Vancouver Economic Commission (VEC) analysis, as summarized in the July 2010 report 'Vancouver's Green Economy'¹, and serves as a companion to that paper. Results of these studies of Vancouver's green economy suggest that approximately three percent of the jobs in the City

of Vancouver can be considered green jobs, and that there is a significant economic development opportunity presented by the growth of the green economy. This study assesses the growth opportunities presented by the draft strategies and actions of the Greenest City Action Plan and determines that, if implemented fully, this plan will provide a solid basis to double the number of green jobs in Vancouver to approximately 23,000 by 2020.

The Green Economy

Since the industrial revolution, economic activity has been defined by unfettered access to natural resources and on the externalization of the costs associated with environmental impacts. However, the cumulative effect of that operating paradigm has been climate change, ecological failure and biodiversity decline. Economic activity has relied to a large degree on the benefits of consistent and predictable weather, supplies of fresh water and productive land, as well as the unlocked potential within plant and animal species. As access to this natural capital declines, businesses are evolving new paths to value creation and innovative patterns of existence that will help them remain competitive and secure viability in a world with fewer resources.

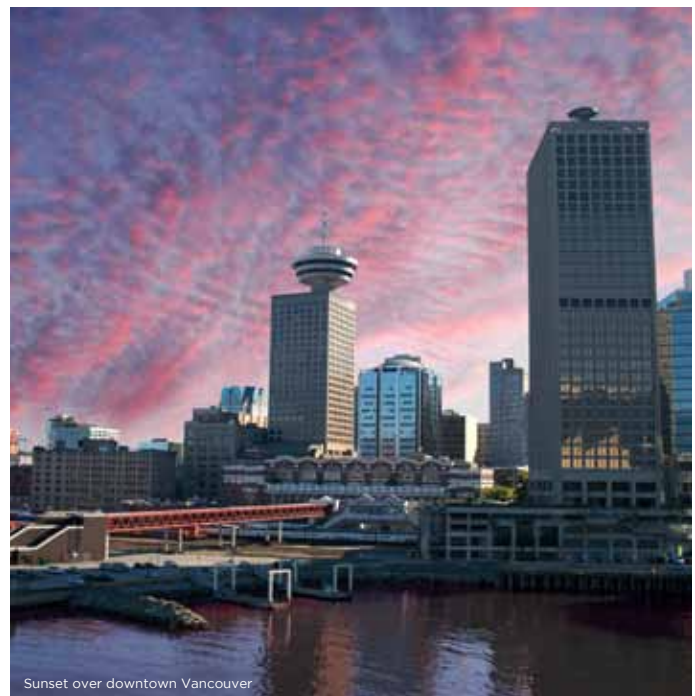
The concept of 'green economy' aims to encapsulate the organizations and people that are creating this new, low carbon economy and are finding solutions that help to eliminate the negative impacts of economic activity. This report assumes a context for the green economy that still allows society to benefit from economic progress, for example in the forms of job and value creation. While the green economy has not been categorically defined by any one jurisdiction or governing body, there are common understandings and themes that facilitate a definition of green jobs for the purposes of this study.

Methodology

To define the term 'green', this study borrows from the United Nations Environment Program (UNEP) definition which has a focus on those activities that restore or preserve environmental quality, reduce energy, materials and water consumption, de-carbonize the economy, and minimize or altogether avoid the generation of all forms of waste and pollution. As growing the local food economy is central to the Greenest City 2020 vision to create a sustainable economy, the UNEP definition is supplemented by the inclusion of local food.² The definition is further expanded to allow for non-union and part-time workers. Voluntary

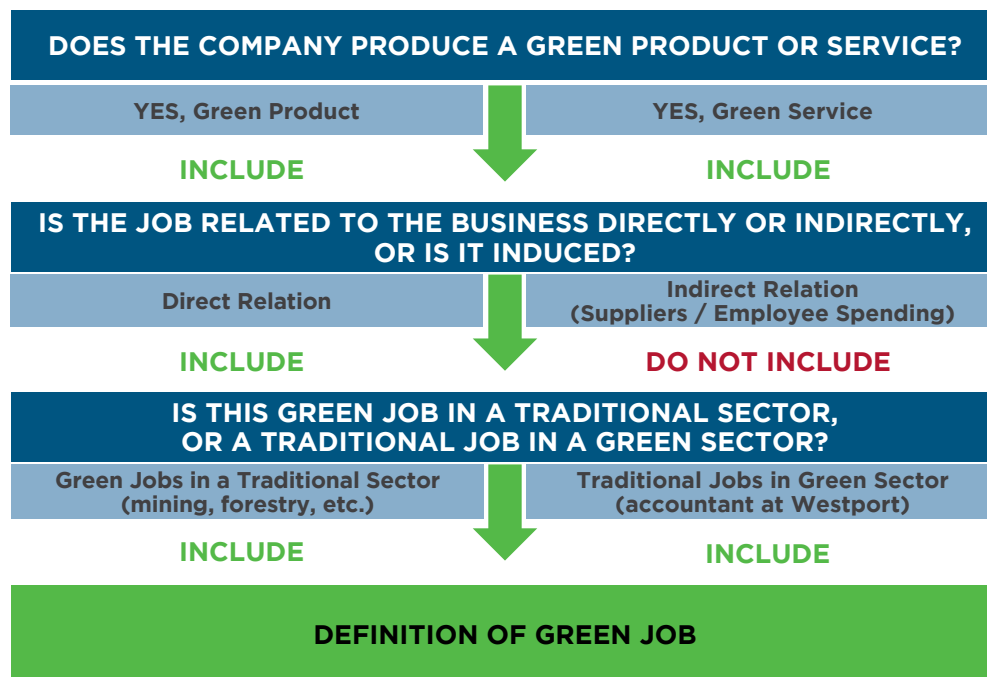
work is excluded from the definition of 'job' for the purposes of this study.

After defining 'green', the study develops a process in order to determine whether a job is considered a 'green job'. Those employees working for an organization that produces green products or services are the most obvious; however, the definition also includes those working on processes that improve environmental performance. For example, manufacturers of high-efficiency windows are considered green, as are sustainable lighting consultants. The provider of carbon management solutions is included in the definition, as are those employees involved in improving the performance of a company in an otherwise non-green firm. On the other hand, jobs that are considered indirect are not included. For instance, suppliers to the high-efficiency window manufacturer would be excluded, in order to avoid any double counting of such jobs in the general economy. Jobs that are in traditional sectors but where the tasks are focused on environmental improvement are also considered green jobs. For example, a sustainability officer or energy manager at a conventional window manufacturer would be included. This working definition is also comparable to the definition of the green jobs used by the Globe Foundation³ and previous VEC studies⁴.



Sunset over downtown Vancouver

Figure 1: Methodology to define 'green job'



Methodologies used

Three methodologies were used to estimate the number of green jobs in Vancouver and to corroborate the results from each method. The first method was based on North American Industry Classification System (NAICS) employment figures for the Metro Vancouver area, derived from the census data available from Statistics Canada. The second method was based on Statistics Canada's Inter-Provincial Input Output (I-O) Model, as applied by the Globe Foundation in the development of the report 'BC's Green Economy' (2010). The third method was based on primary data, collected via a survey of companies by Vancouver Economic Commission (VEC).

Census-based methodology

The census based methodology used census data from 2006 and associated NAICS codes to estimate the number of green jobs at the Vancouver Census Metropolitan Area (Vancouver CMA) level (analogous to the Metro Vancouver region). Analysis of the NAICS 4-digit codes identified all industry sectors with the potential to contain green jobs, with these codes then re-organized into

eight broad categories. The CMA census data for these codes was analyzed to provide the number of jobs in each of these respective industries. Depending on the nature of each NAICS code, in some cases intensity ratios⁵ were applied to the sector to determine the number of green jobs (refer Appendix D for results). Intensity ratios were developed via literature reviews and interviews with industry experts. Green jobs for Vancouver were then estimated by assuming that approximately one third of Metro Vancouver jobs are located in City of Vancouver, an assumption based on empirical analysis of general employment trends in the Metro Vancouver area.

Input-Output based methodology

The Input-Output method was adopted by the Globe Foundation and is summarized in their document BC's Green Economy: Research Methodology. Globe's definition of green jobs is very similar to the approach taken by VEC, though their approach to finding an estimate number of green jobs is different. The data assumes that approximately one third of Metro Vancouver jobs are located in the City of Vancouver in order to derive the city numbers.

Survey-based methodology

The survey methodology is a continuation of the previous work done for VEC, as summarized in the report, 'Vancouver's Green Economy' by Hurrian Peyman. This method relies on collecting primary data from organizations that are identified as part of the green economy (see VEC's 'Database of Green Companies, March 2011'). Using existing databases, interviews with industry experts and canvassing Vancouver companies, VEC established a database of Vancouver's green companies, and conducted a survey to determine the number of jobs that could be considered green at each organization.

This approach attempted to identify all of Vancouver's green companies. The study relied on companies identifying and promoting themselves as green, or any other external indications of the company being green. The survey does not provide 100% coverage due to this restriction, and the data was not scaled to compensate for this.

Example survey questions

For a green company (e.g. David Suzuki Foundation):
 Q: How many employees do you have? (count all)

For a company involVed in green projects (e.g. Busby, Perkins & Will):
 Q: How many of your projects are considered green? (multiply total number of employees by % green projects)

For a company in a traditional sector (e.g. Teck):
 Q: Are your business operations significantly greener than your industry peers (e.g. carbon neutral operations)? (if yes, count all)

If not, do you have any personnel dedicated to greening your business practices and operations? (count each individual)

Comparison of data

The results of the survey method (refer Appendix A) are within +/- 15 percent of the census method (refer Appendix B) and +/- 15 percent of the Input-Output method (refer Appendix C). This offers a

degree of certainty that each method delivers a reasonable estimate of the number of green jobs in Vancouver in 2010. Given the strength of the survey, this study uses the survey data as the basis for all other work. The other two approaches use a rough estimate for City of Vancouver jobs, as well as 2006 census data, both of which will be less reliable.

Census	Survey	Input - Output
Metro Van: 30,729 City (1/3):		B.C.: 117,158 Metro Van (1/3): 38,297 City (1/3):
10,243	12,009	12,638

Limitations of the methodologies

The Census-based method is heavily reliant on the 2006 data provided by Statistics Canada and on being able to identify appropriate values for the intensity ratios. Based on the Federal Government's decision to serve only voluntary long forms for the future census, census-derived VEC estimations will be less reliable. Hence, other methods are needed not only to verify the results of the census methodology, but also to provide another source of corroboration to track the actual growth in Vancouver green jobs.

Since the survey results are heavily dependent on the respondents' interpretation, judgement and willingness to cooperate, a statistical error can be expected in these results.



Local food has been added as a sector because of its significance as a sustainable sector in the Greenest City Action Plan. However, in the absence of a detailed study, rough estimates have been used and a VEC study is underway to further refine the local food job numbers.

Some sectors have been excluded from the definition in order to ensure a defensible definition of green jobs:

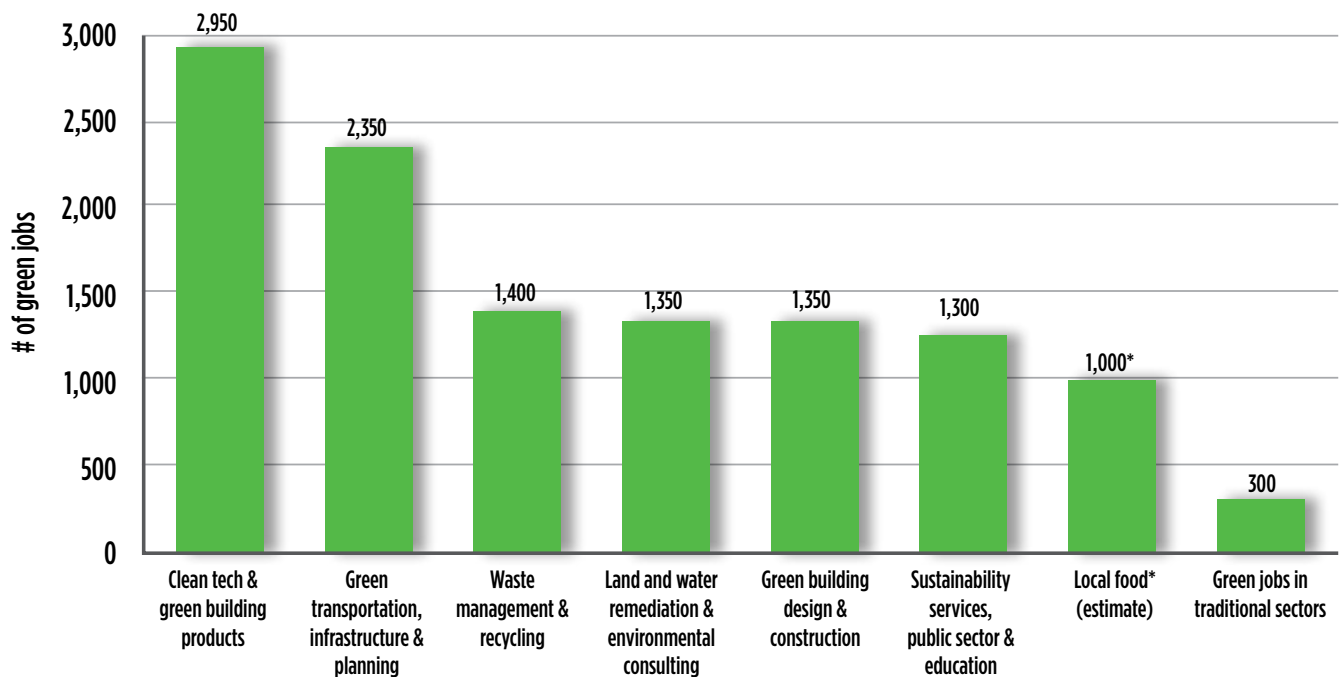
- Bicycle stores and mechanics were excluded because of the difficulty in differentiating between bikes used for commuting or for recreation. Many stores sell bicycles for off-road recreation, in which case the bicycle may be driven several kilometres to the biking location.
- The definition does not include the many individuals that volunteer their time to the growth of the green economy. While their contribution supports the very rapid pace of change in this sector, this does not constitute a way to support oneself economically and is therefore not considered a 'full-time equivalent job'.

Study Results

The survey-method results indicate that Vancouver has approximately 12,000 green jobs in eight sectors. These account for three percent of Vancouver's jobs, in industries ranging from clean technology and education to green building and materials recovery; from local food and urban agriculture to transportation and infrastructure. Green jobs also include jobs in conventional businesses and traditional sectors that contribute to green processes or operations. The break down into the sectors varies between each methodology due to the differences in classifications of job functions and industry codes (see Appendices A, B and C)

“The survey-method results indicate that Vancouver has approximately 12,000 green jobs in 8 sectors. These account for 3 percent of Vancouver's jobs...”

Figure 2: Green jobs in the city of Vancouver by sector



Skill Level

The green jobs data was further analyzed to better understand how important factors like skill level and education factor into the green economy. Job roles in each sector were analysed and segmented into four categories to reflect the level of skill or training required. The results show that at least 10 percent of jobs present low barriers to employment and are accessible to residents facing language barriers, mental health issues, homelessness or other challenges. These include jobs in local, waste management and recycling and some forms of construction (including home weatherization and deconstruction).

Nearly 70 percent of green jobs require post-secondary qualifications, including technical or trades training. This is similar to the changing requirements of the economy as a whole, where

it is estimated that about 70 percent of jobs will require some form of post-secondary, including technical or trades training, by 2031.⁶

“Nearly 70 percent of green jobs require post-secondary qualifications, including technical or trades training...”

Figure 3: Green jobs by skills required

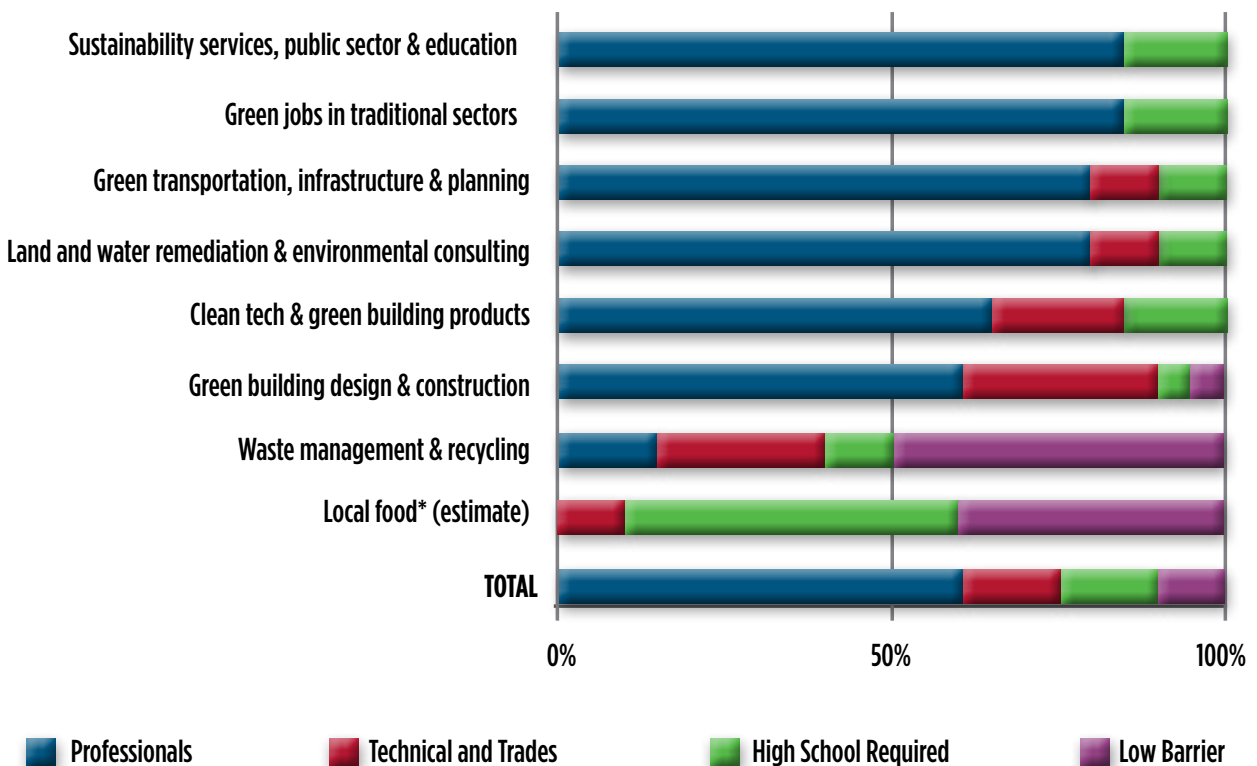


Table 2: Examples of Green Jobs

Sector	Types of New Green Jobs	Existing Jobs that will be Greened
Clean Technology	Electric vehicle mechanics; Smart grid engineers and technicians; Smart meter manufacturers	Energy efficient lighting specialist; ICT networking specialist; Natural gas engine mechanics; Power engineers
Green Buildings	Building commissioning agent; Energy modelers; Green technicians; Energy managers	Green renovators; Building operators; Insulation specialists; Drafters and architects
Waste Management & Recycling	Compost collectors; Waste reduction consultants; E-waste specialists; Recycling facility operators	Waste technicians; Waste collectors; Recycling materials handlers
Local Food Economy	Urban farmers; Bee-keepers	Food processors; Horticulturists; Food retailers
Sustainability Services & Education	GHG emissions auditors; Offsets aggregator; Carbon traders; Sustainability managers	Policy analysts; Supply chain managers; Teachers and educators
Proportion of Growth	50% of growth will be from creation of new jobs	50% of growth will be from greening existing jobs



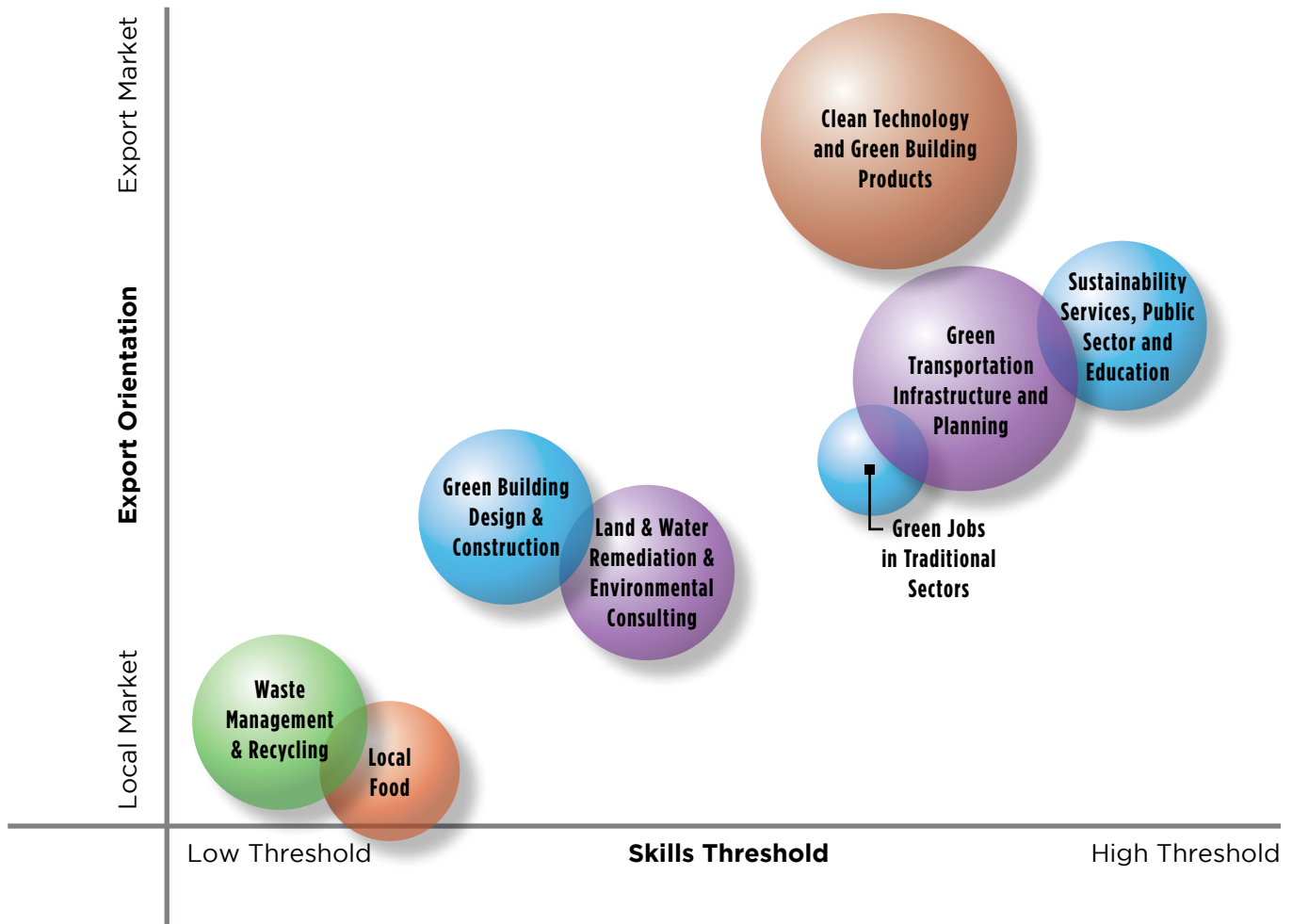
Vancouver introduced curbside composting in 2010 • Photo: City of Vancouver

Export Potential

The export orientation of each industry sector was also assessed using a relative scale to compare the exportability of a sector. Vancouver has a large proportion of jobs in export-oriented sectors, such as clean technology, green transportation and planning, and sustainability services. These sectors are also those which require higher levels of training and education. For example, local food

and waste management and recycling have both lower export orientation and a lower threshold for skills. On the other hand, the clean technology and green products sector and the sustainability services, public sector and education sector are on the cutting edge of technology and research and hence require highly skilled people. In addition, the products and services of these sectors face favourable worldwide demand, making these sectors heavily export oriented.

Figure 4: Export orientation vs skill level

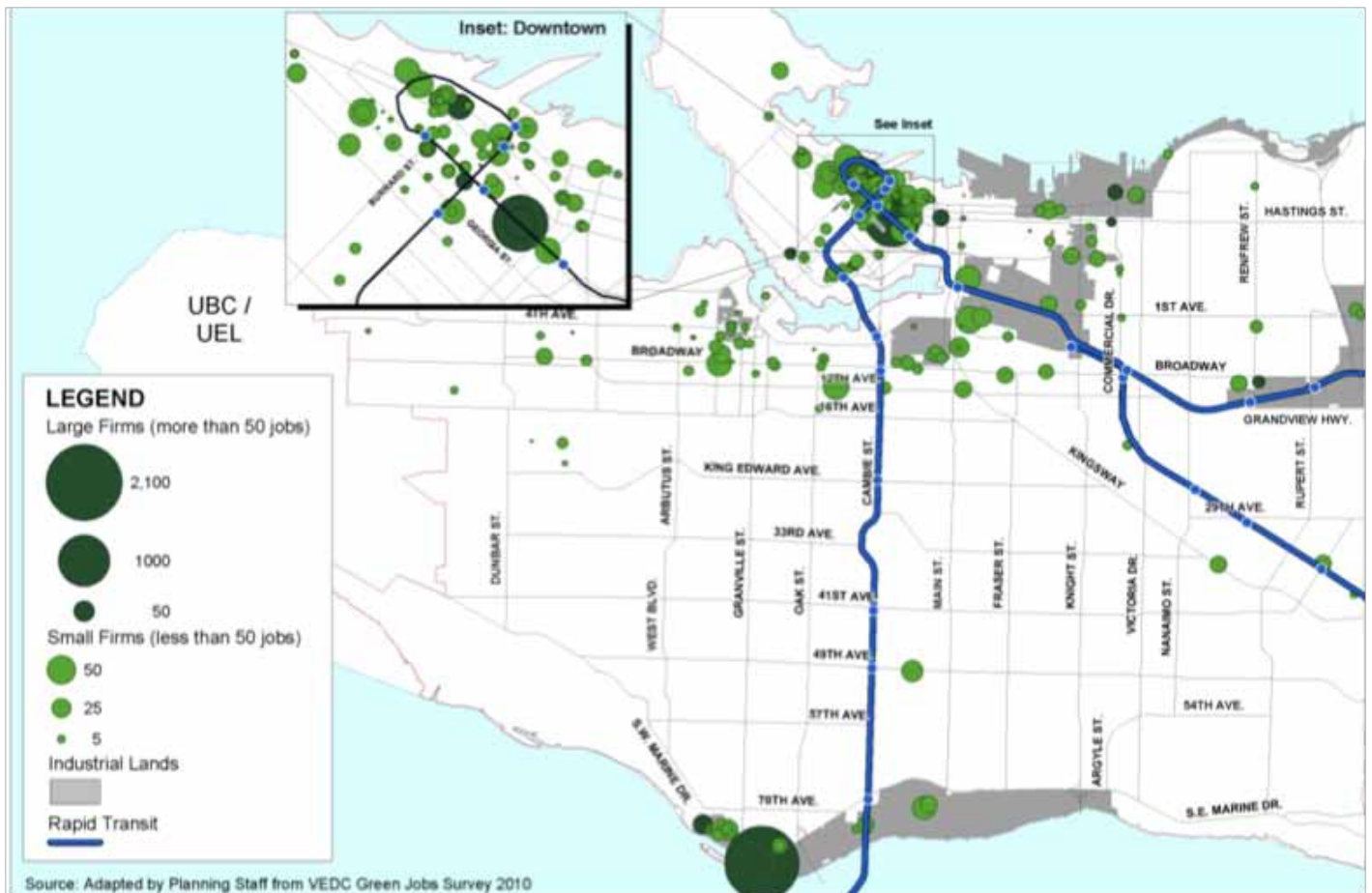


Spatial Analysis

VEC's database of green businesses was analyzed to create a map for the location of green jobs in Vancouver by location. Most of these jobs are concentrated in the Metro Core economic and research hub of downtown Vancouver, though there is also a significant concentration of green jobs in industrial parts of the city.



Figure 5: Spatial analysis of Vancouver green jobs



2. VANCOUVER'S GREEN ECONOMY



Killarney Community Centre • Photo: City of Vancouver

There are eight green sectors identified in this study. Each sector presents a different sized cluster in Vancouver, with different abilities to grow and rates at which this growth will occur. Based on these growth rates, and taking into account export potential and low-threshold job capacity, five sectors are considered priority sectors for economic development in Vancouver:

- **Clean technology**, in particular smart grid, power electronics and power conversion equipment
- **Green buildings**, in particular green renovations and carbon neutral new construction
- **Waste management and recycling**, in particular composting and materials salvage and recovery
- **Local food economy**, in particular food processing and manufacturing
- **Sustainability services and education**, in particular business consulting services and carbon accounting.

Comparative Analysis

The green economy represents three percent of Vancouver's roughly 400,000 jobs. This is a significant part of Vancouver's highly diversified economy, where even large sectors like tourism and health care represent fewer than 11 percent of jobs each.

Table 3: Percentage breakdown of jobs by industry⁷

Key Sectors	Percent of Jobs
Wholesale & Retail Trade	13%
Health Care & Social Assistance	11%
Tourism (Accommodation & Food Service)	9%
Manufacturing	5%
Public Administration	5%
Construction	4%
Transportation & Warehousing	4%
Green Economy	3%

Factoring in growth rates helps to highlight the increasing significance of the green economy, as green sectors are growing more than twice as fast as traditional sectors of the economy.

Table 4: Projected growth rates by industry⁸

Traditional Sectors	Projected annual growth rates (%) (Lower Mainland)
Manufacturing	2
Tourism (<i>Accommodation & Food Service</i>)	2
Construction	1
Priority Green Sectors	Projected annual growth rates (%) North America
Clean technology (<i>incl. smart grid</i>)	7
Sustainability Services & Carbon Finance	7
Green building (<i>incl. retrofits</i>)	6

Few jurisdictions have undertaken a comprehensive analysis of green jobs, making it difficult to find geographically comparative data. Many jurisdictions report clean technology jobs as a proxy for the green economy, and in the process ignore jobs in other potential green sectors.

Table 5: Percentage of green jobs by city⁹

Regional comparison with broad definition of green jobs	Green jobs	%
British Columbia	117,000	5.0
California	433,000	3.4
City comparison with narrow definition of green jobs (clean tech only)	Green jobs	%
Vancouver	3,000	0.75
New York	13,800	0.4

Looking Ahead

To assess whether the City of Vancouver will be able to achieve its target of doubling the number of green jobs by 2020, projections were formulated to compare a 'business as usual' scenario based on status quo growth rates for each green sector against a scenario that incorporated all the policies, programs and projects envisioned as part of the draft Greenest City Action Plan.¹⁰

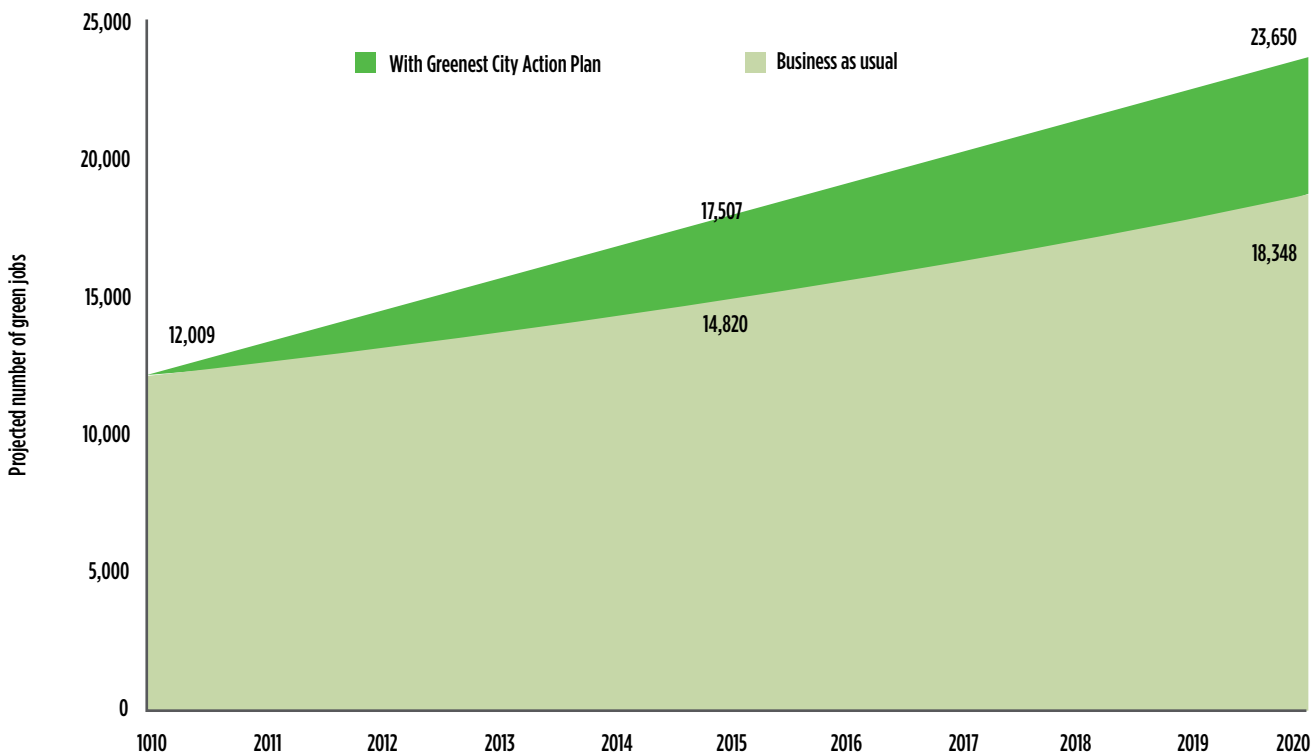
The base projections or the 'business as usual' approach projected the growth of the green sectors by considering a status quo green growth rates. The analysis provided compounded annual growth rate of nearly 4.3 percent, thus contributing to the creation of approximately 6,000 green jobs between 2010 and 2020.

The Greenest City projections approach considered the significant efforts on part of the city as part of the draft Greenest City Action Plan. The dedicated policies, programs and projects proposed in the plan were matched with job creation potential in each of the green sectors, with estimated projections for

job growth as a result of these efforts. This analysis provided a compounded annual growth rate of seven percent, which is significant enough to double the number of green jobs by 2020. These Greenest City strategies would lead to approximately 6,000 additional green jobs overall, assuming full implementation of each of the planned policies, programs and projects.



Figure 6: Forecasted green jobs growth (Greenest City projections)

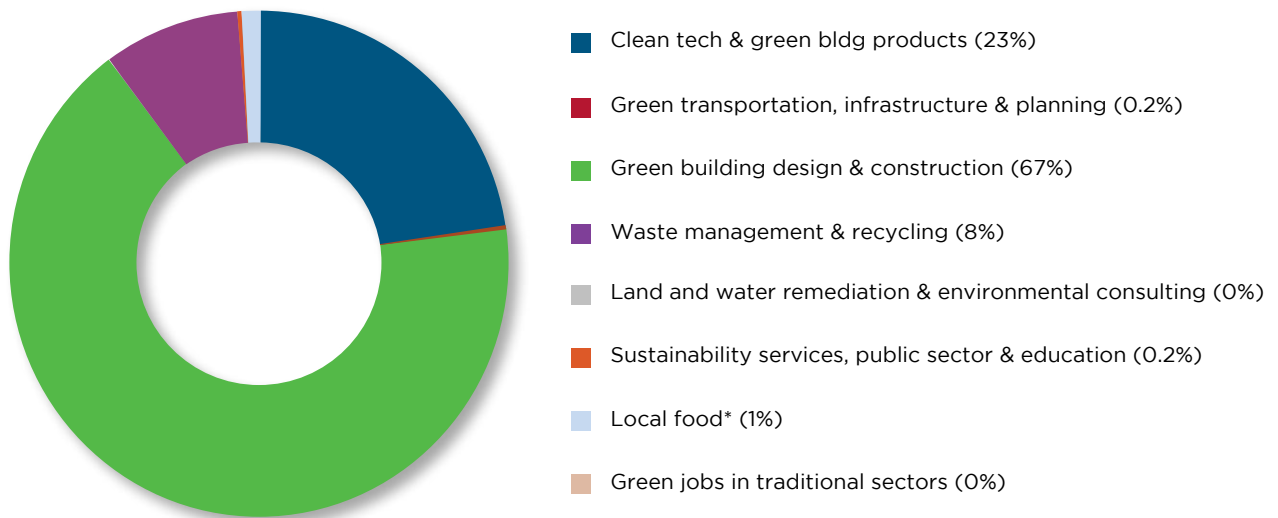


The Greenest City strategies accelerate the growth rate in many green sectors. In particular, nearly 70 percent of the jobs associated with the policies, programs and projects identified in the draft

Greenest City Action Plan are within the green building sector.

Figure 7: GC2020 working group distribution of green jobs by sector (11,000)

Proportion of jobs created in each sector between 2010 and 2010



APPENDICES

Appendix A: Green Jobs Summary: Survey-based Methodology

Sectors	Companies	Vancouver Green Jobs
Alternative, Renewable and District Energy and Power Distribution	87	2730
Green Building Products, Technology and Materials	57	226
Green Building Design and Construction	13	1353
Sustainability Services and Carbon Finance	9	178
Waste Management and Recycling	24	1410
Water Management & Treatment	23	63
Land and Water Remediation and Environmental Consulting	142	1374
Green Infrastructure, Transportation and Planning	7	2284
Public Sector and Non-Profits	54	1097
Green Businesses in Traditional Sectors	36	222
Green Departments in Traditional Businesses	15	72
Total	468	11009

Appendix B: Green Jobs Summary: Census-based Methodology

The survey results were corroborated by comparison with the census method results. This approach assumes 1/3 of census Metropolitan

Area Vancouver jobs (Metro Vancouver jobs) are located in the city of Vancouver. The figures differ by approximately 7 percent.

Sectors	Vancouver Green Jobs
Alternative, Renewable and District Energy and Power Distribution	3095
Green Building Products, Technology and Materials	1444
Green Building Design and Construction	4383
Sustainability Services and Carbon Finance	188
Waste Management and Recycling	3642
Water Management & Treatment	1049
Land and Water Remediation and Environmental Consulting	5717
Green Infrastructure, Transportation and Planning	5882
Public Sector and Non-Profits	3067
Green Businesses in Traditional Sectors	2076
Green Departments in Traditional Businesses	186
Total Metro Vancouver green jobs	30729
Total City of Vancouver green jobs	10243

Appendix C: Green Jobs Summary: Globe Input-Output Methodology

Sectors	Green Jobs	
	Clean and Alternative Energy Energy Management & Efficiency Green Building Environmental Protection Carbon Finance and Investment Knowledge	BC
	Mainland & Southwest	75,703

Appendix D: Green Jobs Detailed Results: Census-based Methodology

NAICS code	Sectors and Industries	Metro Vancouver jobs	Intensity Ratio	Vancouver Green Jobs
	Alternative, Renewable and District Energy and Power Distribution	6,285	0.492	3,095
2211	Power generation and supply	3,635	0.800	2,908
237130	Power and Communication Line and Related Structures Construction	270	0.250	68
3336	Engine, Turbine and Power Transmission Equipment Manufacturing	745	0.05	37
	Alternative Fuel Equipment and Vehicles (sub sector)	1,635	0.05	82
4151	Motor Vehicle Wholesaler-Distributors	755	0.05	38
4412	Other Motor Vehicle Dealers	880	0.05	44
	Green Building Products, Technology and Materials	8,483	0.17	1,444
3211	Sawmills and Wood Preservation	3,810	0.100	381
3241	Petroleum and coal products manufacturing	345	0.010	3
3351	Electric Lighting Equipment Manufacturing	605	0.100	61
3353	Electrical equipment manufacturing	810	0.100	81
541420	Industrial Design Services	1,190	0.050	60
321911	Wood Window and Door Manufacturing	643	1.000	643
3334	Ventilation, Heating, Air-Conditioning and Commercial Refrigeration Equipment Manufacturing	1,080	0.200	216
	Green Building Design and Construction	49,532	0.088	4,383
2300AO	Residential building construction [2300AO]	22,005	0.100	2,201
2300BO	Non-residential building construction [2300BO]	5,250	0.050	263
230010	Other activities of the construction industry	500	0.050	25
531310	Real Estate Property Managers	1,613	0.020	32
541310	Architectural Services	4,096	0.100	410
541320	Landscape Architectural Services	3,072	0.100	307
541330	Engineering Services	4,096	0.100	410
541340	Drafting Services	2,048	0.070	143
541350	Building Inspection Services	3,072	0.070	215

NAICS code	Sectors and Industries	Metro Vancouver jobs	Intensity Ratio	Vancouver Green Jobs
541410	Interior Design Services	1,785	0.100	179
561730	Landscaping Services	1,995	0.100	200
	Sustainability Services and Carbon Finance	4,071	0.046	188
523910	Miscellaneous Intermediation	1,373	0.030	41
523990	All Other Financial Investment Activity	1,373	0.030	41
541619	Other Management Consulting Services	1,325	0.08	106
	Waste Management and Recycling	3,642	1	3,642
418110	Recyclable Metal Wholesaler-Distributors	484	1	484
418120	Recyclable Paper & Paperboard Wholesaler-Distributors	484	1	484
418190	Other Recyclable Material Wholesaler-Distributors	484	1	484
562110	Waste Collection	865	1	865
562210	Waste Treatment and Disposal	925	1	925
562920	Material Recovery Facilities	200	1	200
562990	All Other Waste Management Services	200	1	200
	Water Management & Treatment	1,300	0.807	1,049
2213	Water, Sewage and Other Systems	1,030	1	1,030
237110	Water and Sewer Line & Related Structures Construction	270	0.070	19
	Land and Water Remediation and Environmental Consulting	6,946	0.823	5,717
541330	Engineering Services	4,096	0.700	2,867
541620	Environmental Consulting Services	2,650	1	2,650
562910	Remediation Services	200	1	200
	Green Infrastructure, Transportation and Planning	10,720	0.549	5,882
485	Transit and Ground Passenger Transportation [485]	9,720	0.6	5,832
230G	Other Engineering Construction [230G]	1,000	0.050	50
	Public Sector and Non-Profits	39,440	0.078	3,067
5417	Scientific Research and Development Services	5,800	0.1	580
611210	Government Community Colleges and CEGEPS [GS2220]	7,765	0.05	388
611310	Universities	19,475	0.05	974

D: Green Jobs Detailed Results: Census-based Methodology *continued...*

NAICS code	Sectors and Industries	Metro Vancouver jobs	Intensity Ratio	Vancouver Green Jobs
611430	Professional and Management Development Training	156	0.05	8
611510	Technical and Trade Schools	925	0.03	28
813310	Social Advocacy Organizations	1,395	0.5	698
911910	Other Federal Government Public Administration	3,501	0.1	350
912150	Provincial Regulatory Services	423	0.1	42
	Green Businesses in Traditional Sectors	43,466	0.048	2,076
3221	Pulp, Paper and Paperboard Mills	1,720	0.05	86
325999	All Other Miscellaneous Chemical Product Manufacturing	128	0.02	3
3324	Boiler, Tank and Shipping Container Manufacturing	545	0.02	11
41	Machinery and Equipment (Wholesale Sales)	14,385	0.03	432
334A	Electronic Product Manufacturing [334A]	2,000	0.05	100
334110	Computer and Peripheral Equipment Manufacturing (Semiconductor and Other Electronic Component Manufacturing)	730	0.01	7
334512	Measuring, Medical and Controlling Devices Manufacturing	655	0.05	33
1114	Greenhouse, Nursery and Floriculture Production	493	1	493
541510	Computer Systems Design and Related Services	22,810	0.04	912
	Green Departments in Traditional Businesses	4,710	0.039	186
3359	Other electrical equipment and component manufacturing	1,725	0.05	86
1151	Support Activities for Crop Production	330	0.08	26
1153	Support Activities for Forestry	675	0.05	34
213	Support activities for Mining and Oil and Gas Extraction	1,980	0.02	40
	Total Metro Vancouver green jobs			30729
	Total Vancouver green jobs (x1/3)			10243

Endnotes.

1. <http://vancouvereconomic.com/page/green-economic-development>: June 2011
2. <http://vancouvereconomic.com/page/green-economic-development>: June 2011
3. BC Green economy report: Building a strong low carbon future- Globe Foundation: February 2010
4. VEC 'Vancouver's Green Economy Report' - Hurrian Peyman, ISIS
5. Green job employment numbers for industries that only partially contain green jobs are calculated using intensity ratio (I.R) where I.R. = Number of green jobs in a particular industry/ Total number of jobs in that industry
6. 'People without Jobs, Jobs without People: Ontario's Labour Market Future', Rick Miner, Ph.D. February 2010
7. Statistics Canada 2006, VEC Green Economy Study 2010. Due to overlap of some industry sectors and multiple sources, the data do not sum to 100 percent
8. Globe Foundation, California Department of Employment Development, New York City EDC, VEC
9. BC Hydro 'PowerSmart Employment Impacts'; Global Insights; CleanEdge 'CleanTech Job Trends 2009'; VEC 'Economy of Local Food'; McGraw-Hill Construction
10. Details of the plan can be accessed at www.talkgreenvancouver.ca

