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ECO CANADA
Environmental Careers Organization

The Green Jobs Map

Supplementary Ontario Report

LABOUR MARKET RESEARCH STUDY

2012

EVERGREEN

A national charity since 1991, Evergreen empowers Canadians to take a hands-on approach to improving the health of our cities. This research report is a project of Evergreen CityWorks, a new initiative that aims to improve the environmental and social health of our communities, and accelerate our transition to a green economy.

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ECO Canada develops programs that help individuals build meaningful environmental careers, provides employers with resources to find and keep the best environmental practitioners, and informs educators and governments of employment trends to ensure the ongoing prosperity of this growing sector.

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ECO Canada Labour Market Research investigates current environmental skill and labour trends within the environmental profession and provides up-to-date, timely and relevant insights that can be applied in policy, business, and educational contexts. The complete collection of reports is available at eco.ca.

THE GREEN JOBS MAP

Supplementary Ontario Report

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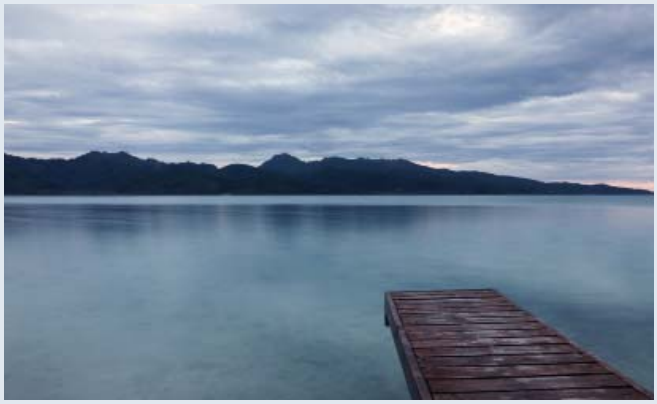
FOREWORD

This supplementary report on green employment in Ontario is based on a larger study performed by ECO Canada entitled, *The Green Jobs Map: Tracking Employment through Canada's Green Economy*. While the full report explores overall national trends for key contributing green sectors, job demand and competency requirements in Canada's green economy, the present study focuses on the unique characteristics of green employment in Ontario.

Since the findings from this regional report were developed using the methodology and pool of job vacancy advertisements used in the national study, readers are encouraged to read the full national report in conjunction with the present study.

EXECUTIVE SUMMARY



> "If we are to promote a green economy we have to link it to employment opportunities."
>
> GREEN ECONOMY EXPERT PANELIST

The Green Jobs Map report series is intended to function exactly as its name implies. It is a practical resource for professionals, policy-makers, researchers and employers that charts the under-explored terrain of current employment opportunities in both Canada and Ontario's green economies.

Accordingly, *The Green Jobs Map* establishes detailed and relevant information on the major characteristics of green jobs, from the top sectors where these occupations can be found to the types of jobs available and the main requirements for working in these roles. This is a level of detail that involves going beyond simply counting the sheer number of green jobs. Instead, this research determines what the key requirements are for these jobs and how both existing and future green workers can tailor their professional development to ensure that they are on the right track to employment success.

By focusing specifically on Ontario, *The Green Jobs Map – Supplementary Ontario Report* has the added advantage of establishing detailed information on how green employment in this province compares to national trends, as well as determining what factors make Ontario's green job landscape unique.

In order to navigate successfully to the growing variety of careers in Ontario's greening economy, individuals need to be aware of the key characteristics that differentiate green employment in this province.

The following are five of the most essential distinguishing traits of Ontario's green employment landscape.

I. Compared to the rest of Canada, Ontario has higher job demand in Renewable/Green Energy, Sustainability Planning & Urban Design, and Energy Efficiency & Green Building.

Nationally, Renewable/Green Energy accounted for 11% of green job vacancies, while Sustainability Planning & Urban Design had 8% and Energy Efficiency & Green Building had 4%. Yet in Ontario, Renewable/Green Energy had 13% of new job postings, Sustainability Planning & Urban Design had 11% and Energy Efficiency & Green Building had 8%, as indicated in Table 1 below.

The fact that Ontario has comparatively higher employment demand in these three sectors is likely a reflection of a major legislative push to position the province as a green economic leader. Recent initiatives such as the Green Energy and Economy Act, the Water Opportunities Act, the Greenbelt Act and the expanded Green Energy Act Alliance program are linked to an increase in business activities, investments, and employment in related green sectors.[1]

In the specific case of the Energy Efficiency & Green Building sector, strong job demand has coincided with a suite of important energy efficiency programs and services in the province. These include the Toronto Region Sustainability Program (TRSP), City of Kitchener Energy Management Program, the Ontario Power Authority's Conservation Fund and Waterloo Region's Residential Energy Efficiency Project (REEP), just to name a few.[2] Additionally, this sector is experiencing growth as green design continues to be a strong priority in Ontario. Based on recent estimates from the Canada Green Building Council, there were 1,487 LEED projects in Ontario from 2003 to the present, which accounted for 37% of all such projects in Canada.[3] All of these activities in green building design, energy efficiency, and sustainable building management require workers with relevant environment-related expertise.

Table 1

Percentage Job Vacancies by Green Sector, Ontario and Canada, March-May 2012

SECTOR	GREEN ECONOMY SECTOR	SHARE OF JOB POSTINGS IDENTIFIED	
		CANADA	ONTARIO
1	Renewable/ Green Energy	11%	13%
2	Energy Efficiency & Green Building	4%	8%
3	Resource Conservation	21%	13%
4	Alternative/Sustainable Transportation	2%	3%
5	Environmental Protection	38%	35%
6	Green Manufacturing	0%	1%
7	Green Services	10%	7%
8	Sustainability Planning / Design / Urban Design	8%	11%
9	Carbon and Climate Change Mitigation	1%	1%
10	Green Retail	1%	1%
11	Eco-Tourism	5%	7%
	Total	**100%**	**100%**

[1] Blue Green Canada, *Building Ontario's Green Economy: A Road Map*, 2012.

[2] Natural Resources Canada, *Directory of Energy Efficiency and Alternative Energy Programs in Canada*, Retrieved October 26, 2012 at: http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?attr=0

[3] Canada Green Building Council, *LEED Projects in Canada*, Retrieved October 26, 2012 at: http://www.cagbc.org/Content/NavigationMenu/Programs/LEED/ProjectProfilesandStats/default.htm

Further evidence of the impact of policy on green growth and jobs can be seen in Ontario's Renewable/Green Energy sector. It makes sense that industries in this sector have high green job vacancies, since Renewable/Green Energy is characterized by substantial new investment. While the Green Energy and Economy Act is estimated to have supported the creation of 13,000 jobs already, expansion of the Green Energy Initiative is expected to increase employment by 35,000 new positions per year with a $18.6 billion investment over 10 years.[4] Thus, the Renewable/Green Energy sector not only accounts for significant green employment demand today, but it is also likely to experience strong job growth into the future.

II. Ontario's Environmental Protection sector has a high demand for certain region-specific occupations

Similar to national green employment trends, the Environmental Protection sector accounts for the greatest percentage (35%) of green job openings in Ontario. Yet within this sector in the province, certain occupations are in especially high demand.

Based on an analysis of the job titles that appeared the most frequently in job postings, Ontario had a relatively high number of vacancies in water quality, including such positions as hydrologists, hydrogeologists, and project engineers for water supply and treatment.

A significant number of job postings were also linked to work in air quality, with employers in Ontario looking for air quality engineers, air quality scientists, and air quality compliance specialists. Additionally, green companies were frequently hiring for positions in environmental health and safety, and mentioned such job titles as health and safety manager, coordinator, trainer or compliance specialist in their job listings.

Finally, several Ontario-based employers had vacancies for workers to perform and manage site assessment, rehabilitation and remediation, especially in relation to the mining industry.

Overall, the prevalence of these green occupations in the Ontario sample demonstrate that there is a strong focus in this province on environmental activities related to water and air quality, environmental health and safety, and site assessment and reclamation. Jobs associated with these areas are clearly in a phase of growth, and as such, these occupations present good opportunities for green job-seekers in Ontario.

III. A higher than average proportion of not-for-profit organizations are hiring green workers in Ontario

A higher proportion of green employers in this province are not-for-profit organizations, reflecting the importance of environmental communications and public awareness, as well as environmental education and training, for many green job opportunities in this region.

Based on the 2006 Census, 1.3% of Ontario's total labour force was employed in the non-profit sector, including social, civic, and grant-making organizations. Yet remarkably, the present study found that not-for-profit employers accounted for 23% of green job vacancies.

The comparatively high number of not-for-profit organizations hiring green professionals relates to the types of work and associated competencies that are particularly prominent in Ontario. Work activities that involve environmental communications and public awareness, and environmental education and training are a high priority. Twenty one percent of employers in Ontario listed proficiency in environmental communications and public awareness as a requirement, while 22% of organizations mentioned a need for job candidates with competencies in environmental education and training.

[4] Robert Pollin & Heidi Garrett-Peltier, *Building the Green Economy: Employment Effects of Green Energy Investments for Ontario*, 2009.

IV. The bulk of green job vacancies are in Ontario's private sector and these jobs are concentrated amongst a specific type of green employer

This research found that 58% of green job opening were at private sector employers. Amongst these companies, 67% of the green job postings were at environmental consulting, engineering or architectural firms. Most of these companies also represented mid to large size firms. Forty-nine percent of the job listings came from companies with over 50 employees, and 30% of the green job openings were at large companies with over 500 employees.

This finding highlights another unique feature of green employment in Ontario. Nationally, mid to large size companies are not the primary employers of green workers, with most of the employment demand coming from small organizations with either less than 20 employees or a single, self-employed professional.[5]

Furthermore, the type of private firms hiring green workers in Ontario has additional implications for the main green competencies that are in demand. When the majority of private companies hiring green professionals are in environmental consulting, engineering or architecture, it makes sense that the top competencies required for these positions are in Natural Resources Planning and Management (40% of job vacancies), as well as Corporate Environmental Program Planning and Implementation (28% of job listings) and Environmental Sampling and Analytical Work (21% of job postings). Last but not least, the majority (63%) of private firms hiring green workers are also exporters, making these green employers important contributors to Ontario's overall economic growth.

These findings suggest that major recent legislation in this province has supported significant private sector development as Ontario makes the transition to a greener economy. The Green Energy and Economy Act (GEA) is one excellent example of the impact that policy has had on recent green industry growth. Widely recognized as one of the strongest renewable energy policies in North America, the GEA has attracted over 30 green energy manufacturing facilities to Ontario, stimulated new business activity in existing industries, such as hydroelectric power, and created over 13,000 jobs.[6] This legislation has focused investment activity in six key green areas: conservation and demand management, hydroelectric power, on-shore wind, bioenergy, waste energy recycling and solar power. As a result, it is likely that industries in these areas will continue to see considerable business, investment and employment growth.

V. For green professionals in Ontario, there are certain competencies that will provide them with greater career flexibility and resilience.

Both the national and Ontario green economy reports examined which competencies were in high demand across the greatest number of green sectors. Canada-wide, the top three competencies with high transferability across green industries were Environmental Business, Technology & Product Development, Environmental Training & Education, and Natural Resources Planning & Management.

By contrast, there were different competencies that had high demand and high inter-sector transferability in Ontario. In this province, Natural Resources Planning & Management was in much stronger demand (39% of job listings) across a greater number of sectors (8 different green sectors) when compared to national trends. Environmental Sampling & Analytical Work was another competency that was especially important for Ontario-based companies – proficiency in this competency was requested in 21% of job postings and in 8 different sectors.

Lastly, Environmental Communications & Public Awareness, as well as Environmental Training and Education, were two competency areas that shared an equivalent level of importance for companies in Ontario's green economy. Both of these competencies were in demand for 21% of job postings across 7 green sectors. Table 2 provides a summary of the differences between findings on Canada and Ontario for high demand and highly transferable competences.

[5] ECO Canada, *Profile of Canadian Environmental Employment*, 2010.

[6] Blue Green Canada, *Building Ontario's Green Economy: A Road Map*, 2012.

Table 2

Transferability and Demand for Environmental Competencies, Canada and Ontario

COMPETENCY CATEGORY	CANADA		ONTARIO	
	SECTORS REQUIRING THE COMPETENCY (Out of 11 Green Sectors)	SHARE OF JOBS REQUIRING THE COMPETENCY	SECTORS REQUIRING THE COMPETENCY (Out of 11 Green Sectors)	SHARE OF JOBS REQUIRING THE COMPETENCY
A – Environmental Impact Assessments	7	10%	4	5%
B – Site Assessment (RRR)	8	21%	7	11%
C – Regulatory & Enforcement	7	23%	6	13%
D – Pollution Prevention, Abatement & Control	3	1%	1	2%
E – Climate Change	7	3%	4	3%
F – Waste Management	6	3%	3	4%
G – Water Quality Management	8	21%	7	16%
H – Environmental Sampling & Analytical Work	9	11%	8	21%
I – Policy Development & Planning	8	8%	6	6%
J – Planning, Monitoring & Reporting for Sustainability	6	15%	4	8%
K – Corporate Environmental Program Planning & Implementation	8	32%	6	24%
L – Environmental Safety	9	23%	7	17%
M – Natural Resources Planning & Management	9	28%	8	39%
N – Environmental Training & Education	10	23%	7	21%
O – Environmental Research	7	7%	5	6%
P – Environmental Business, Technology & Product Development	10	31%	7	17%
Q – Environmental Communications & Public Awareness	9	12%	7	21%

These findings demonstrate that there are clear regional differences when it comes to the competencies that will allow professionals to have the greatest career flexibility and resilience. Environmental workers in Ontario can benefit by focusing their professional development around the top competencies that are uniquely important in this province (Natural Resources Planning & Management, Environmental Sampling & Analytical Work, Environmental Communications & Public Awareness, and Environmental Training & Education). By doing so, these professionals will ensure that they are not only more marketable to employers when they are seeking new job opportunities, but that they are also able to transition more easily from work in one sector to another.

Ultimately, these five points on the unique characteristics of green employment in Ontario are critical for effective workforce development, training programs and individual career planning. There are a number of factors that clearly make green jobs in Ontario different when compared to green employment trends across Canada. As a result, simply knowing about green employment on a national level is not enough for professionals considering their career options in this province. Furthermore, this review of the unique aspects of green jobs in Ontario demonstrates the strong linkages between recent legislation to promote the green economy in Ontario and the significant employment demand in specific green sectors, such as Renewable/Green Energy or Energy Efficiency and Green Building.

PROJECT BACKGROUND

Emergence of a Green Economy

The notion of fostering a green economy has developed out of a rich historical context rooted in environmental protection, resource conservation, and sustainable development. Much of the recent interest in green growth draws on ideas about environmental management that have been building for decades, if not centuries, dating back to the earliest attempts to manage waste and sanitation. In the context of emerging clean technology to improve energy and resource efficiency and sustainability, a green economy can be understood as the latest evolution of environmental activities. It is part of a larger enduring trend.

Initial attempts to address environmental concerns in the late 19th to early 20th century often positioned environmental protection as a cost, instead of an opportunity. Initiatives like the Conservation Movement made sense in the face of the erosion, climate change, and poor water quality caused by unregulated logging during the 1850s to mid-1900s. However, the notion of environmental protection did not receive widespread support because of its presumed conflict with business growth. As Peterson Del Mar notes, "Conservation fared poorly when it appeared to threaten peoples' livelihoods."[7]

Through a series of high profile environmental disasters, the issues of environmental degradation and pollution moved up the social list of priorities from "nice to have" to urgent problems requiring immediate mitigation. Communities realized that they could no longer afford the steep human costs incurred by catastrophes like Love Canal or Three Mile Island. Subsequently, new legislation was enacted to support clean air, water and solid waste management and this coincided with the establishment of national and provincial environmental regulatory agencies to enforce laws and rehabilitate damaged eco-systems.

Following the World Commission on the Environment in 1987, environmental awareness took a new turn. In contrast to the previous approach of reacting to shocking environmental disasters, public attention shifted to long-term planning that coupled the importance of economic development with the need for effective environmental management. The Brundtland report's famous definition of sustainable development[8] appealed to policy-makers, industry leaders and concerned citizens alike. The concept of integrated environmental and economic development struck a happy medium among diverse stakeholders, but the sustainability movement was hampered by a number of issues. In order to satisfy numerous competing interests and arrive at a consensus, the concept of sustainability functioned as an abstract principle with much room for interpretation. The lack of a shared definition and consistent criteria for sustainable development not only made it difficult to link sustainability to practical outcomes, but also opened the door to superficial and inadequate attempts to meet sustainability objectives.

Out of this historical context, the green economy has emerged as the next opportunity to address environmental, economic and social concerns. Accordingly, the present transition to a greener economy draws on ideas about environmental management that have been building for some time. These include the need for a long-term, integrated approach to sustainable development and the importance of recognizing the protection of the environment as an opportunity instead of a cost.

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[7] David Peterson Del Mar, *Environmentalism*, Harlow: Pearson Education Ltd., 2006.

[8] The Brundtland definition of sustainable development is, "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." United Nations' World Commission on the Environment and the Economy, *Report of the World Commission on Environment and Development: Our Common Future*, 1987.

What makes the concept of a greener economy unique from its predecessors, however, is the remarkable currency it enjoys throughout mass media and political discourse. Over the course of the research for this project, it was apparent that the popular perception of a green economy involves at least six key components. These include:

1. Economic prosperity based on sustainable development

A major driver behind the concept of a green economy is the notion that the environment and the economy do not have to be two mutually exclusive and contradictory objectives. Consequently, the shift to greener practices involves making environmentally-conscious decisions that still support long-term increases in profit and significant returns on investment.

2. New technologies, industries and areas of growth

This aspect of green is one of the most popular when people think of a green economy. As a growing number of governments, businesses and consumers commit to conserving resources and reducing environmental impact, innovative new technologies and industries have proliferated. From wind power to green roofs, the growth of a green economy relies on the ongoing development of creative solutions to environmental challenges.

3. Valuing natural capital and assets

One of the most powerful components of a green economy is the idea that natural resources have a value when left in their original state, and not only when they have been developed for industrial use. Thus, it has become increasingly important for businesses and policy-makers to establish an economic value for natural assets, as well as to consider how environmental degradation presents a form of economic loss that must be counted against whatever profits are generated through the unmitigated use of natural resources.

4. Minimizing harmful environmental impact and increasing efficiency

This is the most essential part of what it means to be green. Businesses who claim to produce green products or use green processes must demonstrate how these products and processes generate less waste, minimize emissions, use resources more efficiently, reduce environmental risk and/or improve health and safety. Establishing consistent standards for these green activities is essential for avoiding green washing, in which organizations make superficial and inadequate attempts to demonstrate environmentally-responsible practices.

5. Creating lasting social and ethical benefits

The development of the green economy represents a valuable opportunity to do things right, this time around. As a result, green has also come to be associated with corporate social responsibility and the triple bottom line (people, planet, profits) in which environmental and economic concerns share equal importance with fair and ethical social decisions. In this manner, the adoption of green practices often coincides with the development of fair trade, equitable living wages, and alternate forms of employee compensation that acknowledge the importance of work-life balance and a healthy lifestyle.

6. Increases environmental awareness and environmentally-responsible lifestyles

Going green does not start at the level of big businesses and governments – it starts with the choices of individual consumers and voters. Through spreading awareness of environmental issues and a marked increase in green marketing, green living has become a major, mainstream concept. A rapidly growing number of people are choosing to purchase green products, reduce waste in their homes, and support environmental policies. In turn, the combined impact of these decisions has shaped large-scale policy and business planning.

Within these six different factors, the concept of a greener economy manages to address many of the most pressing social, environmental and economic issues affecting communities around the world today. In this way, the green economy has become a powerful driver of positive, long-lasting change through the growth of new industries, major technological advancements, and improved employment prospects.

GREEN CAREER PATH #1

FINDING THE ULTIMATE GREEN CAREER IN RESEARCH AND POLICY DEVELOPMENT

The transition to a greener economy in Canada is clearly a highly dynamic and multi-faceted process. As a result, there are numerous promising green careers available to those who are interested in identifying and developing the policies that are required to support green growth. In the following profile, one such professional has risen to the challenge of both researching the green economy and developing the policies that are needed for its growth.

Meredith Severin

Bachelor of Arts Honours, Carleton University/ University of Victoria, Master of Environment and Management Candidate (2012) Royal Roads University

For Meredith Severin, the development of the green economy has sparked a dynamic career in research and policy.

To start out on this green career path, Meredith completed Carleton's interdisciplinary program in Environmental Studies. This program provided an excellent basis for understanding complex environmental issues by straddling both social and applied sciences while also drawing upon complementary disciplines, like ecology and political science.

After two years in Ottawa, Meredith had the opportunity to join the University of Victoria's parallel program as a visiting student. The prospects of exploring the West Coast and working as a research assistant in the Department of Geography were too much to resist. Upon returning to Carleton to graduate from her program, Meredith went on to work on a range of environmental and sustainability issues in the ENGO sector, as well as with municipal and provincial governments.

Meredith's interest in policy development led her to the Foreign Commonwealth Office at the British Consulate-General in Vancouver, where she worked on climate change and energy policy. She notes, "I never knew that policy work could be so dynamic and fast-paced. I enjoy moving the goal posts, whether via new objectives and projects, or developing new specialties. I thrive on finding new ways to challenge myself to do better."

This passion for continuous professional growth and learning is clearly evident in Meredith's current endeavors. Currently, she is completing a Master's degree at Royal Roads University and writing a thesis on the green economy as part of this program. Her research on this topic has presented a number of exciting opportunities and thought-provoking discussions.

According to Meredith, "I have been able to engage knowledgeable people from across sectors on the green economy, and have enjoyed discerning the various angles and techniques used to dissect this complex topic." She observes further that, "Discussions always have to take into consideration organizational mandates and this is a helpful reminder of the subjectivity and contextual dependence that is often at play. I find this fascinating."

> "I never knew that policy work could be so dynamic and fast-paced."
>
> MEREDITH SEVERIN

When it comes to developing a vision of the growth and development of the green economy, Meredith's research offers important insights. "My research has me currently digging through dozens of studies and reports to inform myself as to what this might actually look like and it would seem that Canada has to make bold investments in the development of the green economy. We can't hedge our bets. One look at China, the economic powerhouse, and we can see that investment in green technology and alternative energy is an area of massive opportunity that we should not ignore."

Meredith also notes several challenges that must be addressed in order to enable Canada's shift to a greener economy. She states: "While there are strengths to a variety of approaches to fostering a green economy across provinces and municipalities, there are inherent weaknesses too. There are programs and policies, legislation and regulations that are creating a patchwork across Canada, North America and the world. The lack of certainty is not conducive to growing business or making sound 'over-the-horizon' decisions." She adds that, "Greater coordination and cooperation might help lend certainty to initiatives like the WCI or Ontario's FITs for green energy developments. We're all moving in the same direction, but sometimes it feels like a bit of a three-legged race."

In looking back at what has made her green career path especially interesting so far, Meredith mentions her policy work with emerging carbon markets in the EU and North America. As she observes, "This represents a paradigm shift – the beginning of a completely different way of making sense of markets, costs and consumer choices. It has not been, and will not be, an easy shift but changes of this scale never are. Nevertheless, it has been exciting to develop my career alongside a fundamental change like this one."

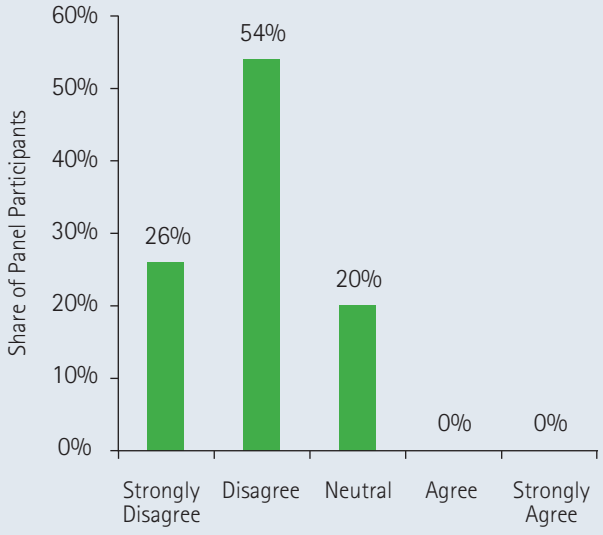
To make the most of an exciting and highly dynamic career focused on research and policy development, Meredith emphasizes the importance of adaptability in aspiring green professionals. She states, "Sometimes apparent distractions need to be considered for their ability to help us refocus. A student once asked the eminent psychologist Carl Jung for the shortest path to her life's goal. Without hesitation, Jung replied: 'The detour.'"

ABOUT THIS STUDY

In popular discourse and major political circles, the green economy has proved to be an irresistible topic. Such allure stems from both the urgency of the problems currently threatening the health of our environment and economy, as well as the breadth of the solutions that the green economy can provide. Yet the same characteristics that make the green economy so popular are also those that can render it meaningless and ineffective. When the green economy means so many different things to so many people, there's the risk of never really arriving at a clear idea of what the green economy actually encompasses or which strategies can best support its growth.

Figure 1

Expert Survey Results for the Question:
To what extent do you agree with the following statement: "A green economy is a concept that is well-understood by most people."



Green Economy Expert Panel, n=35

The range of different perspectives on the green economy was strongly apparent in this study's survey of expert researchers and business leaders directly involved in the green transition. When asked whether there is a commonly-shared understanding of the green economy amongst most people, 80% of these experts believed that the green economy is not a concept that most individuals understand well, as noted in Figure 1. As a result, there is clearly a need for relevant and clear information about what the transition to a greener economy actually means and how this transition impacts the economy, businesses and jobs.

By focusing on employment, *The Green Jobs Map - Supplementary Ontario Report* offers insight into one tangible and particularly salient feature of the green economy. Through the emergence of new industries and the expansion of environmental practices across all sectors, the green economy has produced clear changes in the types of occupations and work activities of thousands of professionals. While there may be a general awareness of these changes, there is still a lack of detailed information on how these employment effects translate into skills requirements, training and career development.

> “...having a real impact on a greener economy can't be restricted to just a few sectors.”
>
> GREEN ECONOMY EXPERT PANELIST

Based on the existing body of research literature on jobs linked to a green economy, these occupations pervade all industries, but remain difficult to define, isolate, and count. Studies in the US have estimated that jobs linked to a green economy represent between 0.3 per cent and 2.0 per cent of total US employment, or as many as 2.7 million US workers.[9] In 2010, ECO Canada found that 4.0 per cent of Canadian workers spend at least 50 per cent or more of their time on environmental tasks, for a total of 682,000 workers.[10] The number of jobs supporting a greener economy is clearly significant, but descriptions of these jobs are often anecdotal, lacking cohesive and systematic information on the demand for green occupations, skills and knowledge.

The Green Jobs Map – Supplementary Ontario Report explores the previously uncharted territory of key green occupations and skills requirements in Ontario. Such information not only meets the needs of professionals working today in green industries, but also assists students and transitioning workers who are considering which type of training to pursue or what industry to make a career switch into. With the growth of the green economy showing no signs of stopping, policy-makers, businesses and job-seekers need a clear map of where green employment is heading. *The Green Jobs Map – Supplementary Ontario Report* adds new and essential detail to this outline of green employment by:

- Identifying which sectors have the strongest employment demand, both in Ontario and across Canada
- Profiling the types of green employers that are hiring in Ontario according to such characteristics as size, type and ownership
- Highlighting the specific technical and transferable competencies that green employers mention most in their job listings
- Determining which competencies are in the highest demand across the greatest number of sectors in Ontario, and thus indicating which competencies offer the greatest career resilience and versatility
- Uncovering the specific job positions that green employers are looking to fill

[9] Brookings Institution – Battelle, *Methodological Appendix, Sizing the Clean Economy*, 2011: http://www.brookings.edu/~/media/Series/resources/0713_clean_economy_appendix.pdf

[10] ECO Canada, *Profile of Environmental Employment*, 2010. Note that 12.2 per cent of Canadian workers have some environmental tasks.

METHODOLOGY

As a major component of the methodology for *The Green Jobs Map – Supplementary Ontario Report*, researchers collected and analyzed a large sample of online job vacancy advertisements. A detailed outline of this methodology is featured in Appendix A. During the months of March through to May of 2012, a total sample was compiled of 44,821 unduplicated job vacancy postings in Ontario. These job listings in Ontario were primarily sourced from the following top 10 websites: workopolis.com; ca.indeed.com; jobbank.gc.ca; gojobs.gov.on.ca; goodworkcanada.ca; workcabin.ca; ejobs.org; eco.ca; eluta.ca; and wowjobs.ca.

Once this total sample of job postings was collected, it was analyzed using a set of computer-based algorithms to identify and classify any environmental competencies that were referenced in the job description. Using this content analysis technique, the research team measured the demand for 17 categories of environmental competencies and knowledge. These categories of environmental competencies were based on ECO Canada's National Occupational Standards (NOS) for environmental employment, in which environmental work is classified first according to formal disciplines (e.g. engineers, chemists, geologists, etc.), and secondly on multi-disciplinary work, or "discipline-plus," developed from experience and professional training. These competencies may be shared amongst many different formal occupations, but are specific to environmental work.

The NOS dictionary of environment-related competencies features 350 competency statements. A full list of these competencies can be seen in Appendix B. The content analysis algorithms were designed to analyze each sentence in the job descriptions and determine the degree of match to competencies in the NOS dictionary, as depicted in Figure 2.

Two content analyses were performed: An analysis that associated NOS statements with sentences in each job description, and an analysis of all sentences in all job descriptions in order to identify clusters of associated concepts and themes. Figure 3 contains a simplified example in which three competency categories are identified: (1) energy (2) policy/legislation and (3) collaboration.

Following this initial categorization of job advertisements that contained content on environmental competencies, additional job listings were collected in Ontario to increase the final sample size from 116 job postings with environmental competencies to 309 job postings with environmental competencies. This increase in the sample size allowed for a more comprehensive analysis of the demand for specific environmental competencies, as well as the demand for these competencies according to particular sectors.

Figure 2

NOS Skills in Current Jobs - Determining the Relationship

Job Descriptions | **What is the Relationship?** | 350 NOS Statements

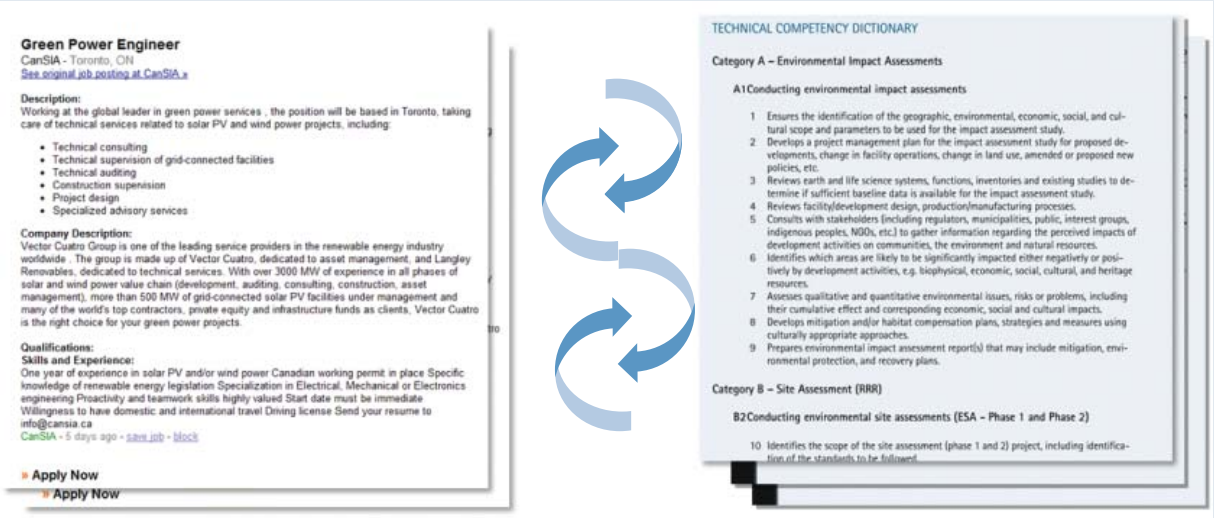


Figure 3

Example: NOS Statement Categories References in a Job Description

In order to link green employment demand to key green sectors, an extensive literature review was also conducted. Based on this review, researchers identified 11 major contributing sectors in Canada's green economy. These sectors are listed in Appendix C. Out of the total list of reviewed reports in Appendix A, three were specific to Ontario. These included:

- *Greening the Economy: Transitions to New Careers*, D. Parsons & Associates
- *Job Opportunities for a Green Economy*, PERI (Political Economy Research Institute).
- *Building the Green Economy: Employment Effects for Green Energy Investments for Ontario*, PERI.

Additionally, a final stage of the research involved a survey with an expert panel of 35 industry leaders and researchers currently involved in the transition to a greener economy. This panel included 17 experts on Ontario's green economy, as indicated in Appendix A. In the survey, these experts provided feedback on the classification of contributing sectors in Canada's green economy, the demand for certain green competencies identified in this study, and the major considerations behind defining and understanding the green economy.

Limitations to the Methodology

This methodology was limited by the fact that data collection was based on online job advertisements. This approach allowed for a much larger sample and more detailed level of analysis than what would have been possible through other methods, such as a survey of companies performing green activities. However, many job openings are not listed online, especially for small to medium-sized companies (SMEs) that do not have the budget available to post their job vacancies on major job search websites. Thus, the undocumented "hidden job market," in which employment opportunities are communicated through networking, word-of-mouth or internal company communications, has not been captured in the present study.

Furthermore, the methodology was limited by the short timeframe (March through May, 2012) in which the job listings were collected. Subsequent research is needed to determine how closely the green employment trends identified here align with findings collected over a longer period of time.

JOB DEMAND IN ONTARIO'S GREEN ECONOMY

Ontario accounted for 39 per cent of Canada's employed labour force, for 40 per cent of all job vacancies linked to a green economy, and for most of Canada's job vacancies (54 per cent) collected during the months of March through May, 2012.

- **During the months of March through May, 2012, a total of 309 job vacancies[11] were identified in Ontario which were strongly linked to supporting a green economy.**[12]
- **Job vacancies linked to a green economy represented approximately 0.7 per cent of all Ontario job postings** (out of a pool of 44,821 online job postings found in Ontario). Industries that represent a similar percentage of Ontario's total labour force include NAICS 711 Performing arts, spectator sports and related industries (0.6 per cent of Ontario employment), NAICS 6211 Offices of physicians (0.7 per cent), NAICS 5312 Offices of real estate agents and brokers (0.7 per cent), and NAICS 5242 Agencies, brokerages and other insurance related activities (0.7 per cent).

> "I think many people would like to know the transition that is required and how they can be positioned in the future to meet the demand of the market."
>
> GREEN ECONOMY EXPERT PANELIST

Table 3

Labour Force and Job Vacancy Postings by Region, March-May 2012

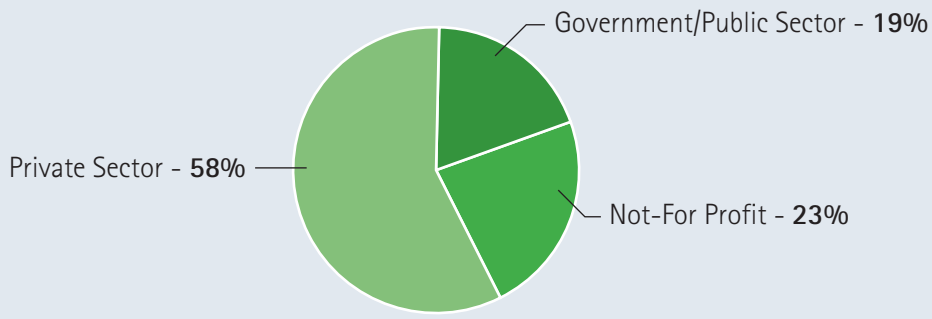
PROVINCE	SHARE OF EMPLOYED LABOUR FORCE (May 2012)	JOB VACANCIES	
		SHARE OF JOB VACANCY ADVERTISEMENTS LINKED TO A GREEN ECONOMY	SHARE OF ALL JOB VACANCY ADVERTISEMENTS
Atlantic Provinces (NL, NB, NS, PEI)	6%	6%	2%
Québec	23%	3%	7%
Ontario	**39%**	**40%**	**54%**
Prairies (MB, SK)	7%	4%	7%
Alberta	12%	22%	22%
British Columbia	13%	23%	8%
Territories	n.a.	3%	0%
Canada (Total)	100%	100%	100%

Sources: Analysis of Job Vacancies, n=771.
Note: Some jobs could not be classified by province; Labour Force Survey, Statistics Canada

[11] This sample of job postings has been collected conservatively, limiting the sample to **only** those jobs that are clearly linked to supporting a green economy through the application of environmental skills and knowledge. Jobs that don't reference environmental skills in the job description requirements – or jobs with scant or vague mention of environmental skills – are excluded. In addition, jobs that are clearly linked to a green economy, but that require few specialized skills, are excluded. Finally, any job that is not directly and clearly linked to supporting a green economy was also excluded.

[12] A total of 835 job vacancies were identified that are linked to a green economy. Out of these jobs, 771 job vacancies clearly identified the province in which the job is located and 40 per cent of these jobs, or 309 job vacancies in total, were identified in Ontario.

Figure 4
Job Vacancies by Sector



- **Governments and public sector employers accounted for 19 per cent of green job vacancies, not-for-profit employers accounted for 23 per cent, and the private sector accounted for 58 per cent.**
- **Within the non-profit sector, most jobs were at social, civic, grant-making, or similar organizations.**
    - Total employment at these types of organizations in Ontario represented 1.3 per cent of Ontario's total labour force in the 2006 Census, but they were responsible for nearly a quarter (23 per cent) of green job vacancies.
- **Green job vacancies were somewhat under-represented in the public sector.**
    - Public sector employment accounted for 23 per cent of total Ontario employment in March 2012[13], but only 19 per cent of green job vacancies.
    - Within the public sector, local governments were the main employer recruiting for green jobs, representing 80 per cent of public sector green job vacancies.
- **Private sector employers accounted for 58 per cent of green job vacancies – compared to 77 per cent of all Ontario jobs. Most green job vacancies were at mid-sized to large firms, many of which were at companies that offer environmental consulting, engineering, or architectural services.**
    - Within the private sector, two-thirds of green job vacancies (67 per cent) were at environmental consulting firms, engineering firms, or architectural firms. The remaining job vacancies existed across a variety of industries including manufacturing (11 per cent of private sector green job vacancies), construction (3 per cent), remediation (2 per cent), waste management (2 percent) and other industries.
    - Most private sector employers in Ontario that were recruiting for green jobs were larger employers. Based on cross-reference information gathered from the Canadian Companies Capabilities database, 49 per cent of green job vacancies were with midsized or larger firms with over 50 employees and 30 per cent of green job vacancies were are at large companies with over 500 employees. Only 21 per cent of vacancies were at small firms with less than 50 employees.
    - The private sector employers recruiting for green jobs were significant contributors to Ontario's economy. In total, 63 per cent of green job vacancies were at firms that are exporters.

[13] Labour Force Survey, Cansim Table 282-0011

GREEN CAREER PATH #2

FINDING THE ULTIMATE GREEN CAREER IN ENVIRONMENTAL PROTECTION

The Environmental Protection sector accounts for the largest percentage of new green job openings in Ontario. For a sense of what a career in this sector involves, the following profile features the valuable experience and advice of a seasoned professional working in this area. The full article for this profile is available in Appendix F.

R. Cecil Burns

CET, EP, CMVP, LTSRP

Environmental Coordinator/Energy Manager at Weyerhaeuser Kenora TimberStrand Plant

For R. Cecil Burns, the path to a rewarding green career has been "a long and winding road," with many key turning points in his impressive thirty-four years as an environmental practitioner.

Cecil set out on this remarkable career journey in 1978, as a graduate of Georgian College's Resources Technology program. After starting out in monitoring municipal and industrial operations, Cecil transitioned into a challenging new role as a Mine Rehabilitation Inspector with the Ministry of Northern Development and Mines. This was a defining career experience for Cecil, since everything was new and he needed to develop different policies and procedures that would fulfill his section's mandate.

Cecil's ability to adapt quickly and learn on the job soon paid off – within a few years he was promoted to Provincial Mine Rehabilitation Specialist. In this role, he coordinated the review of mine closure plans across Ontario and updated relevant sections of the Mining Act, the Mine Rehabilitation Regulation, and contributed to the initial development of the Mining Rehabilitation Code.

Cecil's career success depended not only on his capacity to develop technical expertise, but also on his ability to connect with industry networks. After losing his job to a wave of public sector down-sizing in the mid 90's, Cecil was able to take advantage of this unexpected career detour. As he remembers, "With some contacts that I had made, I became a partner/principal in a small environmental consulting company called Kirtec Resources Ltd. We specialized in assisting mining and other resource based industries." When this company became part of Golder Associates, Cecil stepped into the role of Senior Environmental Specialist, in which he managed mine reclamation projects across North America.

> "College-trained individuals have nearly always had practical training and have been in the field doing real environmental work. Many employers look for these types of skills and experience."
>
> R. CECIL BURNS

Today, Cecil works as the Environmental Coordinator/Energy Manager at Weyerhaeuser's Kenora TimberStrand facility. In this role, Cecil oversees a wide range of activities, from managing the facility's environmental and energy conservation programs to ensuring the facility complies with all regulatory and company environmental requirements.

Looking back at his long and successful career, Cecil has also observed important transitions in his industry. He states: "In the last five years or so, the forest products industry has undergone a huge transformation, most of which has been economic, but also from a regulatory and public perception perspective. To deal with these changes, environmental professionals have had to increase their knowledge and become more adaptable. Many in my type of position have to do more with less, become more conversant with a wider variety of issues, and be more technology savvy."

For those who are considering a career path like Cecil's, he offers this advice: "Find a community college that offers a co-op environmental technology program that has an option to go on and obtain a degree upon graduation from the program. This route not only provides students with some practical work experience, but it also helps them develop the skills that an employer wants. College-trained individuals have nearly always had practical training and have been in the field doing real environmental work. Many employers look for these types of skills and experience."

Table 4

Percentage Job Vacancies by Green Sector, Ontario and Canada, March-May 2012

SECTOR	GREEN ECONOMY SECTOR	SHARE OF JOB POSTINGS IDENTIFIED	
		CANADA	ONTARIO
1	Renewable/ Green Energy	11%	13%
2	Energy Efficiency & Green Building	4%	8%
3	Resource Conservation	21%	13%
4	Alternative/Sustainable Transportation	2%	3%
5	Environmental Protection	38%	35%
6	Green Manufacturing	0%	1%
7	Green Services	10%	7%
8	Sustainability Planning / Design / Urban Design	8%	11%
9	Carbon and Climate Change Mitigation	1%	1%
10	Green Retail	1%	1%
11	Eco-Tourism	5%	7%
	Total	**100%**	**100%**

- **Approximately half of Ontario's jobs linked to a green economy were strongly associated with one of the following 11 green sectors[14]:**
  - Environmental Protection (35 per cent of jobs classified in a green sector),
  - Resource Conservation (13 per cent),
  - Renewable and Green Energy (13 per cent),
  - Sustainability Planning & Urban Design (11 per cent),
  - Energy Efficiency & Green Building (8 per cent),
  - Green Services (7 per cent),
  - Eco-Tourism (7 per cent),
  - Alternative & Sustainable Transportation (3 per cent),
  - Green Retail (1 per cent),
  - Carbon and Climate Change Mitigation (1 per cent), and
  - Green Manufacturing (1 per cent).

The other half of Ontario's green jobs were linked with multiple green sectors, linked with a sector other than the eleven sectors listed above, or could not be classified in a single main sector.

- Similar to Canada, the largest green employment sector in Ontario was the Environmental Protection sector.
  - Compared to Canada, Ontario had a relatively high number of water quality job vacancies for hydrologists, hydrogeologists, project engineers for water supply and treatment, and technical occupations related to water treatment.
  - Several Ontario job vacancies were linked to air quality (air quality engineers, air quality scientists, and air quality compliance specialists), and environmental health and safety (health and safety managers, coordinators, trainers, and compliance specialists).
  - Ontario employers also had vacancies for workers to perform and manage site assessment, and rehabilitation and remediation, especially for the mining industry.
  - The remaining balance of occupations was diverse and reflected the spectrum of occupations that are present in the Environmental Protection sector. Please review the national report, *The Green Jobs Map: Tracking Employment through Canada's Green Economy*, for a more thorough discussion of these occupations.

[14] Green Sectors describe the type of work performed or the end market served. For instance, an engineer at an engineering firm that performs environmental protection activities will be classified in the environmental protection sector, even though the employer is an engineering services firm. Descriptions of these sectors are contained in Appendix C.

- **Relative to Canada, Ontario had a higher percentage of job vacancies in the Energy Efficiency & Green Building sector, the Renewable/Green Energy sector and the Sustainability Planning and Urban Design sector.**
  - **The Energy Efficiency & Green Building sector represented 4 per cent of job vacancies across Canada and 8 per cent of jobs in Ontario.** Occupations most in demand in this sector in Ontario included energy managers and energy project managers for buildings, as well as architects and landscape architects that plan for sustainability.
  - **The Renewable/Green Energy sector represented 13 per cent of green job vacancies in Ontario versus 11 per cent of vacancies in Canada.** Vacancies in the sector spanned a broad set of occupations including wind plant technicians, renewable energy project managers, process and design engineers for solar manufacturing, solar-related research and development scientists, trades occupations (notably arc welders), green energy sales representatives, and other occupations.
  - **The Sustainability Planning and Urban Design sector represented 11 per cent of job vacancies in Ontario, versus 7 per cent of vacancies in Canada.** Top occupations in demand in this sector in Ontario included several project manager positions related to sustainability, the environment, and climate change, environmental planners and policy analysts, urban development managers and planners, ecologists, and other occupations.
- The top skills and competencies that employers in Ontario were seeking for workers in green jobs were:
  - Natural Resources Planning and Management competencies (required for about 40 per cent of job vacancies)
  - Corporate Environmental Program Planning and Implementation (required for 28 per cent of job vacancies)
  - Environmental Communications and Public Awareness competencies (required for 21 per cent of job vacancies)
  - Environmental Education and Training competencies (also required in about 21 per cent of job vacancies), and
  - Competencies for Environmental Sampling and Analytical Work (as well, required for 21 per cent of job vacancies).

- **Compared to Canada, green job vacancies in Ontario placed a greater emphasis on workers with Environmental Communications and Public Awareness competencies.** This is not limited to jobs in the not-for-profit sector, but extends as well to jobs in the private sector and within local government.
- **In addition, Ontario's green economy was driving high demand for workers with Environmental Sampling and Analytical Work competencies.** These skills were in particularly high demand in the private sector.
- In the context of national trends, Ontario has good opportunities to grow in two critical competency areas:
  (1) Jobs that require *Environmental Business, Technology and Product Development* competencies; and
  (2) Jobs that require *Corporate Environmental Program Planning and Implementation* competencies.

These two skill areas are linked to important emerging growth areas nationally and are likely to see growth in demand in Ontario in the future.

GREEN CAREER PATH #3

FINDING THE ULTIMATE GREEN CAREER IN RENEWABLE/GREEN ENERGY

While the Renewable/Green Energy sector features significant employment demand across Canada, it is especially important in Ontario, with 13% of green job postings linked to this sector. To see what a career looks like in this innovative and growing area, the following profile features the exciting career path of one professional who performs work related to Renewable/Green Energy. The full article for this profile is available in Appendix F.

Timothy Adamson
EP, B.Sc, M.Sc
Manager, Sustainable Energy at Enbridge

For Timothy Adamson, following a green career path has not only led him to a variety of different environmental jobs, but also to an impressive array of work locations all over the world. As Mr. Adamson observes, "My career has taken many twists and turns – one can never predict what will happen, as this is such a dynamic field."

After completing a Master's degree in soil science and surveying at Reading University, UK, Tim started his career in an agricultural consulting company, where he spent one of his first major projects working on a complete agricultural survey in Northern Nigeria. Following a number of other international agricultural consultancy projects, he started his own consulting practice. In this capacity, Mr. Adamson provided expertise on Kuwait's program to increase its forest cover. Next on Mr. Adamson's green career trajectory was a stop in Calgary, where he transitioned into the oil and gas sector and worked on soil management and reclamation assignments.

In order to take advantage of all of the opportunities that came his way, Mr. Adamson adopted several key strategies, including an enthusiastic attitude, commitment to developing technical credibility, and willingness to volunteer. According to Mr. Adamson, "In this field, I believe that one's personal credibility is of paramount importance. I place great store in ensuring that when internal staff come to me for advice or help, I'm able to provide the best and most pertinent advice that I can."

Part of sharing this expertise also involves educating others. As Mr. Adamson explains, "Not everyone is as familiar with my subject matter – that's why they have hired me – so doing things like internal lunch and learn sessions, or having external stakeholders come in to talk about the issues, all helps."

> "Environmental work is not just about doing environmental assessments for particular projects; it is driving a fundamental change in the structure of organizations."

This approach to his work has helped Mr. Adamson make significant gains over the course of his career. Currently, he holds the position of Manager, Sustainable Energy at Enbridge, while also serving as the Vice Chair of the Enbridge Climate Change Steering Committee and the Chair of the Canadian Energy Partnership for Environmental Innovation.

At Enbridge, Mr. Adamson acts as a technical resource for the company on a variety of projects, from tracking and responding to any carbon-related regulations to working with governments to align GHG reporting regulations and developing activities to support Corporate Social Responsibility (CSR). One of his major responsibilities also includes completing the Carbon Disclosure Questionnaire for his company. This is a questionnaire that is sent world-wide to the top global 500 companies and requires them to indicate how they are managing the risks and opportunities that arise from climate change.

This questionnaire is one prime example of the important changes that Mr. Adamson has observed in his industry. Mr. Adamson states, "When I started, environmental work was really an 'add-on,' end of pipe type of work – something that companies had to go through to get their approvals for whatever project they were proposing. Today, in my view, environmental work and the environmental space in which a company operates will affect that company's competitiveness, investment decisions and the value of the company's assets."

The changes in environmental work don't just stop there. Mr. Adamson notes further that, "Environmental work is not just about doing environmental assessments for particular projects; it is driving a fundamental change in the structure of organizations. For example, many companies now have a chief sustainability officer, or something similar – a position that was unheard of 10 years ago."

PROFILE OF EMPLOYERS IN ONTARIO'S GREEN ECONOMY

There were a total of 309 green job vacancies identified online, which were posted by a total of 155 unique employers. When available, additional information on employers was gathered from their websites, as well as from Industry Canada's Canadian Companies Capabilities database. This database contains information on total employment, activity of the company in export markets, location of the headquarters, the company's industry (NAICS 6-digit category) and other information. A summary of findings about employers is presented below.

Table 5

Green Employer Profile - Selected Characteristics

TOPIC	SHARE OF GREEN JOB VACANCIES
Vacancies by Industry	
Total – All Sectors	**100%**
Government/Public Sector	**19%**
Local Government	15%
Provincial & National Government	4%
Not-For Profit	**23%**
Other Not-For-Profit	21%
Universities	2%
Private Sector	**58%**
Environmental Consulting Services	27%
Engineering Services	10%
Manufacturing	6%
Architectural Services	2%
Construction	2%
Remediation	1%
Waste Management	1%
Other Industries	9%

TOPIC	SHARE OF GREEN JOB VACANCIES
Private Sector Companies	
By Company Size (total employment)	
All companies, all sizes	**100%**
Small firms (50 employees or less)	**21%**
10 or fewer employees	6%
11 to 30 employees	11%
31 to 50 employees	4%
Mid-sized firms (51 to 500 employees)	**49%**
51 to 100 employees	38%
101 to 500 employees	11%
Large firms (Over 500 employees)	**30%**
501 to 1000 employees	4%
Over 1000 employees	26%
By Exporter Status	
Share of private companies that are exporters	63%
By Ownership	
Ownership of private companies	**100%**
Canadian-owned	76%
Foreign-owned	9%
Ownership unknown	15%

GREEN CAREER PATH #4

FINDING THE ULTIMATE GREEN CAREER IN CORPORATE ENVIRONMENTAL LEADERSHIP

Based on the top green competencies in demand in Ontario, a growing number of companies are looking for well-rounded environmental professionals who can translate environmental expertise into leadership, planning and strategy development in their organizations. The following profile highlights one such professional who has reached career success through a role of environmental leadership and accountability. To see the full article for this profile, please review Appendix F.

Paul Draycott, Esq.
CCEP
Vice-President, Environmental Global Business Unit, and Corporate Counsel at Morrison Hershfield Limited

Paul Draycott's green career is one excellent example of how professional success in a green career depends on multi-disciplinary skill development.

Currently, Paul is the Vice-President, Environmental Global Business Unit, and Corporate Counsel at Morrison Hersfield Limited. In this role of leadership and accountability, he is responsible for the world-wide delivery of his firm's suite of environmental consulting and engineering services. This includes maintaining high-level roles on various environmental projects, such as providing senior project management, technical advisory and peer review services on larger, complex assignments.

Additionally, Paul also oversees the firm's domestic and international compliance with Anti-Corruption and Anti-Bribery legislation for his company's consulting and engineering services abroad. This involves ensuring that the firm's staff are trained to operate all facets of the business in strict compliance with this legislation, while also implementing an audit program that continually monitors compliance.

Embracing the need for continual change and learning has always been crucial to Paul's past career success and prominent present job title. He observes: "I believe that contemporary people's career paths present the opportunity for continual change. My own path has evolved from a purely technical environmental focus through to a multi-disciplinary professional planning and scientific focus to where I am today in a senior executive role requiring a strong leadership focus, both internally with the firm and externally with our clients."

He adds, "I have remained fairly steadfast within the umbrella of an environmental career over thirty plus years, notwithstanding the addition of a legal career in the midst. However, beneath the surface are many small changes that have led to new areas of expertise, meeting and working with new colleagues and clients, and working on an array of exciting and challenging projects."

> "The environmental professional needs to be part technical expert, part planner, part strategist, part engineer, part problem solver, and an excellent communicator."

While Paul has built many of his skills through formal education and training, he has also developed a wealth of knowledge from his day-to-day work. According to Paul, "One of the biggest opportunities I have been involved with is leading the development of standards and specifications that will be used by other professionals in the design and construction of aquatic compensation solutions on Ontario road projects. This is also one of the most challenging projects I have been involved with, as my work will be scrutinized by all those required to use the standards and specifications. Having the opportunity to effect change in the industry is a humbling milestone."

Many of these opportunities to learn and grow professionally are characteristic in environmental work. With more companies adopting sustainability into their practices and products, green professionals are increasingly expected to expand their existing skills and apply their environmental expertise to diverse areas. According to Paul, "I see a growing population of environmental professionals that are multi-disciplinary. They have skills in more than one aspect of the profession or combined with other professions. The environmental professional needs to be part technical expert, part planner, part strategist, part engineer, part problem solver, and an excellent communicator."

When it comes to upcoming changes in environmental work, Paul anticipates an exciting future. In his view, "We will see the expansion of solution development for green or sustainable infrastructure, as well as emerging technologies and strategies addressing issues such as climate change and energy demand. I expect that the industry will take more of a prominent leadership role in this regard, guiding planning, policy and strategy development."

COMPETENCIES REQUIRED FOR CAREERS IN ONTARIO'S GREEN ECONOMY

Competency requirements are a crucial piece of the employment puzzle in the green economy, with decision-makers needing to know which competencies are in the greatest demand and how these requirements may differ regionally. Typically, competencies are applied in connection with formal disciplines such as operations managers, engineers, biologists, systems analysts, etc. Multi-dimensional content analyses of green job descriptions suggest that employers in green sectors in Ontario are seeking skills that differ somewhat from the skill sets that are in demand across Canada.

> "Every job needs to have an element of sustainability if we want to create the solution we need to create, or gather the momentum we need."
>
> GREEN ECONOMY EXPERT PANELIST

Figure 5

Top Skill Areas in Demand: Canada vs. Ontario

TOP SKILL SETS IN DEMAND ACROSS CANADA	TOP SKILL SETS IN DEMAND IN ONTARIO
1. Corporate Environmental Program Planning and Implementation 2. Environmental Business, Technology & Product Development 3. Natural Resources Planning and Management 4. Environmental Health and Safety 5. Regulatory and Enforcement 6. Environmental Education and Training 7. Site Assessment 8. Water Quality Management	1. Natural Resources Planning and Management 2. Corporate Environmental Program Planning and Implementation 3. Environmental Communications and Public Awareness 4. Environmental Education and Training 5. Environmental Sampling and Analytical Work 6. Environmental Business, Technology & Product Development 7. Environmental Health and Safety

- Compared to Canada, Ontario has a comparatively higher demand for workers with Natural Resource Planning and Management competencies, Environmental Communications and Public Awareness competencies, and Environmental Sampling and Analytical Work competencies.
  - **Nearly 40 per cent of all green job vacancies in Ontario require workers with Natural Resource Planning and Management competencies.** By comparison, these competencies are required for only about 28 per cent of jobs across Canada.
  - **Ontario employers are comparatively more active in looking for workers with Environmental Communications and Public Awareness competencies which are required for 21 per cent of jobs in Ontario** versus 12 per cent of jobs across Canada.
  - **Environmental Sampling and Analytical Work competencies are required for 21 per cent of jobs in Ontario** versus 11 per cent of jobs across Canada.
- Compared to the whole of Canada, fewer jobs in Ontario require the following competencies:
  - Environmental Business, Technology and Product Development competencies are required for approximately 18 per cent of jobs in Ontario vs. 31 per cent of all jobs in Canada,
  - Corporate Environmental Program Planning and Implementation competencies are required for 24 per cent of jobs in Ontario vs. 32 per cent of jobs in Canada,
  - Regulatory and Enforcement competencies are required for 13 per cent of jobs in Ontario vs. 23 per cent of jobs across Canada.
  - Site Assessment competencies are required for 11 per cent of jobs in Ontario vs. 21 per cent of jobs across Canada.

Figure 6

Top Competencies in Demand for Jobs Linked to a Green Economy - Ontario and Canada (%)

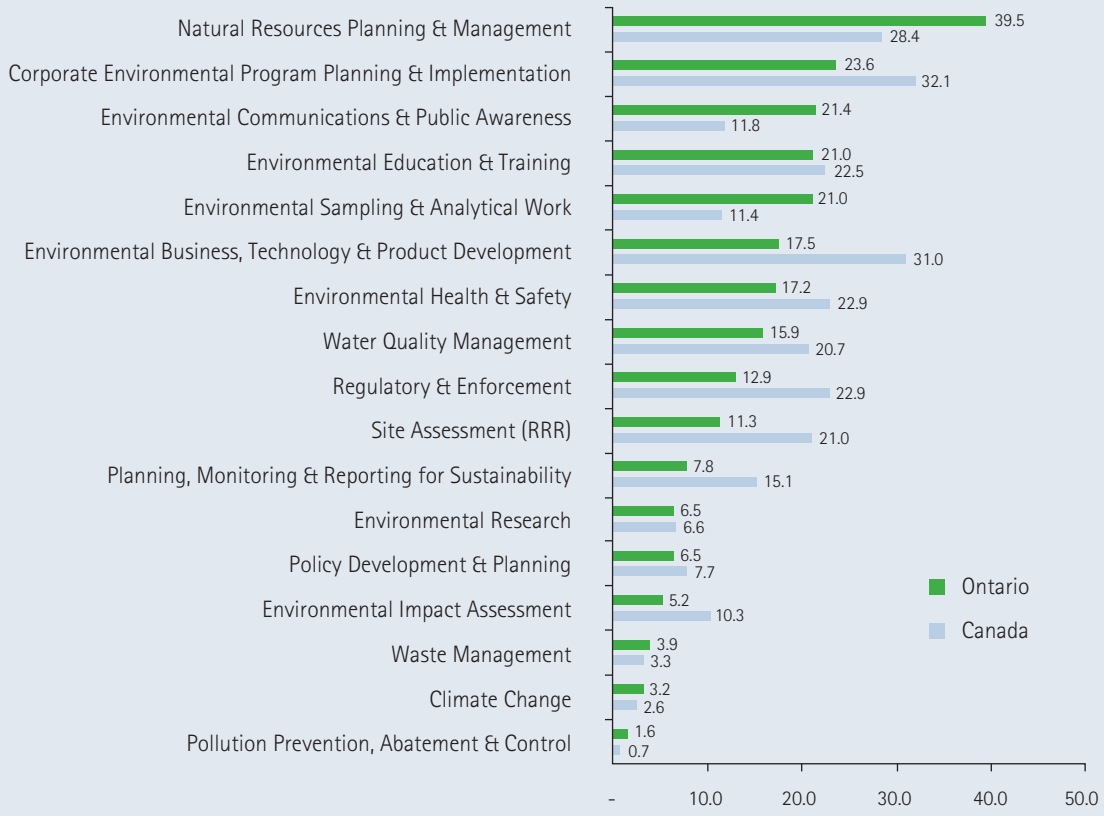


Table 6

Comparison of Demand for Environmental Competencies: Ontario and Canada,
Share of Job Vacancies Referencing Each Competency, Job Postings from March-May 2012

CATEGORY	COMPETENCY AREA	PERCENTAGE OF JOB VACANCIES THAT REQUIRE THE COMPETENCY		
Technical	**Technical Competencies (NOS Categories)**	CANADA	ONTARIO	DIFFERENCE
A	Environmental Impact Assessment	10.3	5.2	(5.1)
B	Site Assessment (RRR)	21.0	11.3	(9.7)
C	Regulatory & Enforcement	22.9	12.9	(10.0)
D	Pollution Prevention, Abatement, & Control	0.7	1.6	0.9
E	Climate Change	2.6	3.2	0.6
F	Waste Management	3.3	3.9	0.6
G	Water Quality Management	20.7	15.9	(4.8)
H	Environmental Sampling & Analytical Work	11.4	21.0	9.6
I	Policy Development & Planning	7.7	6.5	(1.2)
J	Planning, Monitoring & Reporting for Sustainability	15.1	7.8	(7.3)
K	Corporate Environmental Program Planning & Implementation	32.1	23.6	(8.5)
L	Environmental Health & Safety	22.9	17.2	(5.7)
M	Natural Resources Planning & Management	28.4	39.5	11.1
N	Environmental Education & Training	22.5	21.0	(1.5)
O	Environmental Research	6.6	6.5	(0.1)
P	Environmental Business, Technology & Product Development	31.0	17.5	(13.5)
Q	Environmental Communications & Public Awareness	11.8	21.4	9.6
Transferable	**Transferable Competencies (NOS Categories)**			
1	Professional Ethics and Work Style	55.7	44.3	(11.4)
2	Learning and Creativity	-	-	
3	Communicating Effectively	3.7	2.3	(1.4)
4	Collaboration	-	-	
5	Critical Thinking/Judgment	1.1	2.3	1.2
6	Planning and Organizing Work and Projects	8.9	-	
7	Leading/Influencing Others	54.2	29.4	(24.8)
8	Business Acumen	2.6	0.6	(2.0)
Other Technical	**Additional Technical Competencies Required (Other Skill Areas Identified, Not Covered in the NOS)**			
R	Competencies for Sustainable Urban Planning	3.6	4.2	0.6
S	Competencies for Power Generation Systems Management and Implementation	4.2	2.3	(1.9)
Other Transferable	**Additional Transferable Competencies Required (Other Skill Areas Identified, Not Covered in the NOS)**			
9	Competencies for Data Analysis	22.1	19.4	(2.7)
10	Competencies for Human Resource Management	24.6	26.5	1.9

CAREER PATHS IN ONTARIO'S GREEN ECONOMY

Career Development and Flexibility

Most of the 17 competency categories are transferable, meaning that they are in demand for current job vacancies in several green sectors in Ontario. Workers wishing to improve their career development potential can do so by developing the competencies that are in demand for a large percentage of job vacancies and that are also in demand by employers in several sectors.

Demand for environmental competencies in Ontario can be grouped into two categories illustrated in Figure 7: (1) high demand competencies that are highly transferable between sectors and (2) competencies in lower demand that are less transferable.

Figure 7

Transferability and Demand for Environmental Competencies in Ontario

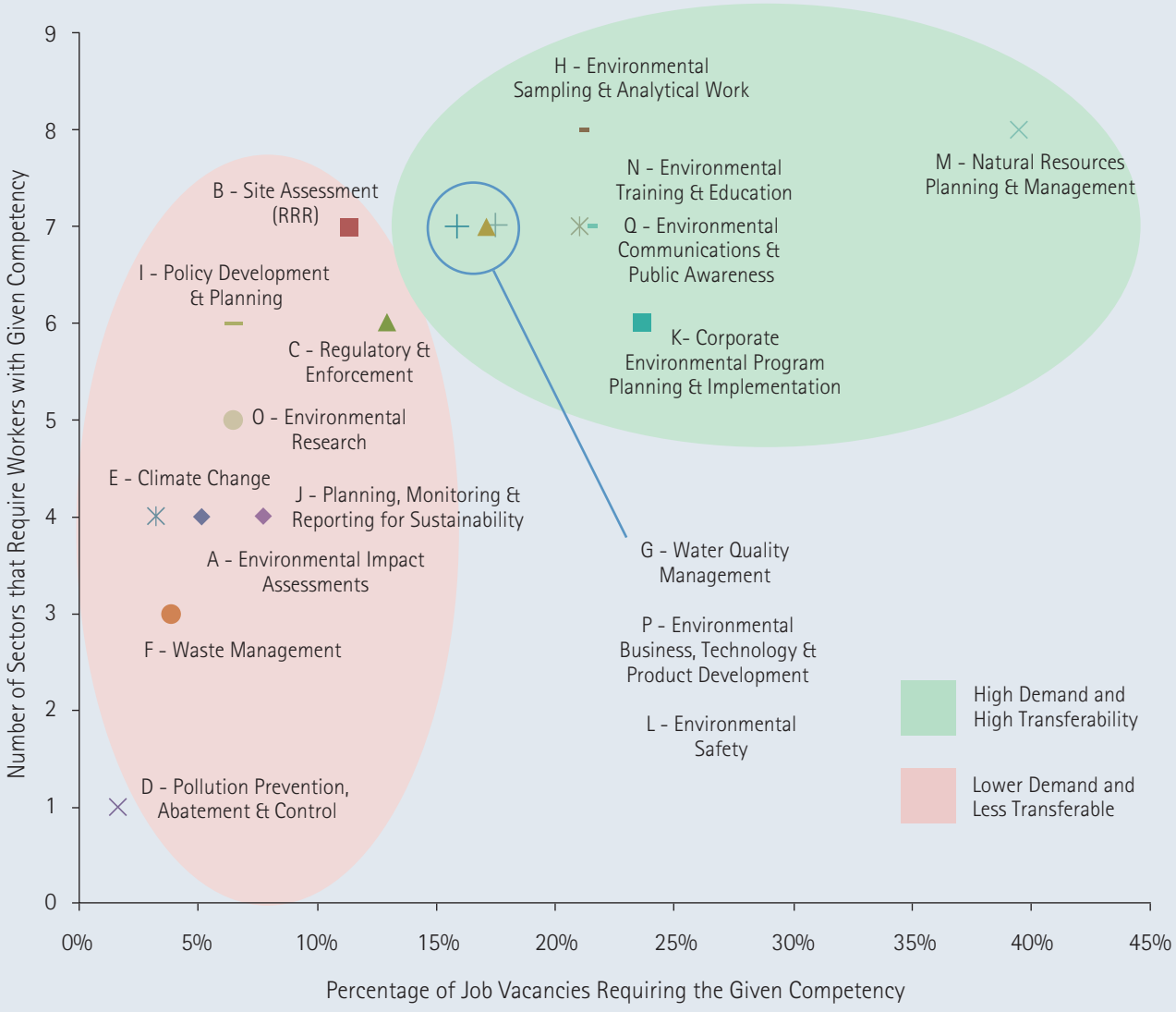


Table 7

Transferability of Environmental Competencies by Green Sector - Ontario

COMPETENCY CATEGORY	SECTORS REQUIRING THE COMPETENCY	SHARE OF JOBS REQUIRING THE COMPETENCY
M - Natural Resources Planning & Management	8	39%
H - Environmental Sampling & Analytical Work	8	21%
Q – Environmental Communications & Public Awareness	7	21%
N – Environmental Training & Education	7	21%
P – Environmental Business, Technology & Product Development	7	17%
L – Environmental Safety	7	17%
G – Water Quality Management	7	16%
B – Site Assessment (RRR)	7	11%
K – Corporate Environmental Program Planning & Implementation	6	24%
C – Regulatory & Enforcement	6	13%
I – Policy Development & Planning	6	6%
O – Environmental Research	5	6%
J – Planning, Monitoring & Reporting for Sustainability	4	8%
A – Environmental Impact Assessments	4	5%
E – Climate Change	4	3%
F – Waste Management	3	4%
D – Pollution Prevention, Abatement & Control	1	2%

As indicated in Table 7, between roughly 15 per cent and 40 per cent of all job vacancies require competencies in one of the following eight categories:

- Natural Resources Planning and Management
- Corporate Environmental Program Planning and Implementation
- Environmental Communications and Public Awareness
- Environmental Training and Education
- Environmental Sampling and Analytical Work
- Water Quality Management
- Environmental Business, Technology, and Product Development
- Environmental Safety

Workers in Ontario who gain proficiency and experience in these areas will enjoy the greatest flexibility in career choices. These competencies are in demand in at least 6 out of the 11 green sectors identified. Workers with the above-mentioned competencies will also benefit from comparatively greater opportunities for career advancement, as the result of more job openings.

For a clearer sense of the difference in demand for certain competencies based on green sector, Table 8 provides a detailed breakdown of how the demand for five top green competencies in Ontario can vary across different green sectors. The full table depicting the demand for all green competencies is available in Appendix E.

Table 8

Transferability of Top 5 Competencies – Requirements by Green Sector in Ontario

NOS CATEGORY	SECTORS REQUIRING THE COMPETENCY	PERCENTAGE OF JOB VACANCIES THAT REQUIRE THE COMPETENCY
M	**Natural Resources Planning & Management**	**39%**
	Sustainability Planning / Design / Urban Design	71%
	Resource Conservation	67%
	Eco-Tourism	60%
	Green Services	52%
	Energy Efficiency & Green Building	41%
	Environmental Protection	30%
	Renewable/ Green Energy	24%
	Alternative/Sustainable Transportation	20%
	Carbon and Climate Change Mitigation	20%
K	**Corporate Environmental Program Planning & Implementation**	**24%**
	Environmental Protection	44%
	Alternative/Sustainable Transportation	40%
	Green Services	35%
	Renewable/ Green Energy	24%
	Sustainability Planning / Design / Urban Design	21%
	Carbon and Climate Change Mitigation	20%
	Resource Conservation	15%
	Energy Efficiency & Green Building	6%
Q	**Environmental Communications & Public Awareness**	**21%**
	Renewable/ Green Energy	43%
	Carbon and Climate Change Mitigation	40%
	Green Services	39%
	Green Manufacturing	33%
	Eco-Tourism	30%
	Sustainability Planning / Design / Urban Design	13%
	Resource Conservation	11%
	Environmental Protection	8%

Table 8

Transferability of Top 5 Competencies – Requirements by Green Sector in Ontario (continued)

NOS CATEGORY	SECTORS REQUIRING THE COMPETENCY	PERCENTAGE OF JOB VACANCIES THAT REQUIRE THE COMPETENCY
N	**Environmental Education & Training**	**21%**
	Sustainability Planning / Design / Urban Design	38%
	Green Services	35%
	Green Manufacturing	33%
	Resource Conservation	26%
	Energy Efficiency & Green Building	24%
	Carbon and Climate Change Mitigation	20%
	Renewable/ Green Energy	19%
	Environmental Protection	19%
	Alternative/Sustainable Transportation	0%
H	**Environmental Sampling & Analytical Work**	**21%**
	Alternative/Sustainable Transportation	60%
	Green Manufacturing	33%
	Environmental Protection	28%
	Sustainability Planning / Design / Urban Design	25%
	Green Services	23%
	Resource Conservation	22%
	Carbon and Climate Change Mitigation	20%
	Renewable/ Green Energy	19%
	Energy Efficiency & Green Building	18%

Compared to national trends, there were also several competencies with high demand and inter-sector transferability that were unique to Ontario. Competencies related to Environmental Sampling & Analytical Work, as well as Environmental Communications and Public Awareness, were frequently mentioned in new job postings across at least 7 different green sectors in the province. However, these competencies were in less demand Canada-wide. Table 9 provides a comparison between national and Ontario-based findings for these competencies.

Table 9

Transferability and Demand for Environmental Competencies, Canada and Ontario

COMPETENCY CATEGORY	CANADA		ONTARIO	
	SECTORS REQUIRING THE COMPETENCY (Out of 11 Green Sectors)	SHARE OF JOBS REQUIRING THE COMPETENCY	SECTORS REQUIRING THE COMPETENCY (Out of 11 Green Sectors)	SHARE OF JOBS REQUIRING THE COMPETENCY
A – Environmental Impact Assessments	7	10%	4	5%
B – Site Assessment (RRR)	8	21%	7	11%
C – Regulatory & Enforcement	7	23%	6	13%
D – Pollution Prevention, Abatement & Control	3	1%	1	2%
E – Climate Change	7	3%	4	3%
F – Waste Management	6	3%	3	4%
G – Water Quality Management	8	21%	7	16%
H – Environmental Sampling & Analytical Work	9	11%	8	21%
I – Policy Development & Planning	8	8%	6	6%
J – Planning, Monitoring & Reporting for Sustainability	6	15%	4	8%
K – Corporate Environmental Program Planning & Implementation	8	32%	6	24%
L – Environmental Safety	9	23%	7	17%
M – Natural Resources Planning & Management	9	28%	8	39%
N – Environmental Training & Education	10	23%	7	21%
O – Environmental Research	7	7%	5	6%
P – Environmental Business, Technology & Product Development	10	31%	7	17%
Q – Environmental Communications & Public Awareness	9	12%	7	21%

Occupational Categories in Demand

Out of the sample of green job vacancies in this province, 276 were linked to major occupational groups and 134 of this could also be linked to the 11 major contributing sectors of the green economy. Based on demand, the top categories for these occupations in Ontario included Managers, Specialists and Engineers, as indicated in the table below. The full list of occupational titles identified in the sample is featured in Appendix D.

Table 10
Occupational Groups in Higher Demand in Ontario

OCCUPATIONAL GROUP	TOTAL	IN GREEN ECONOMY SECTORS	NON-SECTOR SPECIFIC
Managers	46	28	18
Specialists	42	20	22
Engineers	32	13	19
Environmental-Specific Occupations	22	12	10
Stakeholder Relations Professionals	14	2	12
Technicians	14	7	7
Sales & Support Workers	13	3	10
Natural Resources-Specific Occupations	11	4	7
Planners	10	6	4
Regulatory & Policy Occupations	10	7	3
Biologists	6	3	3
Safety & Health Professionals	6	5	1
Scientists	6	4	2
Farm Related Workers	5	1	4
Organic Foods Workers	5	1	4
Outdoor Guides & Instructors	5	2	3
Hospitality Staff	4	2	2
Sustainability Professionals	4	1	3
Trades Workers	4	1	3
Landscaping Workers	3	3	N/A
Maintenance Workers	3	1	2
Outdoors Support Workers	3	3	N/A
Other Support Workers	3	1	2
Seasonal Workers	2	1	1
Ecology Professionals	1	1	N/A
Reclamation Professionals	1	1	N/A
Wildlife Professionals	1	1	N/A
Total	**276**	**134**	**142**

CONCLUSION AND RECOMMENDATIONS

As the transition to greener industries, products and company practices continues to reshape the business landscape in Canada, greater information is needed on how all of these changes affect jobs. Through a detailed analysis of the characteristics of employment linked to the green economy, this study goes beyond a look simply at total green job numbers to actually determine where the demand for green jobs is strongest, what competencies are required, and how professionals can pursue successful, long-term careers in green industries. Consequently, *The Green Jobs Map* report series helps numerous individuals make informed decisions about green career planning and workforce development, including professionals, employers, policy-makers, educators and students.

Through a comparison of regional green employment stats to national averages, *The Green Jobs Map – Supplementary Ontario Report* also provides valuable insights into the unique career opportunities available to green workers in this province. As many of the findings in this report indicate, Ontario's green employment trends are not necessarily the same as those that are occurring Canada-wide. In contrast to national findings, a greater percentage of Ontario-based employers have green job openings in Renewable/Green Energy, Energy Efficiency & Green Building, and Sustainability Planning & Urban Design. Additionally, employers in this province also place a greater emphasis on certain competencies, including Natural Resources Planning & Management, Environmental Communications and Public Awareness, Environmental Sampling & Analytical Work, and Environmental Training & Education.

These findings reflect the unique profile of green employers in Ontario, including the high proportion of not-for-profit organizations that have green job vacancies, as well as the impact of major provincial legislation geared to transitioning the province to a greener economy. In fact, the results from this study indicate that Ontario's legislative framework is a major distinguishing factor when it comes to how green jobs in this province compared to national trends. The province's policies to promote green energy, conservation and energy efficiency have corresponded with greater employment demand in the green sectors that are most impacted by these policies, such as Renewable/Green Energy and Energy Efficiency & Green Building. These region-specific employment effects are likely to continue, as policies like the Expanded Green Energy Act Alliance (GEAA) Program are estimated to produce as much as much as 90,000 jobs per year in Ontario with a $47.1 billion investment over 10 years.[15]

For all decision-makers impacted by the growth of the green economy in Ontario, this information on green job trends is truly vital. Employment is one of the most tangible and immediately relevant paths to a greener economy, since making the green transition depends on the availability of skilled environmental professionals who can design new technologies, implement sustainable programs and support environmental protection activities. In this way, the success of the green economy in Ontario and Canada is inextricably linked to the success of green workforce development and appropriate career planning. Put simply, a greener economy will only be as strong as the talent and skills of the professionals available to build it.

[15] Robert Pollin & Heidi Garrett-Peltier, *Building the Green Economy: Employment Effects of Green Energy Investments for Ontario*, 2009.

Recommendations

As noted throughout *The Green Jobs Map – Supplementary Ontario Report*, the distinguishing characteristics of employment in Ontario's green economy mean that there are several unique opportunities and considerations related to green careers in this province.

The following recommendations are designed to help make the most of these region-specific opportunities:

- Develop training and educational programs that focus on the green competencies that matter most to employers in Ontario:
  - Natural Resources Planning & Management
  - Corporate Environmental Program Planning & Implementation
  - Environmental Communications & Public Awareness
  - Environmental Sampling & Analytical Work
  - Environmental Training & Education
- Continue support for legislation related to energy efficiency, alternative energy, conservation and sustainability, since the sectors most impacted by these policies have shown strong demand for green jobs.
- Provide professional development opportunities for existing environmental professionals and transitioning workers to develop the competencies that are in high demand across the greatest number of sectors in Ontario. This type of professional development should center on such green competencies as:
  - Natural Resources Planning and Management
  - Corporate Environmental Program Planning and Implementation
  - Environmental Communications and Public Awareness
  - Environmental Training and Education
  - Environmental Sampling and Analytical Work
  - Water Quality Management
  - Environmental Business, Technology, and Product Development
  - Environmental Safety
- Focus workforce development initiatives on the green sectors that account for high green job vacancy rates. As such, workforce development should be targeted to support these sectors: Environmental Protection, Renewable/Green Energy, and Resource Conservation.

FUTURE DIRECTIONS

The Green Jobs Map – Supplementary Ontario Report represents an important step in developing a better understanding of the job demand and work requirements for careers in Ontario's green economy. While this research covers valuable new ground, it is also a preliminary foray into a comprehensive analysis of the impact of green growth on jobs.

Further work is needed to determine what green employment trends have occurred over a longer period of time, especially in relation to Ontario's recent legislation to promote a greener economy. Many of these policies appear to have had a positive impact on green job demand, but additional information is still needed on which particular policies have had the greatest impact and what this impact looks like in terms of past and current total green employment numbers.

Most importantly, the present study has focused predominately on the demand side of green employment, such as the green sectors that have the greatest percentage of green job openings and the competencies that employers are looking for in green job candidates. Future research is now needed to assess the other side of the green employment equation – the supply of workers with the right competencies and training. Upcoming studies must determine whether there are enough professionals with the appropriate competencies to meet the needs of employers looking to fill environmental positions. Additionally, this research should include an evaluation of existing training and educational programs to establish what components of these programs are working well and where further improvement is needed to align with the employment demand and required competencies for work in green industries.

Since the green economy is still clearly in a stage of growth and transition, there will be no shortage of important topics to consider in future research on green employment.

APPENDIX A: METHODOLOGY FOR RESEARCH AND CONTENT ANALYSIS

Methods & Approach

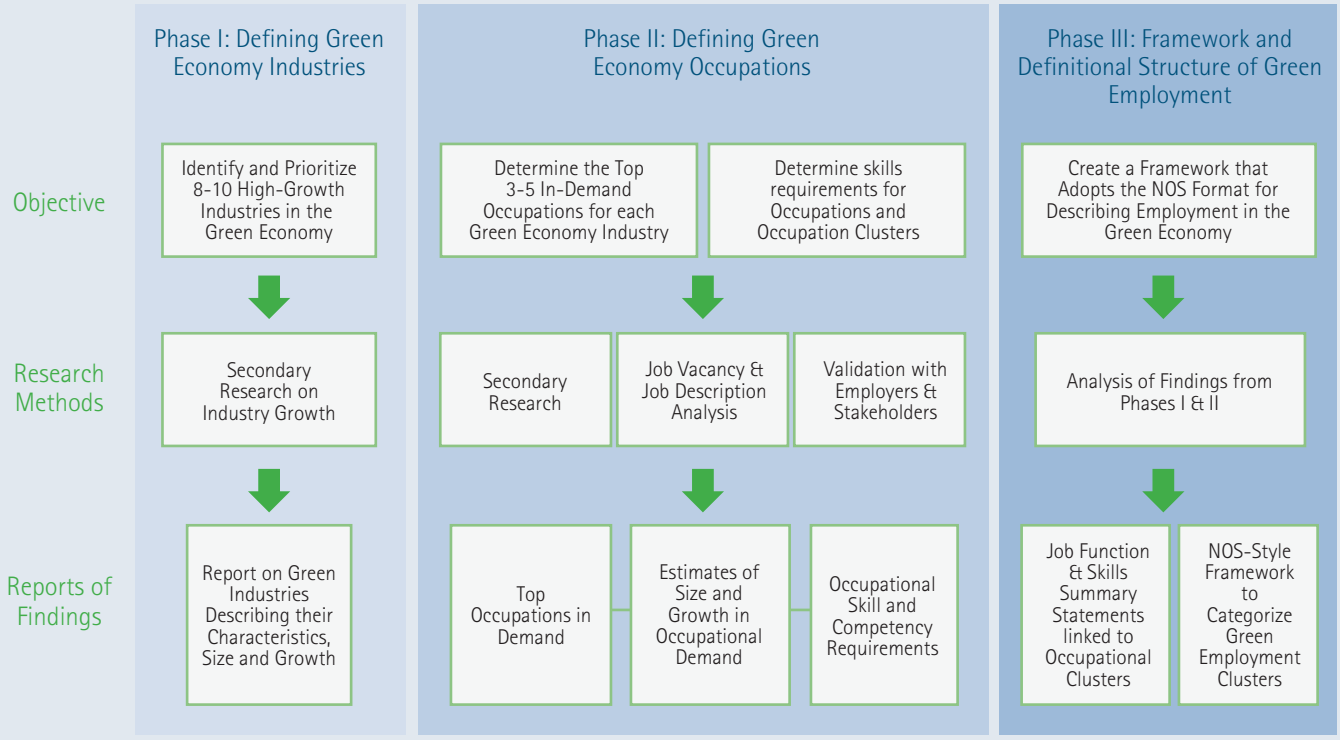
The research objectives for a green economy trends project can be summarized into three overarching goals:

1. Define green industries.
2. Identify the top in-demand occupations and their skill requirements.
3. Describe these occupations with job function statements, using the NOS format.

A three-phase methodology was used to achieve these goals, described in Figure 8. Through the research phases, it became clear that defining the occupations in demand was difficult due to the diversity of occupations identified through web-scraping of job vacancies. The research process was modified to focus on the competencies that were in demand for job vacancies, which produces more useful profiles for career planning.

Figure 8

Objectives, Research Methods and Reporting Summary Diagram



Phase I – Literature Review

A total of 33 secondary research reports on a green economy were reviewed. Ten of these reports contain taxonomies of industries within a green economy or contain discussion of multiple sectors that comprise a green economy. These reports form the basis for the identification of key industries in a green economy. In addition to the reports describing a green economy, a variety of other secondary research reports were reviewed to identify labour force size and growth trends for sub-segments of a green economy.

Table 11
Green Economy Secondary Research Reports Reviewed

NO.	SOURCE / AUTHOR	REPORT
1	Brookings - Battelle	Sizing the Clean Economy
2	Brookings - Battelle	Sizing the Clean Economy - Methodology
3	Bureau of Labor Statistics (BLS)	Green Jobs Initiative
4	Bureau of Labor Statistics (BLS)	Green Jobs Definition
5	Bureau of Labor Statistics (BLS)	Green Goods and Services Survey Questionnaire
6	California Centers of Excellence (CCOE)	California's Green Economy Industry and Workforce Studies (multiple reports)
7	Canada West Foundation	The Green Grail
8	Canadian Institute for Environmental Law and Policy	A Green Economy for Canada: Consulting with Canadians
9	Center for Community Innovation	Innovating a Green Economy in California
10	Commission for Environmental Cooperation	Renewable Energy Training Resources - Survey and Assessment
11	D. Parsons & Associates	Greening the Economy: Transitions to New Careers
12	ECO Canada	Profile of Environmental Employment 2010
13	ECO Canada	Canadian Environmental Sector Trends 2010
14	EIANZ	Green Collar Worker Report
15	Federation of Canadian Municipalities	Building Canada's Green Economy: The Municipal Role
16	Globe Group	British Columbia's Green Economy: Securing the Workforce of Tomorrow
17	Globe Group	Careers for a Sustainable Future: A Reference Guide to Green Jobs in British Columbia
18	Globe Group	British Columbia's Green Economy: Building a Strong Low-Carbon Future
19	HRSDC	Green Jobs Taxonomy
20	ILO	Anticipating Skill Needs for the Low Carbon Economy? Difficult, But Not Impossible
21	ILO	Skills for the Low Carbon Economy
22	OECD	Towards Green Growth
23	OECD	Towards Green Growth, Summary for Policy Makers
24	Pembina Institute	Reducing Pollution, Creating Jobs
25	PERI	Job Opportunities for a Green Economy

Table 11

Green Economy Secondary Research Reports Reviewed (continued)

NO.	SOURCE / AUTHOR	REPORT
26	PERI	Building a Green Economy: Employment Effects for Green Energy Investments for Ontario
27	Pernick, Wilder, and Winnie	Clean Energy Trends (2012)
28	Pew Charitable Trusts	The Clean Energy Economy: A Definition and Framework
29	Statistics Canada	Canadian Business Patterns Database
30	Statistics Canada	Labour Force Survey
31	Statistics Canada	2001 and 2006 Census of Canada, Selected Tables
32	UNEP	Green Economy Report - A Preview
33	US Department of Commerce	Measuring a Green Economy

Phase II – Content Analysis of Job Vacancies Linked to a Green Economy

In Phase II of the research, content analysis methods were used to characterize jobs in a green economy and explore the skills requirements of these jobs, based on an empirical analysis of the content of job postings. Initial content analysis findings were based on analysis of a sample of 430 unique job descriptions which were identified as "green" jobs, or jobs that were clearly identified as part of a green economy. Over the course of the research project, additional job vacancies were identified through an online content scraper which augmented the sample of job vacancies linked to a green economy. At the conclusion of the project, a total of 835 jobs were identified that required environmental skills and were linked to sectors in a green economy. This sample was drawn from 83,451 online job postings collected during the months of March, April, and May, 2012. Job vacancies were limited to Canadian jobs and content analysis techniques were specified for English.

A conservative approach was used to determine whether a job was associated with a green economy and this was reflected in the decision rule regarding the minimum threshold for what was considered a green job. Only job descriptions with a clear relationship to a green sector, company, product, or process were included in the analysis, thereby excluding jobs that had a weak or questionable connection with a green economy. Jobs were further filtered to include only those that described requirements for specific skills identified in the NOS or otherwise defined through the research. This excluded jobs such as well drilling operators for geo-exchange systems, which were linked to a renewable energy sector, but did not state requirements for environmental skills in the job description for vacant positions.

Ambiguity surrounding the definition of a green economy complicates the task of identifying which jobs are to be defined as belonging to a green economy. The literature review in Phase I found that jobs in a green economy are identified based on a combination of several markers including (1) industry[16], (2) the types of skills used by workers, (3) the types of products and services a company provides, (4) a job's connection with a green sector's supply chain (e.g. a metal parts manufacturer that is a supplier for the wind energy sector), or (5) the types of processes used in the provision of products and services (i.e. processes that are more environmentally-friendly). In applying the content analysis methodology, the research team found that the *types of skills* described in the text of a job ad were most often the marker that indicated whether a job could be identified as belonging to a green economy. This is an important distinction because some ads for jobs in a green economy did not contain textual content to indicate that a job was, in fact, associated with a green economy. Our sample of jobs in a green economy was therefore largely limited to only those jobs that described requirements for specialized knowledge or skills.

[16] Some industries, such as environmental remediation, are considered by analysts to be wholly included in the green economy

One consequence of this approach was that the sample of green jobs in our sample meets both criteria identified in the ECO Canada report, *Defining the Green Economy*, in which a green job is defined as:

"... one that works directly with information, technologies, or materials that minimize environmental impact, and also requires specialized skills, knowledge, training, or experience related to these areas."

It should be recognized that this methodology provided detailed information on the skills, knowledge and experience required for real jobs linked to a green economy, but it was limited by the sample analyzed, which included only job vacancies (not filled positions), jobs which were filled using online job posting methods that are captured by job aggregators, and jobs that were vacant during a specified period: March-May 2012. The sample therefore did not capture the full scope of jobs linked to a green economy.

Phase III – Framework for Green Careers

Using the coded data for job descriptions, a set of simple cross tabulations and frequencies were performed on the data to determine patterns of demand for competency requirements. The findings of these tabulations are published in this report.

As a final step in the research process, preliminary results of the research were shared with an online panel of green economy experts. Feedback from the panel was used to refine the framework for career paths in a green economy.

Table 12
Green Economy Expert Panel

PANEL PARTICIPANT	POSITION	ORGANIZATION
John Adams*	Director, Applications	SDTC
Mark Anielski	President and CEO	Anielski Management Inc.
Jeff Bell	Specialist	Alternative and Renewable Energy Specialist, Alberta Environment
Tom Bevers	Employment Committee Member, EuroStat	European Commission
Rachel Birenbaum	Manager, Human Resources	Jantzi-Sustainalytics
Peter Blanchard*	Founder and Coordinator	GoodWork Canada Green Jobs
Keith Brooks*	Project Manager	Blue Green Alliance Canada
Stephanie Cairns*	President	Wrangellia Consulting
Morag Carter	Program Director, Climate Change and Clean Energy	David Suzuki Foundation
Raymond Côté	Professor Emeritus	Dalhousie University
John Cuddihy*	Senior Policy Advisor	NRTEE
Tyler Elm*	Vice-President, Corporate Strategy & Business Sustainability	Canadian Tire
Bob Elton	Former CEO and President	BC Hydro
Tyler Hamilton*	Editor in Chief	Corporate Knights

Table 12
Green Economy Expert Panel (continued)

PANEL PARTICIPANT	POSITION	ORGANIZATION
Chris Higgins*	LEED Canada for Homes Program Leader	Canada Green Building Council
Robert Hornung*	President	Canadian Wind Energy Association
Eddy Isaacs	CEO	Energy and Environment Solutions, Alberta Innovates
Mike Kennedy	President and CEO	Green Analytics
David Layzell	Executive Director	Institute for Sustainable Energy, Environment and Economy
Carla Lipsig-Mummé*	Professor of Work and Labour Studies	York University
Robert Page	Professor, Institute for Sustainable Energy, Environment & Economy, University of Calgary	Former NRTEE Chairperson
Thomas Rankin	Investment Manager	Innovacorp
Marlo Raynolds	Former Executive Director	Pembina Institute
John Robinson	Executive Director, UBC Vancouver Sustainability Professor	Institute of Resources, Environment and Sustainability, and Department of Geography University of British Columbia
Laurie Simmonds*	President & CEO	Green Living
Dixie Sommers	Assistant Commissioner for Occupational Statistics and Employment Projections	U.S. Bureau of Labour Statistics
Esther Speck	Director, Sustainability	Mountain Equipment Co-op
Jim Stanford*	Economist	Canadian Autoworkers Union
Coro Strandberg	Principal	Strandberg Consulting
Denise Taschereau	Owner	Fairware Promotional Products
Andrew Van Iterson*	Coordinator	Green Budget Coalition
Lyle Walker	Senior Transportation Planner	Translink
Sara Wilson*	Principal	Natural Capital Research and Consulting
Mark Winfield*	Assistant Professor	York University
Alex Wood*	Senior Director, Policy and Markets	Sustainable Prosperity

*Organization based in Ontario

APPENDIX B: NOS TECHNICAL AND TRANSFERABLE COMPETENCY DICTIONARY

Technical Competency Dictionary

Category A – Environmental Impact Assessments

A Conducting environmental impact assessments

1 Ensures the identification of the geographic, environmental, economic, social, and cultural scope and parameters to be used for the impact assessment study.

2 Develops a project management plan for the impact assessment study for proposed developments, change in facility operations, change in land use, amended or proposed new policies, etc.

3 Reviews earth and life science systems, functions, inventories and existing studies to determine if sufficient baseline data is available for the impact assessment study.

4 Reviews facility/development design, production/manufacturing processes.

5 Consults with stakeholders (including regulators, municipalities, public, interest groups, indigenous peoples, NGOs, etc.) to gather information regarding the perceived impacts of development activities on communities, the environment and natural resources.

6 Identifies which areas are likely to be significantly impacted either negatively or positively by development activities, e.g. biophysical, economic, social, cultural, and heritage resources.

7 Assesses qualitative and quantitative environmental issues, risks or problems, including their cumulative effect and corresponding economic, social and cultural impacts.

8 Develops mitigation and/or habitat compensation plans, strategies and measures using culturally appropriate approaches.

9 Prepares environmental impact assessment report(s) that may include mitigation, environmental protection, and recovery plans.

Category B – Site Assessment (RRR)

B2 Conducting environmental site assessments (ESA – Phase 1 and Phase 2)

10 Identifies the scope of the site assessment (phase 1 and 2) project, including identification of the standards to be followed.

11 Reviews historical records for the site (e.g. site plans, fire insurance maps, legal title searches, business directories, air photos, satellite images, etc.) to determine previous land use.

12 Carries out visual inspection of site and neighbouring properties to inventory/identify current operations, evidence of discharges, visible contamination, buried tanks, dumping, etc.

13 Collects related information from key stakeholders (e.g. owners and staff, municipalities, regulators) regarding land use, facility operations, permits, relevant legislation, etc.

14 Conducts investigation, sampling, screening, and analysis (including geophysical mapping) activities of landforms, soil, ground water, sediments, airborne contaminants, etc., as required.

15 Characterizes environmental aspects of site (such as landforms, drainage, plant communities, and soil properties) based on interpretation of data collected during site investigation, sampling and analysis (for example, contaminants, their concentration and general extent).

16 Prepares site assessment report(s) to meet regulatory and other requirements, identifying potential risk and scope of further action by appropriate stakeholders, if necessary.

17 Ensures site assessment is completed properly and that action plans are developed and implemented to satisfactorily achieve the desired outcomes.

18 Communicates results of site assessment to stakeholders such as property owners, responsible party, regulators, the public, etc. via a public consultation or other appropriate communication process.

B3 Developing/Implementing site remediation (Phase 3) plan

19 Evaluates possible remediation/restoration/reclamation alternatives, taking into account costs, technological constraints, characteristics of the contaminant, characteristics of the affected land, and stakeholders' concerns.

20 Recommends remediation clean-up targets to make the site fit for its intended use or return it to its original condition (applies to all sites including watershed restoration, forestry site reclamation, mine closures, etc.).

21 Develops site remediation/restoration/reclamation plans and programs, including objectives, targets, contamination description, issue resolution process, pilot requirements, time schedule, and cost estimate.

22 Conducts pilot tests, including treatability studies, to assess the effectiveness of the intended remediation method and/or to advance science and technology.

23 Conducts full-scale remediation activities (e.g. thermal, biological, chemical or physical treatment, containment, vapour extraction, excavation, removal of heritage objects, etc.).

24 Monitors post-remediation conditions and results to assess if targets and regulatory requirements have been met.

25 Prepares remediation completion report, including documentation of remediation and post-remediation monitoring data, and review of environmental outcomes relative to standards, for submission to regulators and stakeholders.

Technical Competency Dictionary (continued)

B4 Developing/Implementing site restoration/reclamation (Phase 3) plans

26 Investigates attributes of materials, such as physical, chemical, and geotechnical involved in the restoration/reclamation.

27 Develops appropriate construction and reclamation procedures and contingency plans based on best management and health and safety practices, and a minimum "footprint".

28 Conducts on-site reclamation activities (including landscaping, tree-planting, and habitat development), using appropriate species and procedures for re-vegetation.

29 Provides environmental inspection during construction and reclamation to ensure that regulatory requirements are met and that procedures and plans are being followed.

30 Conducts on-site restoration activities as required, e.g. restore riparian, coastal zone, and wetland habitats.

31 Ensures that best practices are followed in the restoration/reclamation process to minimize the impact on the environment.

32 Monitors post-restoration/reclamation conditions and results to assess if targets and regulatory requirements have been met.

33 Prepares site restoration and site reclamation report(s) for submission to the appropriate regulators and stakeholders.

Category C – Regulatory & Enforcement

C5 Interpreting/enforcing/complying with environmental regulations and standards

34 Provides expert advice and/or testimony to senior management, internal staff, regulatory bodies, interest groups and the public on matters related to disputes, compliance and other environmental issues, including processes for acquiring regulatory approval.

35 Applies environmental legislation regarding issues such as contaminated sites, hazardous materials and waste, pesticide use, storage tanks, etc. to specific applications as appropriate.

36 Defines environmental performance requirements for specific jurisdictions.

37 Prepares regulatory applications.

38 Prepares permits and operational permit reports (including air permits, waste disposal permits, resource harvesting permits, etc.).

39 Negotiates the terms and approval of compliance procedures and permits, including approval of development plans and use of technology such as Pollution Prevention, Abatement, and Control equipment and systems.

40 Develops plans and programs to meet regulatory requirements, including monitoring programs and employee information and communication plans.

41 Implements programs, including monitoring activities, to ensure regulatory compliance.

42 Evaluates compliance with environmental regulations, including the documentation of violations and non-compliance episodes.

43 Prepares compliance and regulatory reports for internal use and for filing with regulatory agencies.

44 Enforces regulations pertaining to the environment and natural resources, including inspecting sites, patrolling, and issuing warnings.

45 Oversees or participates in audits of the environmental performance of organizations and jurisdictions to determine the adequacy of their policies and procedures, and non-compliance issues.

Category D – Pollution Prevention, Abatement & Control

D6 Implementing pollution prevention, abatement & control (PAC) methods

46 Assesses operations and processes for potential pollution problems (involves identifying contaminant sources, determining their characteristics and the magnitude of the potential risks).

47 Characterizes the attributes of processes and products generated (for example, chemical/biological composition, toxicity, physical properties and degradability).

48 Evaluates the presence and dispersion of pollutants over large geographic areas using, for example, remote sensing devices such as satellites and aerial photos, regional monitoring devices and government reports, and regulated models.

49 Develops recommendations for the best management practice for pollution prevention, abatement, and control measure(s), including the evaluation of control options versus process changes.

50 Implements pollution prevention, abatement, and control methods/solutions to prevent, abate, control and reduce pollution, contamination or emissions (e.g. devises ways to prevent contamination of water by agri-chemicals and petroleum products).

51 Monitors the effectiveness of Pollution Prevention, Abatement, and Control (PAC) solutions, and the performance of installed PAC equipment, systems and technologies.

Category E – Climate Change

E7 Identifying and mitigating climate change impacts

47 Monitors global climate and air quality phenomena such as stratospheric ozone depletion and the greenhouse effect.

48 Develops strategies and programs to address energy consumption and greenhouse gas generation that conform to standard protocols and legislated requirements.

49 Implements GHG adaptation strategies to optimize the utilization of renewable energy and/or conservation of natural energy resources.

50 Develops progressive approaches and solutions to modify national, corporate and individual habits to react to potential global climate changes.

Technical Competency Dictionary (continued)

51 Develops greenhouse gas emissions inventories/trading systems to be compatible with the regulatory programs.

52 Tracks air quality and greenhouse gas emissions for purposes such as evaluating, reporting and trading emissions.

53 Develops greenhouse gas emissions/climate change reports.

Category F – Waste Management

F8 Developing/Implementing waste management plans and programs

54 Monitors global climate and air quality phenomena such as stratospheric ozone depletion and the greenhouse effect.

55 Develops strategies and programs to address energy consumption and greenhouse gas generation that conform to standard protocols and legislated requirements.

56 Implements GHG adaptation strategies to optimize the utilization of renewable energy and/or conservation of natural energy resources.

57 Develops progressive approaches and solutions to modify national, corporate and individual habits to react to potential global climate changes.

58 Develops greenhouse gas emissions inventories/trading systems to be compatible with the regulatory programs.

59 Tracks air quality and greenhouse gas emissions for purposes such as evaluating, reporting and trading emissions.

60 Develops greenhouse gas emissions/climate change reports.

F9 Monitoring waste application/disposal/reduction programs and activities

61 Determines requirements of new/improved waste disposal, treatment and recycling systems (e.g. waste volumes, types and methods of treatment).

62 Characterizes waste and waste streams.

63 Monitors (potential) emissions and discharges of waste disposal sites for their effects on surrounding air, water and soils (including for example sanitary landfills, hazardous waste disposal sites, etc.).

64 Uses models to simulate the fate, transport and impacts of contaminants such as discharges, emissions, and toxicants, etc.

65 Tracks waste generation: source, volume, type, location, storage, transportation and disposal.

66 Conducts waste audits to determine, for example, if waste is properly identified and managed, and if material being disposed conforms to permitted use of the disposal facility/site.

Category G – Water Quality Management

G10 Developing/Implementing water supply and water efficiency plans and programs

62 Assesses the environmental aspects of the design, operation and maintenance of water and wastewater distribution/collection systems.

63 Assesses the quality and availability of water supply (both surface and groundwater).

64 Develops water management programs including demand management, water conservation, and water or wastewater treatment programs.

65 Implements strategies to achieve demand management and water conservation targets through programs and projects.

66 Monitors effectiveness of water/wastewater programs and water treatment equipment and processes to meet environmental performance requirements.

67 Provides expert advice for the development of plans for a variety of financially, socially and environmentally acceptable water efficiency projects and programs.

68 Determines site requirements for water wells, farm buildings, industry and feedlots considering such factors as waste run-off patterns and municipal/provincial regulations.

69 Designs water treatment plants, storage facilities and diversion methods to enhance efficiency and minimize environmental impact.

70 Provides guidance and management on day to day operations of water treatment plants.

71 Supports in the optimization of plant processes and operations to ensure/maintain excellent water quality.

Category H – Environmental Sampling & Analytical Work

H11 Developing environmental sampling, testing and monitoring programs

72 Determines the need and scope for sampling program, including environmental indicators, chemicals of concern, and sampling constraints (such as access to sites, fiscal or other limitations).

73 Develops environmental sampling protocols, including data quality objectives, the frequency and timing of sampling, optimum locations for continuous or discrete sampling, data capture systems, sampling procedures, sampling methodology, personnel, and parameter list for analysis.

74 Develops site-specific work plans, including Quality Assurance/Quality Control (QA/QC) methods, measuring/monitoring procedures and analytical equipment (both field and lab equipment) to be used for the specific application (e.g. air, water, soil, sediments, rock, fauna, flora, human, workplace, etc.).

75 Develops methodologies and protocols for the collection and analysis of qualitative data to complement any quantitative data collected.

76 Modifies existing sampling programs to reflect changing research priorities and/or environmental circumstances.

77 Maintains analytical test instruments and monitoring or sampling equipment as per manufacturers' user-maintenance specifications and user's standard operating procedures, including calibration of instruments/equipment.

Technical Competency Dictionary (continued)

H12 Collecting samples and data for environmental purposes

78 Determines the appropriate sample size, sampling containers, protocols, preservation methods, collection apparatus and transportation, etc.

79 Selects, assembles and deploys analytical test instruments or sampling equipment (such as data capture systems, continuous monitoring devices, drilling cores, water bailers, etc.), including assembly and documentation of deployment and operational conditions and other pertinent details, such as any deviation to standard procedures.

80 Collects samples and specimens as per established protocol, using more routine sampling procedures and apparatus.

81 Collects samples and specimens as per established protocol, using more complex sampling procedures and apparatus.

82 Uses appropriate techniques to prepare (code, preserve, pre-treat and transport) samples for analysis while maintaining chain of custody requirements and sample integrity.

83 Prepares samples (other than biological) for lab analysis using techniques such as grinding, dehydration, dilution or concentration, chemical extraction, digestion, and fractionation.

84 Prepares biological samples for lab analysis using techniques such as dissection, emulsification, and tissue or bacterial culturing.

85 Performs direct measurement of physical parameters for air/water/soil, including for example, temperature, flow rates, pressure, gaseous/particulate emissions, etc.

86 Collects data on odours or taste (e.g. for muddy flavour) using appropriate means to determine thresholds.

87 Collects data from images obtained from sources such as remote sensing devices, satellite, and aerial/terrestrial/under-water cameras/sensors.

88 Maintains appropriate records and ongoing documentation pertaining to field and laboratory analytical work, including regulatory documentation.

H13 Analyzing and interpreting environmental samples and data

89 Uses more routine analytical procedures and instruments (such as meters, electrodes, and spectrophotometers) to identify and/or quantify the physicochemical properties, specific chemicals or chemical groups, etc. of the samples collected.

90 Uses more complex analytical procedures and advanced instruments, such as gas liquid chromatography, mass spectrometry, polymerase chain reaction and Enzyme-Linked ImmunoSorbent -Assay, to identify and/or quantify chemical properties, specific chemicals or chemical groups (including those present at trace concentrations), etc. in the samples collected.

91 Analyzes samples for microbiological organisms by application of basic methods such as aseptic techniques, membrane filtration, staining procedures, culturing & isolation procedures, microscopic and related techniques.

92 Classifies samples using applicable classifications (e.g., CSCC soil classification, taxonomy, sorting sample by phylum, order, family, species).

93 Classifies soils, land formations, minerals, etc. by their type, chemical and geophysical properties, etc.

94 Makes required calculations and estimates including for example, calculation of air quality indices (e.g. daily smog ratings).

95 Conducts statistical analysis of data using appropriate computer software, databases, etc.

96 Assesses the accuracy and precision of analytical results by applying good practice guidance or established QA/QC methods.

97 Interprets analytical data to identify trends, significant changes from historical patterns, deviations, or evidence of environmental stresses, etc.

98 Determines how results will be applied, for example redesigning sampling protocol, redesigning research methodology, developing a baseline dataset, etc.

99 Conducts quality control reviews of data collection, processing, and analysis to ensure data is 'fit for purpose' using accepted scientific practices and proper Quality Assurance/Quality Control (QA/QC) protocols.

100 Prepares summary reports of analysis results using technical formats such as tables, charts, and diagrams for integration into technical reports and/or presentation to expert and/or non-expert audience through scientific journals, oral presentations, etc.

Category I – Policy Development & Planning

I14 Developing environmental policies, measures & standards

101 Lobbies legislators to develop appropriate environmental policy and to enforce regulations and standards.

102 Reviews existing and/or proposed environmental policies/legislation/standards (and the rationale supporting them) to assess implications to stakeholders, including customers and suppliers.

103 Influences environmental policy and legislation by participating in or leading expert level environmental committees and associations.

104 Consults with experts, including environmental, policy and legislative experts in public, corporate, non-governmental organizations (NGO), and governments, regarding new or revised environmental policies and legislation to make recommendations to regulatory authorities.

105 Develops environmental frameworks to address policy issues across multiple jurisdictions, including legal and legislative limitations of the various jurisdictions.

106 Evaluates environmental business management practices in Canada in light of international policy changes in order to influence future changes in Canada's legislative framework.

107 Drafts new or revised environmental legislation, regulations, standards and guidelines.

Technical Competency Dictionary (continued)

I15 Liaising and partnering with stakeholders

108 Liaises with stakeholders (e.g. governments, private sector, environmental experts, farmers, producers, NGOs, culturally diverse groups, communities, etc.) to collaborate on stewardship and sustainability issues and concerns (e.g. broad-based habitat preservation and management practices and ecological fiscal reform).

109 Identifies ethical and cultural concerns regarding the economic, social, cultural, and spiritual valuing of specific natural resources, and the implications for informed decision-making regarding sustainability.

110 Builds consensus regarding the goals and timelines of sustainable development initiatives (e.g. use of natural resources), considering the competing interests of all stakeholders (e.g. economics, increased productivity or harvesting, protecting habitats, access and rights to land, etc.).

111 Develops partnerships with key stakeholders (e.g. industry, governments, local communities and other stakeholder groups) to address environmental sustainability and stewardship issues and concerns.

112 Develops partnership and stewardship agreements which incorporate sustainable development guidelines, indicators, targets, and processes for measuring progress related to specific environmental issues.

113 Secures partnerships involving industry joint ventures, environmental consulting, and/or environmental technology transfer at municipal, provincial, national and international levels.

Category J – Planning, Monitoring & Reporting for Sustainability

J16 Developing sustainable development indicators, plans, and strategies

114 Develops a framework and policies, with input from key stakeholders, for identifying sustainable development approaches and solutions that balance environmental, economic, social and cultural needs.

115 Identifies gaps in scientific, technical and cultural knowledge that aid in forecasting/modeling sustainable development scenarios.

116 Identifies/stays current with emerging developments, best management practices and guiding principles for sustainable environmental development.

117 Provides technical input to the development of positions on environmental issues and sustainable development plans, in areas such as reasonable timelines, priority actions, indicators towards progress, etc.

118 Evaluates the environmental, economic, social and cultural implications (both short and long term) of potential sustainable development initiatives.

119 Uses a multiple account approach to identify the potential indicators of environmental, economic, social and cultural change and the targets for sustainable development.

120 Develops sustainable development indicators and a process for reporting progress towards environmental performance targets.

121 Creates holistic sustainable development plans that integrate economic, social and cultural needs with ecosystem-based management strategies.

J17 Implementing/monitoring sustainable development strategies and programs

122 Implements sustainable development strategies, including the promotion of sustainable development practices (such as "green building" and sustainable communities).

123 Monitors the changing needs of stakeholders and the effectiveness of sustainable development strategies over short and long timelines to determine if strategies, targets, and/or timelines need to be modified.

Category K – Corporate Environmental Program Planning & Implementation

K18 Developing corporate environmental plans, policies, and procedures

124 Advocates with senior management and other key stakeholders to ensure due consideration of and commitment to environmental management and sustainable development principles and strategies.

125 Develops strategic internal and external partnerships and relationships with key stakeholders to garner their advice and gain their commitment to the organization's environmental policies and initiatives.

126 Advises senior management (and other stakeholders) on corporate environmental matters related to leadership responsibilities, regulatory and reporting requirements, and corporate liability.

127 Provides advice to senior decision makers on the extent to which environmental liabilities and risk are being managed appropriately.

128 Evaluates the environmental, economic, social and cultural impacts and implications of the organization's operations and processes.

129 Evaluates the effectiveness of indicators (including economic, social, cultural, and human health benefits) to measure progress in areas such as a reduction in emissions to the environment.

130 Prepares environmental performance reports relative to established metrics for communication to internal management, regulatory and stakeholder groups.

131 Makes recommendations for improvements to organizational operations based on an evaluation of corporate environmental performance.

132 Benchmarks environmental policies and performance against those of corporate, municipal, provincial, regional, national, or international peers.

133 Develops the organization's environmental policies and program in alignment with regulatory requirements, corporate values, and stakeholders' environmental, economic, social and cultural expectations.

Technical Competency Dictionary (continued)

134 Assesses the cost-benefit implications of the changes in process or practices required to conform to new standards or guidelines.

135 Develops the environmental policy component of the organization's strategic plan, including the processes and practices that support the environmental policy.

K19 Conducting environmental risk assessments

136 Identifies hazards, opportunities or potential risks to human health, the environment, facility operation/financial loss, legal liability, social impact, public perception through such activities as collecting source data, reviewing literature, investigating illness/injuries, and obtaining feedback from workers or the public.

137 Conducts hazards and operability studies (e.g. of oilfield facilities and operations).

138 Predicts the probable exposure to hazards using exposure and chemical fate/transport models, and the physical and chemical properties of contaminants.

139 Conducts qualitative assessment of risk by identifying the likelihood of events and the likelihood and severity of individual consequences.

140 Conducts quantitative risk assessment to identify the direct and indirect consequences of individual and multiple environmental impacts, including remediation and restoration activities if applicable.

141 Characterizes the risks of environmental stressors or contaminants at varying intensities and cumulative dosages on human health and/or the ecosystem.

142 Develops site specific standards/criteria to identify and manage risk with help from toxicologists and medical staff.

143 Develops risk management strategies, including prioritization of risks and actions to address ecological and human risks, and to manage financial, legal, social, and public perception issues.

144 Uses models to evaluate the effectiveness of the risk management strategies in the Environmental

145 Management Systems for contaminants of concern, and the resulting impact on the environment (for example, reduction of green house gas emissions).

146 Assesses the effectiveness of risk management activities to minimize impact on the environment and human health.

K20 Implementing environmental management systems

147 Develops an Environmental Management System which is consistent with the organization's strategic plan and regulatory requirements, including goals, objectives, and targets.

148 Implements the Environmental Management System strategies and practices.

149 Integrates the environmental management components of new operations, new projects, facility expansions, etc. into the corporate environmental management program.

150 Provides leadership to all aspects of the design, implementation, monitoring and reporting on the corporate environmental management program.

151 Ensures that corporate environmental management projects and proposals meet corporate standards, and financial and budgetary requirements.

152 Advises on human resource issues pertaining to the responsibilities and selection of external environmental contractors and consultants and the internal environmental team in accordance with the organization's policies and regulatory standards.

153 Develops full life cycle plans for the stewardship of environmental resources (from development to restoration, if applicable).

154 Implements programs and practices that encourage accountability, for example, by integrating environmental responsibilities into employees' jobs.

155 Integrates risk management decisions into the Environmental Management System and/or corporate business/strategic planning.

K21 Managing environmental management systems and practices

156 Uses information systems to monitor and track regulatory compliance, environmental incidents, permits, waste streams and other Environmental Management Systems requirements.

157 Revises Environmental Management System practices and outcomes to correct and prevent non-conformance.

158 Manages audits of the Environmental Management System to identify areas where corrective actions are needed.

159 Benchmarks the organization's Environmental Management System against that of other companies and/or international standards (e.g. ISO).

K22 Coordinating environmental aspects of facility design & operation

160 Determines the environmental aspects of the design and operation of the proposed facility, plant, landfill, etc.

161 Develops plans, protocols and procedures to address the environmental aspects of facility design, construction, operation and closing.

162 Coordinates the implementation of the environmental aspects of plans, protocols and procedures related to facility construction and operations.

163 Implements measures to correct environmental or safety problems relative to the facility or operation site.

164 Implements the environmental aspects of decommissioning facilities, operations or exploitation sites.

Category L – Environmental Safety

L23 Monitoring/addressing occupational and public health and safety

165 Evaluates the significance of environmental occupational/public hazards and safety issues as a basis for the development of policies, programs and procedures.

Technical Competency Dictionary (continued)

166 Develops and implement programs to manage risk to the public.

167 Develops preventative programs that help protect workers' (or the public's) health and safety in response to environmental concerns.

168 Develops organizational procedures concerning environmental and occupational/public health and safety matters.

169 Implements measures to mitigate the health & safety hazards associated with environmental issues created by operations or construction activities and their by-products such as hazardous leachates, effluents and dusts.

170 Develops emergency response plans and procedures to address environmental crises (such as accidental emissions, discharges, releases, explosions, leaks or spills that could cause a threat to humans and the environment), in consultation with stakeholders and emergency response experts.

171 Plans responses to mitigate human health risks/dangers of catastrophic events and insidious damage, such as the release of toxic gases.

172 Monitors existing or potential environmental health hazards and stressors such as noise, energy (UV, IR, radiation), chemical/biological pollutants in the air, water, and/or soil.

173 Monitors HVAC systems relative to health and safety standards for indoor air quality.

174 Assesses the effectiveness of health and safety programs for continuous improvement of programs and results.

Category M – Natural Resources Planning & Management

M24 Conducting studies related to ecosystem and habitat preservation and/or the management of natural resources

175 Develops models to set targets for sustainable use and/or to predict outcomes of conservation practices.

176 Develops methods for indexing existing natural resources and parameters (e.g. wildlife populations and harvest mortality).

177 Defines data (e.g. age, size, structure of population, genetics, distribution, migration patterns, abundance, water temperature, environmental factors, etc.) to forecast future state of natural resources, such as fish populations.

178 Establishes the biodiversity baseline (e.g. nature, number and location of species involved) of the management area under study.

179 Identifies interrelationships between individual ecosystem parameters to develop comprehensive databases of natural resources.

180 Assesses the economic, social and cultural value of natural and physical resources, such as parks/open spaces, heritage resources, wildlife, minerals, etc.

181 Establishes background levels of naturally occurring biological, chemical, and physical activity in ecosystems, such as naturally occurring emissions from forests.

182 Identifies the impact of development/exploration/exploitation activities on the biodiversity of surrounding natural habitats (such as the "downstream" impacts of agricultural activities on surrounding soil and water).

183 Applies GIS tools to monitor change and identify trends in natural habitats and/or ecosystems in order to manage habitat quality and resource sustainability.

184 Evaluates the capability of target sites to sustain restoration, rehabilitation and/or enhancement activities (of fisheries, forestry, etc.).

185 Evaluates the benefit of human-built structures (such as dams, ditches and fish weirs) to prevent destruction or erosion and/or to rehabilitate the habitat.

186 Evaluates the best sites and routes (e.g. gas/oil wells, gas processing plants, pipelines, and mines) for habitat and ecosystem preservation and conservation of natural resources.

187 Conducts modeling of ecosystem variables to predict potential outcomes of habitat restoration practices (such as fisheries rehabilitation or forestry regeneration).

188 Determines how and to what extent the natural resource can be modified (e.g. soil tilled, forest harvested) based on its characteristics.

189 Compiles a comprehensive inventory of data collected to establish a baseline that characterizes ecosystems, natural resources, and social and cultural factors, and/or to determine suitability for an intended use.

190 Prepares baseline report including gap analysis report where baseline data is incomplete, interpretation of baseline data and development of recommendations for consideration by stakeholders and decision-makers.

191 Designs monitoring systems for measuring human impacts on natural resources and/or ecosystems.

192 Tracks the deviation of earth and life science inventories from baseline levels through environmental monitoring programs.

M25 Developing and implementing plans, programs and practices for ecosystem and habitat preservation and/or the management of natural resources

M26 Monitoring/evaluating effectiveness of programs and practices related to ecosystem and habitat preservation and/or management of natural resources

Category N – Environmental Training & Education

N27 Developing environmental curricula and programs

193 Investigates significant occurrences and changes that may signal the need for a resource management and/or ecosystem preservation plan.

194 Seeks input from technical specialists (e.g., biologists, taxonomists, modelers) and other stakeholders (governments, non-governmental organizations, aboriginal peoples, etc.) with respect

Technical Competency Dictionary (continued)

to resource management and habitat protection (such as the identification of important habitat sites).

195 Determines opportunities, options, and targets for increased productivity, utilization or yield of natural resources.

196 Establishes indicators of ecosystem health, based on established baseline data or extrapolations from similar ecosystems and/or traditional knowledge where available.

197 Determines end-use of natural resources (e.g., crops, forest, fisheries) to forecast future needs and demands and the corresponding resource management practices and the basis for its selection.

198 Formulates integrated ecosystem and habitat management plans (including interim management plans for public consultations) and programs to address identified preservation and conservation needs.

199 Implements ecosystem and habitat preservation projects and practices (such as preservation of fish and wildlife habitats and restoration in lakes, rivers, streams, wetlands, marshlands, etc.) to protect and conserve the biodiversity and health of ecosystems.

200 Implements fisheries and wildlife management and conservation practices such as limiting catch and capture, restocking, banding, and increasing nesting and breeding sites.

201 Implements forestry management and conservation practices such as site preparation, fertilization, replanting, seeding, pre-commercial thinning, brushing, pest control, etc.

202 Identifies effective resource management practices, including consideration of cultural and spiritual values of various jurisdictions and stakeholders (including indigenous peoples).

203 Develops effective practices to deal with naturally occurring phenomena, such as damage to crops caused by wildlife or damage/benefits to forests caused by fire.

204 Determines the resources and partnerships required to implement a natural resource management/conservation plan (e.g. funding mechanisms, services).

205 Formulates integrated natural resource management plans (including interim management plans for public consultations) and programs to address identified preservation and conservation needs.

206 Implements agricultural land conservation practices (such as preventing wind or water erosion, maintaining soil organic matter, correcting or controlling soil salinity problems, etc.) to conserve the availability and productivity of agricultural land.

207 Advises producers on the full range of sustainable resource utilization and harvesting practices and techniques, such as soil conservation/enhancement technologies (e.g. tillage options, measures to prevent wind and water erosion, crop rotation, cropping systems, nutrient management, residue management).

208 Implements conservation and preservation practices to manage the environmental impact of human activity in parks and natural recreation areas.

209 Implements urban land resource management practices to minimize detrimental impacts and to maximize environmental benefits, such as restoring undeveloped public lands to their natural state and ensuring proposed developments are consistent with land-use management criteria.

210 Identifies criteria, in collaboration with stakeholders, for evaluating proposals and land-use plans to determine impacts of changes in use of land resources such as conversion of agricultural land to urban use.

211 Identifies residual environmental impact and the associated economic implications (e.g. cash compensation to landowners for land use) of a proposed change in the use of natural resources.

212 Uses models and data (such as projections of population growth, municipal infrastructure needs, and increased demand for resource-based commodities) to forecast the environmental impact of long-term requirements for land resources such as parks, natural recreation sites, agricultural land, and urban development.

213 Develops long term integrated land-use plans (for urban, recreational, industrial, and agricultural uses) that include strategies (such as landscape ecology) to minimize adverse environmental impact.

N28 Implementing environmental education and training

214 Evaluates exploitation or exploration technologies (used to harvest/use natural resources) that do the least damage (low impact) to ecosystems.

215 Monitors baseline data to identify changes, both positive and negative, in order to continually improve conservation and preservation practices.

216 Assesses the effectiveness of conservation and preservation practices, including the interpretation of monitoring data and the validation of conclusions with experts in the field (e.g. government agencies, harvesters, industry, and non-governmental organizations).

217 Evaluates the effectiveness of alternative conservation practices (such as silviculture systems) that are perpetual or require minimal maintenance.

218 Evaluates the effectiveness of changes in municipal by-laws, regulations, and/or targets (such as targets for "green" and/or natural space) in minimizing the adverse impact of land-use activities on natural ecosystems.

219 Evaluates the socio-economic costs and benefits of conservation and preservation practices, including the spin-off costs and benefits, and where appropriate, the social assessment parameters.

N29 Evaluating/Mentoring/Supervising students/practitioners

220 Mentors students and environmental practitioners by advising, supervising, and challenging them to facilitate the development and application of new knowledge in their role as environmental practitioners and community partners in their role in the delivery of sustainable environmental practices.

221 Cultivates a stewardship approach within students and practitioners in the application of sound environmental practices within specific industries.

Technical Competency Dictionary (continued)

222 Evaluates the transfer of knowledge and skills, including comprehension of: the multidisciplinary nature of environmental practice, current best practices in industry, and the need for a global perspective for solving environmental problems.

Category O – Environmental Research

O30 Designing/developing environmental research and development proposals, programs, and projects

223 Participates in taskforces and committees (set up by industry, governments or professional associations) to expand the body of knowledge on environmental research priorities, methodologies, and breakthroughs.

224 Identifies research priorities and opportunities for funding, considering financial viability and other indicators such as, current environmental conditions, scientific knowledge gaps, need for industrial improvements, socio-economic and cultural factors.

225 Defines the environmentally-related problem or opportunity and potential scientific, ecological or socio-economic benefits of conducting research (often including its practical application).

226 Conducts review of literature and existing data pertinent to the potential environmental research program/project.

227 Defines the scope, strategy and objectives for specific environmental research projects and programs, including appropriative quantitative and qualitative methodologies and tools.

228 Writes a proposal, communicating the scientific rationale behind the environmental research project to obtain funding and/or approval from internal, industry, government, or other sources.

229 Evaluates the technical, environmental and socio-economic merits of proposals (e.g. for determining eligibility and allocation of funds).

230 Develops a research action plan for the environmental project (e.g. establish budget, deliverables, timelines and human resource needs) for consideration by stakeholders and decision-makers.

231 Identifies the laboratory, equipment and other site-specific needs for the environmental research program.

232 Provides expert input for the recruitment of environmental research staff.

O31 Conducting environmental research/publishing results

233 Establishes the framework, baselines and benchmarks against which environmental research outcomes can be measured.

234 Defines the specific methodologies and protocols appropriate to the environmental research project.

235 Conducts science and social science environmental research (e.g. eco-toxicology studies, developing models, identifying optimal agri-chemical application rates, studies on environmental perspectives and the effectiveness of public education programs, etc.).

236 Provides expert guidance to others who may be assisting with the environmental research within or outside the organization.

237 Analyzes the environmental research findings to determine if research objectives have been met, or if research methodologies need to be modified.

238 Develops recommendations for the application of the environmental research findings based on pilot testing and demonstration.

239 Writes up the results of the environmental research in accordance with rigorous publishing guidelines (for publication in peer-reviewed journals, presentation at conferences, etc.).

240 Reviews other environmental researcher's reports, proposals, and publication papers to ensure their technical accuracy and soundness.

Category P – Environmental Business, Technology & Product Development

P32 Developing/Coordinating/Implementing energy efficiency programs

241 Develops energy efficiency programs such as Fleet Smart and ENFOR (energy from the forest).

242 Identifies best practices, objectives, and targets for implementation of energy efficiency programs.

243 Implements the technological and process changes relevant to the energy efficiency programs.

244 Develops energy efficiency tracking systems.

245 Monitors success of energy efficiency programs to identify and report on how closely objectives are met and what revisions are necessary.

P33 Identifying/Implementing activities pertinent to commercialization of environmental technologies, systems & equipment

246 Assesses the environmental implications of consumer behaviour and the resulting demand for products, services or natural resources.

247 Assesses emerging opportunities for manufacturing or business start-ups and services in response to changing environmental policies and consumer demand.

248 Advises on corporate strategies and product lines which take into account the drivers of environmental change and their impacts on consumer demand, regulatory changes, and competitive market forces.

249 Articulates the concept and ideas for new environmental technological processes and equipment, such as technologies to remove greenhouse gases from the atmosphere or to destroy waste materials.

Technical Competency Dictionary (continued)

250 Assesses the economic feasibility of new environment-related products and technologies, including biotechnologies such as new crop species.

251 Determines objectives of the commercialization of new equipment or biotechnology products, considering environmental, technical, regulatory and financial constraints.

252 Provides expert input to the preparation or evaluation of proposals to conduct environmental technology development projects (including responding to RFP and preparing unsolicited proposals).

253 Develops new products and species, such as crops, trees, fish, etc. with the long term goal to reduce the burden on the natural resources and ecosystems.

254 Conducts laboratory-scale experiments to determine feasibility of proposed technologies/equipment.

255 Guides the development of new products and equipment from prototype to commercial scale, including trials of new agri-chemicals and their applications.

256 Conducts product and/or process life cycle analysis, including end-products, constituents used to produce them, and the methods used to dispose of them (focusing especially on the environmental implications over the full life cycle).

257 Develops improvements that will make the products (or the processes in which they are used or by which they are made) safer or more environmentally acceptable.

258 Provides expert input to the marketing and sales of environmental products or services (i.e. technical sales and ongoing client services)

Category Q – Environmental Communications & Public Awareness

Q34 Developing/Implementing environmental communications and awareness programs

259 Demonstrates an understanding of the fundamental relationships between human activities and the natural environment.

260 Demonstrates an understanding of the Canadian environmental business sector and sustainability issues.

261 Demonstrates a working knowledge of environmental legislation and agreements relevant to their organization.

262 Demonstrates an understanding of the role of communications in increasing public awareness of environmental issues and in motivating the public to work towards solutions.

263 Develops compelling, well researched and strategic proposals for approval and/or funding of environmental communication/awareness programs.

264 Develops communications/public relations strategies to address employee and public concerns about environmental issues and risks, or to promote the environmental interests of the organization.

265 Provides expert input to the development of a marketing/communication plan to promote/fully describe the organization's environmental capabilities and accomplishments.

266 Ensures the creation (research, writing, and design) of web-based and print communications and educational resources in support of the environmental communications strategies.

267 Develops means to address constraints, sensitivities, or opposing views on environmental concerns so that the message reaches the designated target audience(s) (using a variety of formats such as printed materials, videos, internet, CD ROMs).

268 Establishes goals for environmental awareness programs that will help ensure the intended message is accurately conveyed to the appropriate target audience.

269 Develops the content of environmental awareness programs designed, for example, to encourage and reward environmentally responsible behaviour.

270 Makes presentations to a variety of audiences (including schools, and community and non-governmental organizations) to build awareness of environmental issues, concerns and/or programs (e.g. the health-related effects of chemical enhancements to agricultural food production).

271 Champions environmental programs and their implementation with media, outside audiences, organizations, etc.

272 Assesses the effectiveness of environmental communications/awareness programs in attaining their goals.

Q35 Presenting expert information on environmental matters

273 Manages customer relations on environmental matters in a manner that builds positive, productive partnerships with clients, suppliers and other stakeholders.

274 Manages media relations concerning environmental matters to build, foster and sustain a positive public image for the organization.

275 Acts as the organization's spokesperson concerning environment-related issues and inquiries (e.g. health & safety, contamination of air, water, soil/water, etc.).

276 Conducts informational meetings to identify community and stakeholder priorities on environmental issues and concerns.

277 Identifies current environment-related trends and top companies/thought leaders in the global environmental business sector for the selection of content and speakers for conferences, seminars, focus groups, public consultations and forums.

278 Participates as a speaker, panelist, witness, or expert in conferences, public forums on environment-related topics and issues, or hearings (such as defending the Environmental Impact Assessment report).

279 Critiques environmental reports, proposals, and publications of peers or staff.

Transferable Competency Dictionary

Professional Ethics & Work Style

1 Maintains good standing in professional associations, practicing professional ethics and remaining current in practice requirements.

2 Demonstrates professional, ethical conduct, such as trust, integrity, confidentiality and discretion during the conduct of all work activities.

3 Demonstrates self reliance, motivation and commitment in the conduct of day to day activities.

4 Demonstrates flexibility and creativity in the face of unusual or unexpected circumstances.

5 Cooperates willingly with others in dealing with changing situations, conditions, and expectations.

6 Demonstrates attention to detail to ensure the thoroughness and accuracy of work results.

7 Balances the need for 'attention to detail' with a focus on goals and objectives to achieve the desired outcomes.

8 Applies principles of quality assurance and scientific rigour in all work activities.

Learning & Creativity

9 Stays current on the theory and practice pertinent to one's roles and responsibilities.

10 Integrates relevant data and information from a variety of disciplines/ sources.

11 Continuously pursues personal learning and development opportunities to promote professional growth and development.

12 Uses creative approaches to develop innovative ways of working, new designs and technologies, and cost-effective solutions to technical and business challenges.

Communicating Effectively

13 Prepares clear, well-formatted reports and other written communications that meet established protocols and are appropriate to the target audience.

14 Communicates clearly and respectfully using verbal and nonverbal language appropriate to the cultural and social context.

15 Uses effective interviewing techniques, including appropriate and respectful questioning, clarifying and listening skills, to elicit accurate and complete information.

16 Conveys technical information accurately, clearly and concisely, interpreting it appropriately and effectively for the target audience.

17 Uses appropriate content, graphics and format in oral presentations to address the specific needs of target audiences.

Collaboration

18 Builds constructive networks inside and outside the organization to facilitate the accomplishment of results.

19 Builds strong relationships and trust with team members that make it possible to receive everyone's input and ideas, and maximize individual and team output and potential.

20 Works cooperatively with multiple stakeholders, demonstrating willingness to consider alternative approaches or ideas.

21 Deals effectively with confrontational situations, demonstrating diplomacy, tact, empathy and consideration for differing points of view.

Critical Thinking/Judgment

22 Carries out independent primary, secondary and tertiary research to collect sufficient data and information pertinent to the area of inquiry.

23 Performs an objective and thorough analysis of information and data from multiple sources.

24 Distinguishes between facts, inferences and assumptions to establish the quality of the information collected and the reliability of its source.

25 Employs professional skepticism to assess the objectivity and reliability of assumptions and evidence asserted by a responsible party or client.

26 Makes decisions in a timely manner, committing to a course of action that considers pertinent data, information, options and implications.

Planning & Organizing Work and Projects

27 Uses ICT (information communication technologies) as appropriate to manage work effectively and increase efficiency.

28 Manages multiple priorities through the selection and application of time and project management tools and approaches.

29 Develops work/project plans, identifying the work to be accomplished, the risk/contingencies that may arise, and how they will be addressed.

30 Coordinates resources (including financial, logistical, supplies, etc.) needed to implement work/project plans and achieve desired results.

Leading & Influencing Others

31 Manages the work of others, including project teams, working groups and contractors.

32 Builds consensus and commitment to the team mandate, vision, goals, roles, responsibilities, and processes.

33 Facilitates solutions to barriers that affect individual, team and project performance.

34 Identifies the individual/and or team competencies that are required to accomplish work/project objectives and deliverables.

35 Mentors peers and team members to facilitate their technical competence and on-going professional development.

36 Creates an environment that promotes innovation, creativity and entrepreneurial thinking within the organization.

37 Navigates effectively through political and organizational complexities to avoid or overcome potential barriers to successful completion.

Business Acumen

38 Analyzes relevant business trends, financial measures, economic factors and new regulations, assessing and articulating their impact on the organization.

39 Recognizes business threats and/or opportunities affecting their area of the business, recommending actions to address them.

40 Identities clients' stated and underlying needs, and the work activities and methodologies that will best address these needs.

41 Translates the organization's vision and goals into relevant plans and actions, realigning work efforts with changes in organizational direction.

42 Drives the implementation of changes, tracking their impact to ensure organizational performance is improved or sustained.

APPENDIX C: SECTORS CONTRIBUTING TO A GREEN ECONOMY

Table 13

Sectors Commonly Referenced by Researchers Studying Green Economic Activity

SECTOR		DESCRIPTION
1.	Renewable and Green Energy Generation	This sector encompasses four sub-sectors: (1) Renewable power and heat generation, (2) Production of biofuels and biogas, (3) Other forms of greener energy; and (4) Renewable energy services. Renewable power generation includes hydropower, ocean and wave energy, solar energy (both solar thermal and photovoltaic solar power), wind energy and geo-exchange or earth energy. The biofuels sub-sector includes activities linked to production of bioenergy, biofuels, landfill gas, and municipal solid-waste-to-fuel activities. Other forms of greener energy include cogeneration of power, hydrogen power, and nuclear energy. Renewable energy services include the professional, technical, and scientific services that support a renewable energy sector.
2.	Energy Efficiency and Green Building	The energy efficiency sector includes (1) green building activities and (2) other energy efficiency technologies and applications. The green building sub-sector includes architectural and construction services to build more energy and resource-efficient buildings or retrofit existing buildings to improve their resource efficiency. It also includes building inspection and audit for resource and energy efficiency, deconstruction of inefficient systems or structures, resource-efficient landscaping, the use of energy-saving building materials, installation of energy-efficient HVAC and building control systems, energy-efficient lighting, resource-conserving water systems, and other professional energy services. Beyond green building services, the energy efficiency sector includes energy storage and battery technologies and the use of "smart grid" technologies to make transmission and distribution infrastructure more efficient. Other sub-sectors of energy efficiency include energy-saving consumer products and appliances, energy consulting, software and services, and fuel cell technologies.
3.	Resource Conservation	The resource conservation sector encompasses fisheries and wildlife management, and natural resource management. The natural resource management subsector encompasses organic and sustainable agriculture, sustainable forestry, land management, water and soil conservation, storm water management, water-efficient products for natural resource management, and other forms of resource conservation.
4.	Alternative and Sustainable Transportation	This sector includes two different subsectors: (1) vehicles and (2) transportation systems planning. The vehicles subsector includes electric vehicles, hybrid vehicles, alternative fuel vehicles, and fuel cell vehicles. It also encompasses repair and maintenance of these vehicles and fueling stations for these vehicles (e.g. stations supplying natural gas, hydrogen, electric power, etc.). The transportation systems planning subsector includes mass transit systems, transportation systems planning, and transportation logistics with reduced environmental impact such as traffic monitoring software or truck fleet tracking systems.

Table 13

Sectors Commonly Referenced by Researchers Studying Green Economic Activity (continued)

SECTOR		DESCRIPTION
5.	Environmental Protection	The sector encompasses seven sub-sectors with an environmental protection function: (1) Air quality, (2) Water quality, (3) Site assessment and reclamation, (4) Waste management, (5) Professional environmental services, (6) Pollution control, and (7) Environmental health and safety. The air quality subsector includes air purification technologies, air testing, and other services related to monitoring and improving air quality. The water quality sub-sector encompasses water testing, water purification technologies, and waste water treatment. The waste management subsector includes both waste treatment and recycling.
6.	Green Products Manufacturing	This sector includes the production of goods that have an environmental benefit. Sub-sectors include green building materials, biomaterials, bioplastics, biochemicals, and biorubber products, green consumer products (including electrical equipment, appliances and components), environmental monitoring and control products, recycled-content products, eco-friendly packaging and green product process management. Some companies produce green paper products, green petroleum and coal products, and machinery used in protection of the environment or more efficient resource usage.
7.	Green Services	Green services is a broad sector that encompasses several sub-sectors including (1) Environmental education and training, (2) Environmental communications and public awareness, (3) Policy and legislation, (4) Research and development, (5) Financial services including carbon finance and investment, financial services and venture capital for green businesses and energy trading, and (6) Business services including the use of ICT to lower environmental impact.
8.	Sustainability Planning & Urban Design	This sector encompasses all activities related to planning for a sustainable urban environment.
9.	Carbon and Climate Change Mitigation	This sector includes carbon capture and storage as well as activities that are related to mitigating the effects of climate change.
10.	Green Retail	Green retail sector encompasses businesses that sell environmentally-friendly products as well as those who employ sales consultants to help customers make more environmentally-conscious purchasing decisions.
11.	Eco-Tourism	This sector encompasses the services that are consumed by tourists as they visit fragile, pristine, undisturbed natural areas in a low-impact manner as to preserve the ecological system. Responsible eco-tourism includes all programs and activities that minimize the negative aspects of conventional tourism on the environment and enhance the cultural integrity of local people.

APPENDIX D: GREEN OCCUPATIONS IN DEMAND IN ONTARIO

Table 14

Jobs in Demand: Job Vacancies for Occupations Supporting a Green Economy

RENEWABLE / GREEN ENERGY
Manager
Operations manager
Quality control manager
Engineer
Civil engineer
Process engineer, solar manufacturing
Project engineer, renewable power
Specialist
Security advisor
Technical specialist
Technician
Mechanical service technician
Wind technician
Trades
Arc welder
Scientist
Physics technical specialist
R&D scientist (metallurgy)
Regulatory & Policy
Policy advisor
Sales & Support
Customer representative
Sales professional, solar PV & thermal
Sales representative, geoexchange
Support
Program assistant

ALTERNATIVE & SUSTAINABLE TRANSPORTATION
Manager
Program manager
Roadway design manager
Planning
Environmental planner
Transportation planner
Specialist
Site animator

RESOURCE CONSERVATION
Manager
Conservation crew leader
Garden centre manager & garden worker
Specialist
Arborist
Beekeeping intern
Invasive species specialist
Stewardship & horticultural assistant
Ecology
Restoration ecology professional
Farm-Related
Farm help
Natural Resources Occupations
Forestry program assistant
Hydrogeologist
Urban forest bursary
Water resources analyst
Organic
Organic gardener
Wildlife
Wildlife hotline emergency services operator/educator

EFFICIENCY & GREEN BUILDING
Manager
Energy project manager
Manager - energy & environment management
Municipal infrastructure project manager
Structural building science project manager
Sustainability and energy manager
Environmental
Civil engineering technologist, environmental & geotechnical
Specialist
Field inspector
Strategic energy initiatives coordinator
Landscape
Landscape architect
Landscape architectural technologist
Research scientist - nursery and landscape horticulture

Table 14

Jobs in Demand: Job Vacancies for Occupations Supporting a Green Economy (continued)

ENVIRONMENTAL PROTECTION
Manager
Director of health, safety and environment
Environmental consulting project manager
Environmental manager
Environmental professional project manager
Environmental remediation site foreman
Municipal infrastructure project manager
Project administrator
Project manager, contaminated sites or reclamation
Project manager, wastewater infrastructure remediation
Technical director, water treatment
Engineer
Air quality environmental engineer
Environmental engineer
Geoscientist
Health and safety engineer
Hydrogeologist
Process engineer
Project engineer
Water resources engineer
Water resources engineer/hydrologist
Environmental
Environmental affairs coordinator
Environmental consultant
Environmental coordinator
Environmental services intern
Environmental technologist
Biologists
Aquatic biologist
Terrestrial and wetland biologist
Terrestrial biologists & ecologist

ENVIRONMENTAL PROTECTION
Planning
Land development design technologist
Reclamation
Environmental & reclamation assessments professional
Regulatory & Policy
Air quality compliance specialist
Site environmental and regulatory coordinator
Supervisor, regulatory compliance
Safety & Health
Environment, health and safety coordinator
Environmental health and safety manager
Health & safety compliance management specialist
Health and safety administrator
Health, safety & environment advisor
Seasonal
Park person, seasonal
Specialist
Air emissions specialist
Mining closure & rehabilitation specialist
QA analyst
Technical analyst infrastructure assessment
Sustainability
Infrastructure sustainability leader
Technician
Civil engineering or geotechnical technologists
Emissions testing field technician
Laboratory technologist
Materials management technician

Table 14

Jobs in Demand: Job Vacancies for Occupations Supporting a Green Economy (continued)

GREEN SERVICES
Manager
Manager, sustainability and stakeholder communications
Project manager, mining permitting
Environmental
Environmental outreach campaigner
Environmental policy co op
Maintenance
Lead hand (grounds worker, parks)
Meteorology
Meteorologist
Regulatory & Policy
Environmental compliance coordinator
Scientist
Staff scientist
Specialist
Interpretive program guide
Network coordinator
Senior consultant management systems
Stakeholder Relations
Frontline campaigner
Invasive species community outreach liaison

GREEN PRODUCTS MANUFACTURING
Manager
Energy project manager
Quality control manager
Engineer
Corporate environmental health & safety engineer

CARBON AND CLIMATE CHANGE MITIGATION
Environmental
Environmental services intern
Regulatory & Policy
Associate director of policy
Scientist
Staff scientist
Specialist
Strategic energy initiatives coordinator
Technician
Field technician/technologist, emissions testing

SUSTAINABILITY PLANNING & URBAN DESIGN
Manager
Manager, operational sustainability
Project manager urban development
Project manager, sustainability environment & climate change
Environmental
Environmental planner & monitor
Environmental services mining practice leader
Planning
Administrative planning technician
Ecological planner
Resource planning technician
Regulatory & Policy
Senior policy analyst, sustainability
Specialist
Economics & sustainability location operations director

GREEN RETAIL
Environmental
Analyst, product & environmental stewardship
Specialist
E-commerce coordinator at grassroots organization

ECO-TOURISM
Manager
Canoe trip support/logistics manager
Hospitality Staff
Dining room server
Housekeeping staff
Outdoor Guides & Instructors
Canoe guide
Wilderness canoe instructor
Outdoors Support
Camp counsellors & specialists, waterfront staff
Campground office worker
Maintenance summer camp male staff position
Specialist
Provincial park warden

Table 15

Remaining Occupations in Ontario's Green Economy

OTHER OCCUPATIONS IN ONTARIO'S GREEN ECONOMY (NOT STRONGLY LINKED TO A SECTOR)
Biologists
Environmental biologist
Faculty position in biology
Engineer
Building scientist/engineer
Electrical engineer
Energy management engineer
Engineer - ventilation
Engineer- design instrumentation
Engineering manager
Engineer-in-training - mining
Engineers/designers/planners - mining
Environmental scientist or engineer
Environmental/chemical engineer
Geotechnical engineer-tailings
Instrument & control engineer
Naval combat systems engineer
Project engineer
Senior engineer
Structural engineer
Technologist
Water resources engineer
Environmental
Environmental advisor
Environmental biologist
Environmental justice project coordinator
Environmental performance verification officer
Environmental planner
Environmental project manager
Environmental scientist or engineer
Environmental specialist
Environmental/chemical engineer
Environmentally-friendly cleaners
Farm Related
Community garden coordinator
Farm camp director
Organic dairy and egg farm apprentice
Organic farm intern
Hospitality Staff
Culinary assistant
Kitchen staff
Maintenance
Maintenance manager
Residential garden maintenance leader

OTHER OCCUPATIONS IN ONTARIO'S GREEN ECONOMY (NOT STRONGLY LINKED TO A SECTOR)
Manager
Account manager
Assistant vice president
Associate brand manager
Business development manager
Chief operating officer
Communications and event manager
Contaminated site manager
Energy efficiency services program manager
Engineering manager
Environmental project manager
Maintenance manager
Marketing and development manager
Menu manager
Municipal manager
Program manager, southern Ontario land & water campaign
Sales account manager
Waste operations manager
Natural Resources
Engineer-in-training - mining
Engineers/designers/planners - mining
Greenway conservation intern
Hydrogeologist
Mining supervisor
Utilities operator
Water resources analyst
Organic
Fair-trade, organic coffee marketing & delivery by bike
Organic dairy and egg farm apprentice
Organic farm intern
Organic vegetable delivery driver
Outdoor Guides & Instructors
Canoe trip leader
Student outdoor education assistant
Student recreation programming assistant
Planning
Engineers/designers/planners - mining
Environmental planner
Land development project coordinator
Land steward
Regulatory & Policy
Policy analyst
Regulation officer

Table 15

Remaining Occupations in Ontario's Green Economy (continued)

OTHER OCCUPATIONS IN ONTARIO'S GREEN ECONOMY (NOT STRONGLY LINKED TO A SECTOR)
Safety & Health
EHS specialist
Sales & Support
Barista
Children's camp community networker
Customer service representative
Green marketing coordinator
Marketing assistant
Marketing intern
Retail associate
Sales account executive
Sales account manager
Solar sales agents
Scientist
Building scientists/engineers
Environmental scientist or engineer
Seasonal
Summer program staff
Specialist
Assistant publisher
Autocad specialist
Bilingual interpreter
Bookkeeper
Coastal centre intern
Community energy specialist
Community food programming assistant
Draftsperson
Driver
EHS specialist
Environmental specialist
Food for life operations coordinator
Freight consolidation centre analyst
Lunch club coaches
Medical research associate
Membership development coordinator
Office coordinator
Project assistant
Project facilitator
Receptionist/office assistant
Research coordinator
Vegetarian directory assistant

OTHER OCCUPATIONS IN ONTARIO'S GREEN ECONOMY (NOT STRONGLY LINKED TO A SECTOR)
Stakeholder Relations
Campaign director
Communications coordinator
Communications officer
Community development programming assistant
Community outreach
Fundraising coordinator
Outreach canvasser
Production intern
Rain communications assistant
Rain communications officer
Student heritage events assistant
Support
After school program coordinator
Help desk support technician
Sustainability
Education and outreach intern
Stewardship program student
Terracycle summer intern
Technician
Assistant water resource technician
Conservation technician
Hazardous materials technologist
Help desk support technician
Land resources technician
Project developer/analyst - integration
Technologist
Trades
Electrician
Lift mechanic
Solar panel installer

Note: the content analysis techniques used in the research resulted in some duplicate job titles, or job titles that were similar enough to justify their consolidation in this report. For example, the research revealed 309 job titles in Ontario's green economy during the data collection period, however only 276 occupations are presented in Tables 14 & 15.

After grouping these various job titles according to major occupational groups, the three top categories for occupations in Ontario's green economy included Managers, Specialists and Engineers, as indicated in the table below.

Table 16

Occupational Groups in Higher Demand in Ontario

OCCUPATIONAL GROUP	TOTAL	IN GREEN ECONOMY SECTORS	NON-SECTOR SPECIFIC
Managers	46	28	18
Specialists	42	20	22
Engineers	32	13	19
Environmental-Specific Occupations	22	12	10
Stakeholder Relations	14	2	12
Technicians	14	7	7
Sales & Support Workers	13	3	10
Natural Resources-Specific Occupation	11	4	7
Planners	10	6	4
Regulatory & Policy Occupations	10	7	3
Biologists	6	3	3
Safety & Health Professionals	6	5	1
Scientists	6	4	2
Farm Related	5	1	4
Organic Foods	5	1	4
Outdoor Guides & Instructors	5	2	3
Hospitality Staff	4	2	2
Sustainability Professionals	4	1	3
Trades	4	1	3
Landscaping Workers	3	3	N/A
Maintenance Workers	3	1	2
Outdoors Support Workers	3	3	N/A
Other Support	3	1	2
Seasonal	2	1	1
Ecology	1	1	N/A
Reclamation	1	1	N/A
Wildlife	1	1	N/A
Total	**276**	**134**	**142**

APPENDIX E: DEMAND FOR COMPETENCIES BY GREEN SECTOR

Table 17

Transferability of Competencies – Requirements by Green Sector in Ontario

CATEGORY	DEMAND FOR COMPETENCIES, BY GREEN SECTOR	PERCENTAGE OF JOB VACANCIES THAT REQUIRE THE COMPETENCY
A	**Environmental Impact Assessment**	**5%**
	Alternative/Sustainable Transportation	40%
	Sustainability Planning / Design / Urban Design	21%
	Green Services	13%
	Resource Conservation	7%
	Environmental Protection	5%
B	**Site Assessment (RRR)**	**11%**
	Alternative/Sustainable Transportation	40%
	Eco-Tourism	20%
	Environmental Protection	19%
	Resource Conservation	15%
	Renewable/ Green Energy	14%
	Green Services	13%
	Energy Efficiency & Green Building	12%
	Sustainability Planning / Design / Urban Design	4%
C	**Regulatory & Enforcement**	**13%**
	Environmental Protection	33%
	Energy Efficiency & Green Building	24%
	Green Services	23%
	Sustainability Planning / Design / Urban Design	21%
	Alternative/Sustainable Transportation	20%
	Renewable/ Green Energy	14%
	Resource Conservation	7%
D	**Pollution Prevention, Abatement, & Control**	**2%**
	Green Services	3%
	Environmental Protection	2%

Table 17

Transferability of Competencies – Requirements by Green Sector in Ontario (continued)

CATEGORY	DEMAND FOR COMPETENCIES, BY GREEN SECTOR	PERCENTAGE OF JOB VACANCIES THAT REQUIRE THE COMPETENCY
E	**Climate Change**	**3%**
	Green Manufacturing	33%
	Carbon and Climate Change Mitigation	20%
	Energy Efficiency & Green Building	12%
	Green Services	10%
	Renewable/ Green Energy	10%
	Environmental Protection	3%
F	Waste Management	4%
	Environmental Protection	6%
	Energy Efficiency & Green Building	6%
	Renewable/ Green Energy	5%
	Sustainability Planning / Design / Urban Design	4%
G	**Water Quality Management**	**16%**
	Green Manufacturing	33%
	Environmental Protection	30%
	Sustainability Planning / Design / Urban Design	29%
	Alternative/Sustainable Transportation	20%
	Resource Conservation	19%
	Green Services	16%
	Energy Efficiency & Green Building	6%
H	**Environmental Sampling & Analytical Work**	**21%**
	Alternative/Sustainable Transportation	60%
	Green Manufacturing	33%
	Environmental Protection	28%
	Sustainability Planning / Design / Urban Design	25%
	Green Services	23%
	Resource Conservation	22%
	Carbon and Climate Change Mitigation	20%
	Renewable/ Green Energy	19%

Table 17

Transferability of Competencies – Requirements by Green Sector in Ontario (continued)

CATEGORY	DEMAND FOR COMPETENCIES, BY GREEN SECTOR	PERCENTAGE OF JOB VACANCIES THAT REQUIRE THE COMPETENCY
I	**Policy Development & Planning**	**6%**
	Alternative/Sustainable Transportation	20%
	Green Services	16%
	Sustainability Planning / Design / Urban Design	8%
	Environmental Protection	8%
	Resource Conservation	7%
	Renewable/ Green Energy	5%
J	**Planning, Monitoring & Reporting for Sustainability**	**8%**
	Green Manufacturing	33%
	Energy Efficiency & Green Building	29%
	Sustainability Planning / Design / Urban Design	25%
	Green Services	16%
	Environmental Protection	9%
	Renewable/ Green Energy	5%
	Resource Conservation	4%
K	**Corporate Environmental Program Planning & Implementation**	**24%**
	Environmental Protection	44%
	Alternative/Sustainable Transportation	40%
	Green Services	35%
	Renewable/ Green Energy	24%
	Sustainability Planning / Design / Urban Design	21%
	Carbon and Climate Change Mitigation	20%
	Resource Conservation	15%
	Energy Efficiency & Green Building	6%
L	**Environmental Health & Safety**	**17%**
	Green Retail	50%
	Environmental Protection	41%
	Green Manufacturing	33%
	Green Services	29%
	Resource Conservation	26%
	Renewable/ Green Energy	24%
	Sustainability Planning / Design / Urban Design	13%

Table 17

Transferability of Competencies – Requirements by Green Sector in Ontario (continued)

CATEGORY	DEMAND FOR COMPETENCIES, BY GREEN SECTOR	PERCENTAGE OF JOB VACANCIES THAT REQUIRE THE COMPETENCY
M	**Natural Resources Planning & Management**	**39%**
	Sustainability Planning / Design / Urban Design	71%
	Resource Conservation	67%
	Eco-Tourism	60%
	Green Services	52%
	Energy Efficiency & Green Building	41%
	Environmental Protection	30%
	Renewable/ Green Energy	24%
	Alternative/Sustainable Transportation	20%
	Carbon and Climate Change Mitigation	20%
N	**Environmental Education & Training**	**21%**
	Sustainability Planning / Design / Urban Design	38%
	Green Services	35%
	Green Manufacturing	33%
	Resource Conservation	26%
	Energy Efficiency & Green Building	24%
	Carbon and Climate Change Mitigation	20%
	Renewable/ Green Energy	19%
	Environmental Protection	19%
	Alternative/Sustainable Transportation	0%
O	**Environmental Research**	**6%**
	Green Retail	50%
	Alternative/Sustainable Transportation	20%
	Energy Efficiency & Green Building	12%
	Green Services	10%
	Sustainability Planning / Design / Urban Design	8%
	Resource Conservation	4%
	Environmental Protection	2%

Table 17

Transferability of Competencies – Requirements by Green Sector in Ontario (continued)

CATEGORY	DEMAND FOR COMPETENCIES, BY GREEN SECTOR	PERCENTAGE OF JOB VACANCIES THAT REQUIRE THE COMPETENCY
P	**Environmental Business, Technology & Product Development**	**17%**
	Green Retail	100%
	Green Manufacturing	67%
	Energy Efficiency & Green Building	41%
	Renewable/ Green Energy	29%
	Carbon and Climate Change Mitigation	20%
	Green Services	19%
	Sustainability Planning / Design / Urban Design	17%
	Environmental Protection	14%
	Resource Conservation	7%
Q	**Environmental Communications & Public Awareness**	**21%**
	Renewable/ Green Energy	43%
	Carbon and Climate Change Mitigation	40%
	Green Services	39%
	Green Manufacturing	33%
	Eco-Tourism	30%
	Sustainability Planning / Design / Urban Design	13%
	Resource Conservation	11%
	Environmental Protection	8%

APPENDIX F:
GREEN PROFESSIONAL PROFILES

Green Professional Profiles

The Green Jobs Map – Supplementary Ontario Report provides important new information on the types of employers currently hiring green workers in Ontario, as well as the specific competencies that these companies look for. While these details are essential for new professionals considering their green career options, there is also tremendous value in hearing the experiences of highly successful, experienced environmental practitioners. More often than not, these green career champions have not simply found great opportunities -- they have created them through their willingness to continuously expand their skills and tackle new challenges.

The following profiles demonstrate what it is like to pursue a green career path, as well as what it takes to demonstrate true leadership and initiative in the transition to a greener economy.

PROFILE:

Meredith Severin

Bachelor of Arts Honours, Carleton University/ University of Victoria, Master of Environment and Management Candidate (2012) Royal Roads University

For Meredith Severin, the development of the green economy has sparked a dynamic career in research and policy.

To start out on this green career path, Meredith completed Carleton's interdisciplinary program in Environmental Studies. This program provided an excellent basis for understanding complex environmental issues by straddling both social and applied sciences while also drawing upon complementary disciplines, like ecology and political science.

After two years in Ottawa, Meredith had the opportunity to join the University of Victoria's parallel program as a visiting student. The prospects of exploring the West Coast and working as a research assistant in the Department of Geography were too much to resist. Upon returning to Carleton to graduate from her program, Meredith went on to work on a range of environmental and sustainability issues in the ENGO sector, as well as with municipal and provincial governments.

Meredith's interest in policy development led her to the Foreign Commonwealth Office at the British Consulate-General in Vancouver, where she worked on climate change and energy policy. She notes, "I never knew that policy work could be so dynamic and fast-paced. I enjoy moving the goal posts, whether via new objectives and projects, or developing new specialties. I thrive on finding new ways to challenge myself to do better."

This passion for continuous professional growth and learning is clearly evident in Meredith's current endeavors. Currently, she is completing a Master's degree at Royal Roads University and writing a thesis on the green economy as part of this program. Her research on this topic has presented a number of exciting opportunities and thought-provoking discussions.

According to Meredith, "I have been able to engage knowledgeable people from across sectors on the green economy, and have enjoyed discerning the various angles and techniques used to dissect this complex topic." She observes further that, "Discussions always have to take into consideration organizational mandates and this is a helpful reminder of the subjectivity and contextual dependence that is often at play. I find this fascinating."

When it comes to developing a vision of the growth and development of the green economy, Meredith's research offers important insights. "My research has me currently digging through dozens of studies and reports to inform myself as to what this might actually look like and it would seem that Canada has to make bold investments in the development of the green economy. We can't hedge our bets. One look at China, the economic powerhouse, and we can see that investment in green technology and alternative energy is an area of massive opportunity that we should not ignore."

Meredith also notes several challenges that must be addressed in order to enable Canada's shift to a greener economy. She states: "While there are strengths to a variety of approaches to fostering a green economy across provinces and municipalities, there are inherent weaknesses too. There are programs and policies, legislation and regulations that are creating a patchwork across Canada, North America and the world. The lack of certainty is not conducive to growing business or making sound 'over-the-horizon' decisions." She adds that, "Greater coordination and cooperation might help lend certainty to initiatives like the WCI or Ontario's FITs for green energy developments. We're all moving in the same direction, but sometimes it feels like a bit of a three-legged race."

In looking back at what has made her green career path especially interesting so far, Meredith mentions her policy work with emerging carbon markets in the EU and North America. As she observes, "This represents a paradigm shift – the beginning of a completely different way of making sense of markets, costs and consumer choices. It has not been, and will not be, an easy shift but changes of this scale never are. Nevertheless, it has been exciting to develop my career alongside a fundamental change like this one."

To make the most of an exciting and highly dynamic career focused on research and policy development, Meredith emphasizes the importance of adaptability in aspiring green professionals. She states, "Sometimes apparent distractions need to be considered for their ability to help us refocus. A student once asked the eminent psychologist Carl Jung for the shortest path to her life's goal. Without hesitation, Jung replied: 'The detour.'"

PROFILE:

R. Cecil Burns

CET, EP, CMVP, LTSRP

Environmental Coordinator/ Energy Manager at Weyerhaeuser Kenora TimberStrand Plant

For Cecil Burns, the path to a rewarding green career has been "a long and winding road," with many key turning points in his impressive thirty-four years as an environmental practitioner.

Cecil set out on this remarkable career journey in 1978, as a graduate of Georgian College's Resources Technology program. According to Cecil, "This program was an early forerunner of Environmental Technology programs and provided me with a sound footing in many aspects of environmental management and engineering practices."

With this educational background, Cecil was hired as a Development Coordinator with the Ministry of Natural Resources. He was based in Wasaga Beach Provincial Park in southern Ontario, and was responsible for the design and management of construction projects within the park, including roads, parking areas and trails. Following this first foray into the green sector, Cecil went on to become an Environmental Officer with the Ministry of Environment in Kenora, where his initial duties included monitoring municipal sewage and water plants, waste disposal sites and land developments.

After several years of monitoring municipal and industrial operations, Cecil transitioned into a challenging new role as a Mine Rehabilitation Inspector with the Ministry of Northern Development and Mines. This was a defining career experience for Cecil, since everything was new and he needed to develop different policies and procedures that would fulfill his section's mandate. Cecil's ability to adapt quickly and learn on the job soon paid off – within a few years he was promoted to Provincial Mine Rehabilitation Specialist. In this role, he coordinated the review of mine closure plans across Ontario and updated relevant sections of the Mining Act, the Mine Rehabilitation Regulation, and contributed to the initial development of the Mining Rehabilitation Code.

Cecil' career success depended not only on his capacity to develop technical expertise, but also on his ability to connect with industry networks. After losing his job to a wave of public sector down-sizing in the mid 90's, Cecil was able to take advantage of this unexpected career detour. As he remembers, "With some contacts that I had made, I became a partner/principal in a small environmental consulting company called Kirtec Resources Ltd. We specialized in assisting mining and other resource based industries." When this company became part of Golder Associates, Cecil stepped into the role of Senior Environmental Specialist, in which he managed mine reclamation projects across North America.

This winding career road has led Cecil to his current position as the Environmental Coordinator/Energy Manager at Weyerhaeuser's Kenora TimberStrand facility. In this role, Cecil oversees a wide range of activities, from managing the facility's environmental and energy conservation programs to ensuring the facility complies with all regulatory and company environmental requirements. Cecil also serves as Weyerhaeuser's Canadian Corporate Radiation Safety Officer and the Management Co-Chair of the plant's Joint Health and Safety Committee. Finally, Cecil functions as a corporate travelling auditor, in which he conducts audits for EMS, Quality, Chain of Custody, Environmental Compliance and Health & Safety Exchange. As Cecil observes, "Initially, the role was narrowly focused on just environmental issues, but with my varied background and experience, my role continued to expand with new challenges brought on by economic constraints and by increased regulatory requirements."

Looking back at this long career, Cecil can clearly see which strategies helped him get ahead. He states: "I think that the most important contributing factors to my career development and success have been my willingness to take on new challenges and my ability to adapt to change. I am committed to life-long learning and take every opportunity that I can to learn new skills and develop my abilities." Accordingly, Cecil has attended hundreds of training sessions over the years to increase his knowledge base and skill level. He has also learned from a number of major career opportunities. For instance, in Cecil' work as a regulator, he was involved in many precedent-setting court cases, while in his job as a consultant, he managed the largest single season tailings reclamation project in North America (covering over 2500 acres in a single season).

At the same time that Cecil has taken the opportunity to learn from important transitions in his career, he's also observed important transitions in his industry. According to Cecil, "In the last five years or so, the forest products industry has undergone a huge transformation, most of which has been economic, but also from a regulatory and public perception perspective. To deal with these changes, environmental professionals have had to increase their knowledge and become more adaptable." He notes further that, "Many in my type of position have to do more with less, become more conversant with a wider variety of issues, and be more technology savvy. It is no longer enough to control what's coming out of the end of the pipe – one needs to look farther downstream at impacts on a regional, national and global scale."

Many of these industry changes are paving the way to a promising future. From Cecil's perspective, the next 5 to 10 years will likely feature more emphasis on sustainability, not only in forest management practices, but in the manufacturing field as well. He states, "I think that we will see more regulatory pressure for ecosystem type management, such as watershed and airshed control. We will also see more emphasis on reducing energy consumption and on reducing waste."

For those new professionals or students considering a career path like Cecil's, he offers this advice: "find a community college that offers a co-op environmental technology program that has an option to go on and obtain a degree upon graduation from the program. This route not only provides students with some practical work experience, but it also helps them develop the skills that an employer wants. College-trained individuals have nearly always had practical training and have been in the field doing real environmental work. Many employers look for these types of skills and experience."

PROFILE:

Paul Draycott, Esq., CCEP

Vice-President, Environmental Global Business Unit and Corporate Counsel at Morrison Hershfield Limited

Paul Draycott's green career is one excellent example of how important multi-disciplinary skill development is to professional success. As he notes, "If I was to look back at the drivers of change for myself, I would have to say that the most influential was both the type and number of opportunities that were presented to me, as well as being somewhat risk tolerant to accept the challenge of those opportunities. This approach created a career-long learning environment that allowed me to expand my skills and leverage them in new and emerging environmental markets."

Currently, Paul is the Vice-President, Environmental Global Business Unit and Corporate Counsel at Morrison Hersfield Limited. In this role of leadership and accountability, he is responsible for the world-wide delivery of his firm's suite of environmental consulting and engineering services. He also oversees the firm's domestic and international compliance with Anti-Corruption and Anti-Bribery legislation for his company's consulting and engineering services abroad. This involves ensuring that the firm's staff are trained to operate all facets of the business in strict compliance with this legislation, while also implementing an audit program that continually monitors compliance.

In Paul's position, he also maintains high-level roles on various environmental projects at Morrison Hershfield. He typically provides senior project management, technical advisory and peer review services on larger, complex assignments. Additionally, his role as a senior consultant requires him to provide mentoring and knowledge transfer to younger staff in order to support their personal and professional growth.

Paul transitioned into his current job after many years of running his own environmental consulting firm. During this time, he provided consulting services to Morrison Hershfield, and as this business relationship developed over the years, it was apparent that there would be great value in merging the two firms. "As a result of that merger, I became responsible for the growth and delivery of environmental consulting and engineering services under the Morrison Hershfield brand," states Paul.

Embracing the need for continual change and learning were (and still are) crucial to Paul's career success and prominent present job title. He observes, "I believe that contemporary people's career paths present the opportunity for continual change. My own path has evolved from a purely technical environmental focus through to a multi-disciplinary professional planning and scientific focus to where I am today in a senior executive role requiring a strong leadership focus, both internally with the firm and externally with our clients."

He adds, "I have remained fairly steadfast within the umbrella of an environmental career over thirty plus years, notwithstanding the addition of a legal career in the midst; however, beneath the surface are many small changes that have led to new areas of expertise, meeting and working with new colleagues and clients, and working on an array of exciting and challenging projects."

Throughout all of these various green career routes, Paul pursued ongoing educational and training programs. He started out with a technical education at a community college, and following a series of proficiency exams, accreditation and accumulated technical experience, he moved into a professional scientific stream. About half-way through his career, Paul went back to school to complete his Juris Doctor (Doctorate of Laws), which further expanded his expertise.

While Paul has built many of his skills through formal education and training, he has also developed a wealth of knowledge from his day-to-day work. According to Paul, "One of the biggest opportunities I have been involved with is leading the development of standards and specifications that will be used by other professionals in the design and construction of aquatic compensation solutions on Ontario road projects. This is also one of the most challenging projects I have been involved with, as my work will be scrutinized by all those required to use the standards and specifications. Having the opportunity to effect change in the industry is a humbling milestone."

In another important learning experience, Paul was the first Canadian to be accepted into the American Council of Engineering Companies Senior Executive Institute in 2011. "This opportunity has afforded me an incredible learning environment with our colleagues across the United States over the one and a half years of the program, and it provides valuable insight into the sustainability of the profession," he notes.

Many of these opportunities to learn and grow professionally are characteristic for environmental work. With more companies adopting sustainability into their practices and products, green professionals are increasingly expected to expand their existing skills and apply their environmental expertise to diverse areas. According to Paul, "I see a growing population of environmental professionals that are multi-disciplinary. They have skills in more than one aspect of the profession or combined with other professions. The environmental professional needs to be part technical expert, part planner, part strategist, part engineer, part problem solver, and an excellent communicator."

The evolving role of environmental practitioners is especially noticeable when it comes to client relations. "There is one aspect of the profession that is really starting to resonate with clients, in Ontario and elsewhere, and that is a fundamental movement from what value I or my firm bring to the client to showing the client where they have value in uncovered resources and solutions to recover these resources," notes Paul.

When it comes to upcoming changes in environmental work, Paul anticipates an exciting future. In his view, "We will see the expansion of solution development for green or sustainable infrastructure, as well as emerging technologies and strategies addressing issues such as climate change and energy demand. I expect that the industry will take more of a prominent leadership role in this regard, guiding planning, policy and strategy development."

He offers these final tips for individuals seeking to become part of the promising future in environmental work: "Be open to as many new experiences as you can. These experiences may come in the form of volunteer activities or entry-level positions with industry firms. They may not seem overly glamorous, but as an employer of environmental talent, I look for initiative and enthusiasm to learn and grow in the industry." He states further, "Be involved in the industry through conferences and professional development. Meet and speak with those already in the profession. You never know where or from whom that important opportunity in your career development may come from."

PROFILE:

Timothy Adamson EP, B.Sc, M.Sc

Manager, Sustainable Energy at Enbridge

For Timothy Adamson, following a green career path has not only led him to a variety of different environmental jobs, but also to an impressive array of work locations all over the world.

After completing a Master's degree in soil science and surveying at Reading University, UK, Mr. Adamson started his career in an agricultural consulting company, where he spent one of his first major projects working on a complete agricultural survey in Northern Nigeria. Following a number of other international agricultural consultancy projects, he started his own consulting practice. In this capacity, Mr. Adamson provided expertise on Kuwait's program to increase its forest cover.

Next on Mr. Adamson's green career trajectory was a stop in Calgary, where he transitioned into the oil and gas sector and worked on soil management and reclamation assignments. As Mr. Adamson observes, "My career has taken many twists and turns – one can never predict what will happen, as this is such a dynamic field."

In order to take advantage of all of the opportunities and career shifts that came his way, Mr. Adamson adopted several key strategies, including an enthusiastic attitude, commitment to developing technical credibility, and willingness to volunteer. According to Mr. Adamson, "in this field, I believe that one's personal credibility is of paramount importance. I place great store in ensuring that when internal staff come to me for advice or help, I'm able to provide the best and most pertinent advice that I can."

Part of sharing this expertise also involves educating others. As Mr. Adamson explains, "Not everyone is as familiar with my subject matter – that's why they have hired me – so doing things like internal lunch and learn sessions, or having external stakeholders come in to talk about the issues, all helps."

This approach to his work has helped Mr. Adamson make significant gains over the course of his career. Currently, he holds the position of Manager, Sustainable Energy at Enbridge, while also serving as the Vice Chair of the Enbridge Climate Change Steering Committee and the Chair of the Canadian Energy Partnership for Environmental Innovation.

At Enbridge, Mr. Adamson acts as a technical resource for the company on a variety of projects, from tracking and responding to any carbon-related regulations to working with governments to align GHG reporting regulations and developing activities to support Corporate Social Responsibility (CSR). One of his major responsibilities also includes completing the Carbon Disclosure Questionnaire for his company. This is a questionnaire that is sent world-wide to the top global 500 companies and requires them to indicate how they are managing the risks and opportunities that arise from climate change.

This questionnaire is one prime example of the important changes that Mr. Adamson has observed in the industry where he works. Mr. Adamson states, "When I started, environmental work was really an 'add-on,' end of pipe type of work – something that companies had to go through to get their approvals for whatever project they were proposing. Today, in my view, environmental work and the environmental space in which a company operates will affect that company's competitiveness, investment decisions and the value of the company's assets. Today, we see investor-type questionnaires such as the Carbon Disclosure Project in which investors, who have control over some $78 trillion world-wide are asking serious questions about how a company is managing its carbon issues, since these issues now significantly impact shareholder value."

The changes in environmental work don't just stop there. Mr. Adamson notes further that, "Environmental work is not just about doing environmental assessments for particular projects; it is driving a fundamental change in the structure of organizations. For example, many companies now have a chief sustainability officer, or something similar – a position that was unheard of 10 years ago."

Since many of the drivers for environmental protection are also closely linked to positive business outcomes, such as increasing the efficiency of company processes or staying competitive through new technologies, Mr. Adamson has also observed important trends in business development. As he states, "There is now significant investment proceeding under the general public's radar screen in renewable technologies. Enbridge, for example, has invested some $2 billion in renewable energy projects across North America, including one of the largest solar farms in the world, Sarnia Solar."

Looking towards the future, Mr. Adamson believes that the pressure to address the various environmental issues facing society and arrive at appropriate business and social solutions will only increase. "It is predicted we will see more extreme weather events, resulting in considerable impact and damage to our infrastructure (roads, bridges, power lines, communities etc.), so society will have to consider adaptation issues more seriously than they are considered now. This will result in a revised view of how we currently work and play." he mentions.

The need for a more serious assessment of environmental impacts is already producing a significant change in the requirement for open disclosure in financial reporting on the TSX. There are now briefs to assist Boards in discharging their responsibilities for the oversight of environmental and social issues that may have risk, strategy and financial implications for the companies they serve. According to Mr. Adamson, "Briefing notes have been developed by the Canadian Institute for Chartered Accountants, and I envision that there will be more public reporting required."

All of these various factors add up to strong prospects for work in GHG management or carbon management. As Mr. Adamson states, "I think candidates need to recognize that GHG management issues are essentially a business/strategic issue for a company and even government, in the context of ensuring that they remain competitive. With the potentially significant GHG reporting obligations coming out and that are already here, I see a strong future in GHG inventory and verification work. But more importantly, candidates who can clearly articulate the business links between carbon and the businesses they serve will be valuable resources. "

He offers the following advice to individuals considering a related green career path: "While a first degree in some environmental discipline is okay to learn about the science of what is involved, taking a combined environment and business degree would help potential applicants understand the business linkage. Employers have to find value in the work that you do, and part of this value is for you to understand their terminology and be able to explain what the company needs to do to ensure a sustainable future, while also meeting the company's vision."

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Evergreen and ECO Canada (2012).
The Green Jobs Map - Supplementary Ontario Report

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