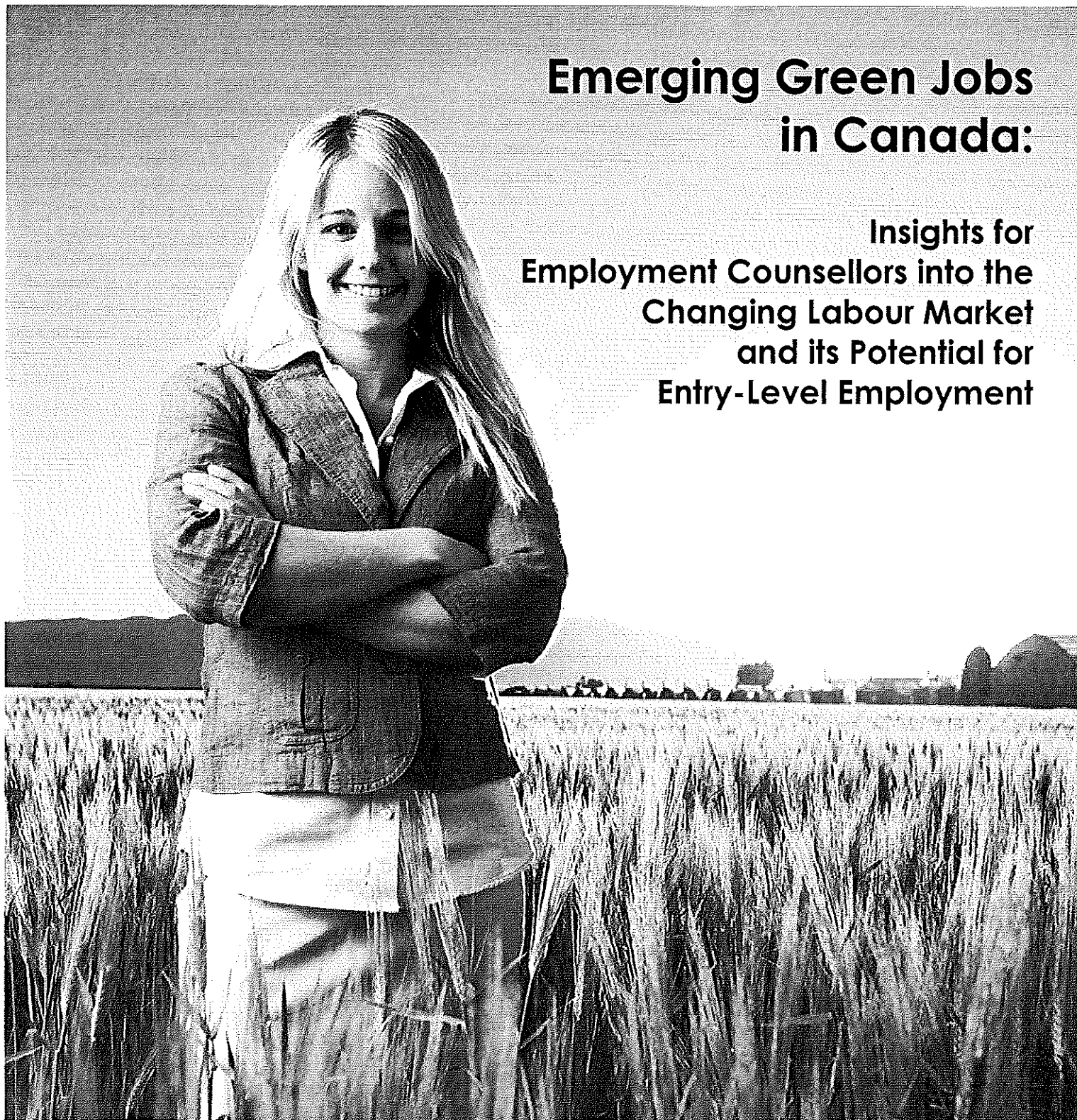


Emerging Green Jobs in Canada:

Insights for
Employment Counsellors into the
Changing Labour Market
and its Potential for
Entry-Level Employment



FIRST **1** WORK

GREENSKILLS
NETWORK 



ceric

CANADIAN EDUCATION AND RESEARCH INSTITUTE FOR CO-ASSESSING
INSTITUT CANADIEN D'ÉDUCATION ET DE RECHERCHE EN ORIENTATION

Acknowledgements

First Work would like to acknowledge the following individuals and organizations who all contributed to the development of this report.

We express our appreciation to the Canadian Education and Research Institute for Counselling (CERIC) for providing funding and ongoing support for this research.

Principle Author:

Justine Katz, Green Skills Network

Contributing Authors and Research Team:

Mirga Saltmiras, Evidence Consulting

Ryan Stanga, Evidence Consulting

Ron Sly, Sly Communications

Susan Kachmar, Tracks Employment

Reginald Sheffield, The Red G Company

Stefeni Higuchi, Volunteer

Eleanor (Bing Shu) Shi, Volunteer

Executive Director:

Matt Wood, First Work

Special thanks to the following organizations for their participation in the case studies:

Choices for Youth

Eco Canada

Kortright Centre

Warm Up Winnipeg

Green Skills Network Advisory Committee

John Baker, Aperio

Paul Charbonneau, Energy Advocate

Angela Eckart, Employment Hamilton

Michael Harris, KEYS Job Centre

Catherine Lang, C. Lang Consulting

Karen Lior, Toronto Workforce Innovation Group

Nicole Risse, Ontario Sustainable Energy Association

Nora Spinks, The Vanier Institute of the Family

Aaron Stauch, Lutherwood Employment Services

The Green Skills Network is a department of First Work: The Ontario Association of Youth Employment Centres. It serves to close labour market gaps by connecting entry-level workers to emerging Green employment opportunities.

For more information, contact:

Justine Katz, Green Skills Network Coordinator

416-323-9557 ext 227/ jkatz@firstwork.org

www.greenskillsnetwork.ca / www.firstwork.org

Executive Summary

As Canada transitions to a greener economy, its labour market is transforming and new employment opportunities are emerging. This report will assist employment counsellors, job developers, and job seekers in gaining a better understanding of these effects, specifically as they relate to entry-level employment in renewable energy and energy conservation.

Entry-level is defined as jobs that require less than a post-secondary degree. The focus on entry-level jobs is due to the ongoing challenges in youth employment in Canada. The youth unemployment rate is almost double that of the country's total unemployment rate and is steadily increasing.

The focus on renewable energy and energy conservation is due to these sectors providing the most opportunity for entry-level work. Renewable energy includes occupations found in the generation and distribution of wind energy, solar energy, bioenergy and hydropower. Energy conservation for the purpose of this report relates to jobs found in energy efficient building, including new building construction and retrofitting of existing buildings.

There are a number of factors that are influencing the labour market and the demand for labour in the green economy. These factors include climate change, consumer habits and demands, policy and investment, with policy and investment being particularly influential. Canada's provinces and territories have all drafted energy and/or climate change strategies and have invested in the green economy financially. Although there is currently still a heavy reliance on fossil fuels, there is strong potential for future growth in green jobs as Canada continues to shift to a greener economy.

Within the literature, there is an ongoing and inconclusive debate over defining green jobs. A number of studies provide different, but related, concepts, but there is not a single standard definition that is used. Studies do all agree, however, that green jobs are found in multiple, if not all, sectors of the economy, and include a variety of activities.

In identifying the areas of the green economy that have the most potential for employment, there are two approaches that studies take. The first approach, the green sector approach, speaks about green job opportunities as though they are taking place in new sectors such as renewable energy or energy conservation. A review of six labour market studies demonstrates that the renewable energy and energy conservation sectors are most commonly identified as having the most employment opportunities. Four other sectors also identified include clean transportation, environmental protection, waste management and recycling, and energy management.

While the green sector approach does provide insight into the direction of the green economy and the areas that are particularly being affected, the approach can misrepresent the relationship between the green economy and the traditional economy. For example, the use of terminology such as "clean transportation" and "renewable energy" denotes separation from the traditional transportation and energy sectors, which is not the case. For this reason, many studies take another approach, the traditional sector approach, when describing the green economy. The traditional sector approach speaks about green job opportunities as though they are taking place in traditional sectors such as utilities or construction. Using this approach, the sectors identified as being most effected by the green economy are the energy, manufacturing and construction sectors.

Literature suggests that the skills needed for jobs in renewable energy and energy conservation include a combination of existing and new skills or knowledge. Both generic and technical skills used in occupations outside of the green economy are often transferable, and the development of new skills can be learned through on-the-job training and specialized courses.

Occupations in renewable energy include a variety of activities and mostly mirror the occupations found in the generation of traditional forms of energy generation. Occupations are found in the manufacturing and distribution of equipment, project development, and the construction and installation and operation and maintenance of energy facilities. Bioenergy also includes growing and harvesting biomass. These activities include a mixture of high, medium, and low skilled jobs.

Energy conservation, defined as energy efficient building including new building construction and retrofitting of existing buildings, also holds enormous opportunity for entry-level work. Building certifications and rating systems such as Leadership in Energy and Environmental Design (LEED) are driving the construction sector to adapt greener techniques in every stage of construction and renovation, from picking the location of a building to onsite practices of construction crews. For some occupations, such as construction labourers and machine operators, there is little change to the responsibilities and skills required in response to these standards. At the management level, enrolment in courses to become more familiar with sustainable building practices and building certification requirements may be necessary. For speciality trade occupations such as plumbers, electricians, carpenters, and HVAC installers, more in-depth training is needed to become familiar with new green technologies and techniques.

The recommendations for employment counsellors are as follows:

1. Review the six job task analyses found in Appendix A of this report. These will provide further insight into the nature of more common entry-level green jobs.
2. Use the inventories of training programs and employers found in Appendix B and C to connect youth to the appropriate training program and/or employer. Contact the Green Skills Network if you know of a training program or an employer that is not included in the inventory.
3. Review the map of renewable energy and energy conservation projects in Canada found in Appendix D to become familiar with the types of activity occurring in your community and province. These projects provide potential leads for your clients. Contact the Green Skills Network if you know of a project that is not included in the inventory.
4. Review the case studies in Appendix E, which serve as examples of different models for green jobs training programs. Contact the Green Skills Network if you would like support in implementing a training program in your community.
5. Stay informed about Green policy and investment as it relates to your community.
6. Visit the Green Skills Network website at www.greenskillsnetwork.ca for more information on green jobs.

Table of Contents

Introduction	Page 6
Part 1: The Green Economy	
Section 1: How the Labour Market is Influenced	Page 9
Section 2: Defining Green Jobs	Page 12
Section 3: Areas of Opportunity	Page 14
Part 2: Occupations in Renewable Energy and Energy Conservation	
Section 4: Skills and Training for Jobs in Transition	Page 18
Section 5: Occupations in Renewable Energy	Page 20
Section 6: Occupations in Energy Conservation	Page 23
Section 7: Conclusions and Recommendations for Employment Counsellors and Job Developers	Page 24
Works Cited	Page 25
Appendices	
Appendix A: Job Task Analyses	Page 27
Appendix B: Inventory of Training Programs	Page 34
Appendix C: Inventory of Employers	Page 53
Appendix D: Map of Renewable Energy and Energy Conservation Projects	Page 90
Appendix E: Pathways to Success in the Green Economy: Five Green Jobs Training Program.	Page 91

Introduction

As Canada transitions to a greener economy, its labour market is transforming and new employment opportunities are emerging. The green economy extends throughout the broader economy and is affecting many, if not all, traditional industries. Environmental Careers Organization of Canada (Eco Canada), an organization that determines human resource needs in the environmental industry, describes the green economy as follows:

The green economy is a subset of the entire Canadian economy. It does not exist in parallel to the traditional economy, but it includes similar activities and processes. It produces similar goods and services as the broader economy, but also includes new products and services and green processes supporting the production of green products and services.¹

The implication of this description of a green economy with respect to new employment opportunities, or “green jobs” as they have been labelled, is that many of these new jobs are very much like the jobs found in traditional sectors, demanding the same or similar skills as existing jobs, and often requiring little or no additional training. However, especially where new technologies and techniques are becoming more commonplace, the greening of our economy is having an impact on the labour market, and employment counsellors, job developers and job seekers must be aware of these changes.

This literature review will assist employment counsellors, job developers, and job seekers in

gaining a better understanding of the green economy and its labour effects, specifically regarding entry-level employment in renewable energy and energy conservation.

- **Entry-level** is *defined* as jobs that require less than a post-secondary degree.

The focus on entry-level jobs is due to the ongoing challenges in youth employment in Canada. The youth unemployment rate is almost double that of the country’s total unemployment rate and is steadily increasing. Youth are competing in the job market against others in their cohort as well as two generations of workers who possess more work experience. Having a better understanding of emerging entry-level occupations and the skills needed to obtain employment in these areas can help youth enter the labour force and begin developing their careers.

- **Renewable energy** includes occupations found in the generation and distribution of wind energy, solar energy, bioenergy and hydropower.
- **Energy conservation** for the purpose of this report relates to jobs found in energy efficient building, including new building construction and retrofitting of existing buildings.

The focus on renewable energy and energy conservation is due to these sectors providing the most opportunity for entry-level work. As will be demonstrated in Part 1 of this literature review, a comparison of six labour market studies demonstrates that renewable energy and conservation have been identified as the two

¹ Environmental Careers Organization Canada, “Defining the Green Economy: Labour Market Research Study”. 2010. Page 3.

sectors with the most employment opportunity. The literature also suggests that renewable energy not only creates more jobs per unit of electricity produced than traditional forms of energy do², but also creates more jobs for those with less education. According to one study, clean energy creates 3.6 times more jobs for people with high school degrees or less than fossil fuels do.³

Part One of this Literature Review will address the following questions:

- What is causing the transition to a green economy and how does this affect the labour market?
- What are green jobs?
- Which sectors offer the most opportunity for green jobs?

Part Two will focus specifically on renewable energy and energy conservation and will provide information on the skills and training needed to be successful in obtaining a job in these sectors as well as the types of occupations available in wind energy, solar energy, bioenergy, hydropower, and energy conservation.

² ClearSky Advisors Inc., "Economic Impacts of the Solar PV Sector in Ontario 2008-2018". July 2011. Page 15.

³ RDA Global, "Green Collar Jobs: New Workforce Development Opportunities in Alberta". 2010. Page 7

Part One:

The Green Economy

SECTION 1:

How the Labour Market is Influenced

There is little disagreement among experts regarding the factors that are influencing the shift to a greener economy and the associated labour market effects. A study by Martinez-Fernandez, Hinojosa, and Miranda entitled *Green Jobs and Skills: the Local Labour Market Implications of Addressing Climate Change*, closely examines the ways in which the labour market is being affected by climate change, including direct impact from climate change, changes in consumer habits, and regulations.⁴ Canadian literature parallels this study and identifies the following as key factors that are influencing the labour market:

- Climate change and other environmental issues
- Consumer habits
- Policy and regulation
- Financial investment

Canadian literature also identifies the changes occurring in the job market as a result of the abovementioned influencing factors:

- **Job creation**, which refers both to the development of new occupations that are specific to the green economy, such as an energy auditor, and the increased demand for workers, such as construction workers needed to perform retrofits on existing buildings to increase energy efficiency.
- **Job loss**, which refers to the phasing out of occupations in response to changing regulation and consumer demands. For example, as Canada moves away from using

plastic bags and packaging, jobs relating to manufacturing these products will decrease.

- **Job adaptation**, which refers to the changes in existing jobs to reflect the new demands of the green economy. As indicated in both Canadian and non-Canadian literature, job adaptation is the most significant labour market effect of the green economy.

Influencing factors and their labour market affects are outlined below in further detail.

Climate Change and other Environmental Issues

Physical changes in the environment as a result of climate change (i.e. resource depletion and increases in natural disasters such as droughts and earthquakes) as well as pollution from fossil fuels, are transforming the labour market directly and indirectly:

- **Direct effects** include the development of new skills in industries such as agriculture and fishing to adapt to changing weather patterns and resource depletion, as well as the demand for additional workers to re-stabilize communities in the aftermath of a natural disaster.⁵
- **Indirect effects** refer to changes in the priorities and practices of consumers, investors, businesses and governments to mitigate the effects of climate change through an increased awareness of its negative consequences. These indirect effects and their influence on the demand for labour

⁴ OECD/Martinez-Fernandez, C, Hinojosa C, Miranda G., "Green Jobs and Skills: The Local Labour Market Implications of Addressing Climate Change". 8 February 2010. Page 7.

⁵ Strietska-Illina, Olga, Christine Hofmann, Mercedes Durán Haro & Shinyoung Jeon, "Skills for Green Jobs: A Global View. 2011.

are outlined in more detail in the following pages.

Consumer Habits and Demands

Literature projects that despite increased efforts to conserve energy, energy use will continue to increase both in Canada and globally. One estimate calculates that electricity use in Canada will increase by 1.3% annually until 2020⁶. Energy conservation efforts, however, will affect the level of energy increase. In their study *Skills and Occupational Needs in Renewable Energy*, the International Labour Office calculates that with no policy changes, global energy use will rise by approximately 84% between 2007 and 2050, but is reduced to 32% if strong energy efficiency measures are put in place⁷. The increase in social awareness about the importance of conserving energy and of the negative effects of climate change has spurred interest among consumers for environmentally friendly and energy efficient products. This is increasing the demand for labour and creating new jobs as workers are needed in all stages of production and distribution for energy efficient products and services.

Policy

The government's actions to mitigate or adapt to the effects of climate change has a strong impact on the labour market with regard to job creation and job loss. The Canadian Centre for Energy Information, a non-profit organization that provides information on the Canadian energy system, identifies that all of Canada's provinces and territories have drafted energy and/or climate change strategies that include targets for reductions in greenhouse gas emissions, as well as conservation efforts and increased renewable energy use. Furthermore,

⁶ Calvert, John and Marjorie Griffin Cohen, "Climate Change and the Canadian Energy Sector: Implications for Labour and Trade Unions". October 2011. Page 22.

⁷ International Labour Office Skills and Employment Department, "Skills and Occupational Needs in Renewable Energy". 2011. Page 13.

some provinces have developed additional strategies or set specific goals relating to one or more of the renewable energies such as British Columbia's Bioenergy Strategy⁸. Strategies are reflective of each province's available resources. Many green jobs studies state that policies that include stipulations on the domestic content of renewable energy projects and incentivize private investment in renewable energy will result in further job creation.

Despite the efforts to increase renewable energy use and energy conservation efforts, many studies make special mention that Canada is still heavily reliant on fossil fuels, including oil, natural gas and coal. One study states that it is not likely that renewable energies will be effective in changing this reliance on fossil fuels or nuclear generation in the near future⁹.

Financial Investment

The aforementioned energy strategies are not as easily achieved without financial investment. There are a number of federal and provincial initiatives that offer incentives and other provisions towards energy projects, though literature suggests that the Canadian government has not come up to par. A study entitled *Falling Behind: Canada's Lost Green Energy Jobs*, examines the relationship between financial investment and job creation. It estimates that in 2010 the federal government invested just under \$300 million in renewable energy and energy efficiency, an investment that is relatively low when compared to other parts of the world, and demonstrates how an additional 65,000 jobs would have been created had Canada matched the United States' spending for that year. In sum, an increase in investment is a possibility and could spark further growth in job creation.

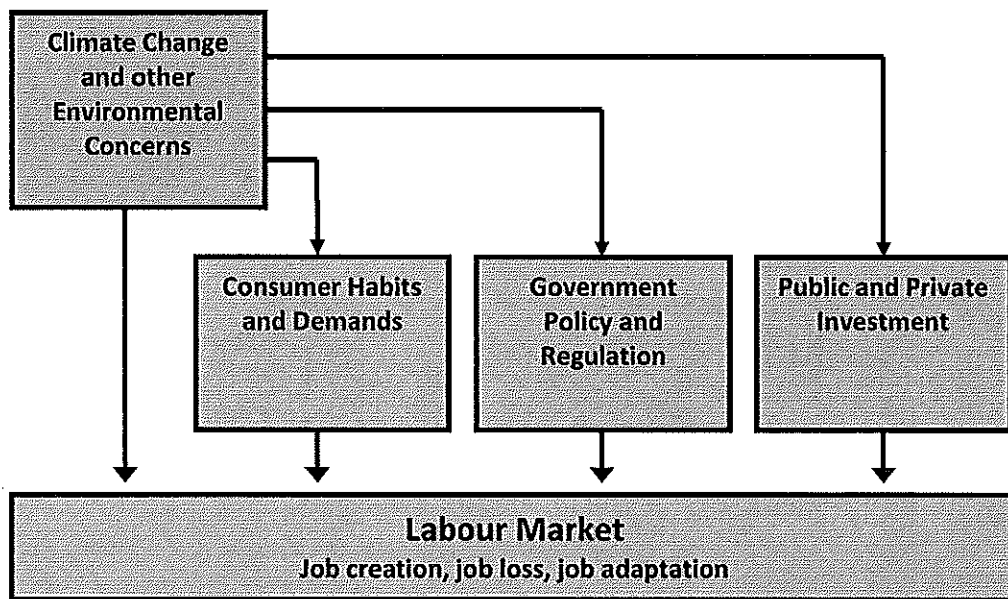
⁸ Links to energy strategies can be found by visiting www.centreforenergy.com

⁹ Calvert, John and Marjorie Griffin Cohen, "Climate Change and the Canadian Energy Sector: Implications for Labour and Trade Unions". October 2011. Page 14.

The labour market will be more or less affected depending on how strong and numerous the aforementioned influencing factors are. This implies that the changes that are occurring in the labour market will be felt differently across Canada.

Additionally, these changes are not static. Employment effects will fluctuate should policy or investment be strengthened or weakened over time. Figure 1 provides an overview of the factors that are influencing the demand for labour and the effects on the labour market.

Figure 1: Influencing the Demand for Labour



SECTION 2: Defining Green Jobs

Defining green jobs is an ongoing and inconclusive debate in both Canadian and global literature. Canadian examples of definitions for green jobs are as follows:

"...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."¹⁰

"These are occupations that facilitate the reduction of waste and pollution, improve the environment, and pay a livable wage with benefits that can support a family and offer potential for upward mobility."¹¹

"When an occupation produces an output or lowers the price of a product that offers positive environmental externalities, this may be considered in whole or in part as a green job."¹²

"In a nutshell, green jobs are high-quality jobs that are saved or created by policies that will shift our economy toward greater sustainability."¹³

¹⁰ Environmental Careers Organization Canada, "Defining the Green Economy: Labour Market Research Study". 2010. Page 4.

¹¹ Peel Halton Workforce Development Group, Toronto Workforce Innovation Group and Workforce Planning Board York Region, "Greening the Economy: Transitioning to New Careers". December 2009. Page 3.

¹² Globe Foundation, "Careers for a Sustainable Future: A Reference Guide to Green Jobs in British Columbia". September 2010. Page 9.

¹³ Thompson, David, "Green Jobs: It's Time to Build Alberta's Future". Page 2.

Though there are a number of definitions available, definitions can be grouped together based on the emphasis that they put on certain features of green jobs. Eco Canada¹⁴ and The Georgetown University Center on Education and the Workforce¹⁵ have identified common approaches to defining green jobs based on these highlighted features, which are outlined in Figure 2.

Figure 2: Approaches to Defining Green Jobs

Industrial-Based Approach	Emphasizes the economic outputs of a particular job.
Occupational-Based Approach	Emphasizes the activities and inputs of a particular job.
Worker-Centred Approach	Emphasizes the quality of a job first (i.e. Adequate wages and opportunity for career advancement) and environmental consciousness second.
Energy-Centred Approach	Includes only jobs found within energy generation and conservation.
All-Encompassing Environmental Approach	Includes all jobs that improve or protect the environment in some way.

¹⁴ Environmental Careers Organization Canada, "Defining the Green Economy: Labour Market Research Study". 2010.

¹⁵ Georgetown University Center on Education and Workforce, "State of Green: The Definition and Measurement of Green Jobs".

For some, the lack of a standard definition or approach to defining green jobs is unacceptable and is a roadblock to investment in the green economy. For example, Morris, Bogart, Dorchak and Meiners' *7 Myths about Green Jobs* states that "committing hundreds of billions of dollars to promoting a policy goal that lacks a transparent definition cannot be justified."¹⁶ Without a clear definition, they propose that there can be no measure of green jobs and no comparison between green jobs studies, which can lead to uninformed policy debate and the creation of counterproductive environmental policies.

A perspective that provides some level of definitional consistency but that also allows for some flexibility comes from Martinez-Fernandez, Hinojosa, and Miranda, who provide several indicators of green jobs as opposed to one rigid definition. This study stipulates that in order for a job to be labelled green it needs to conform to several of the indicators, which are as follows:

1. The sector that a job is found within and whether it is considered to be a "green sector", such as renewable energy and recycling.
2. The **product or service's** impact or output on the environment provided by the company in which the job is found.
3. The **production method**, including techniques and practices, used by the company to provide its product or service.
4. The **green awareness** and commitment to the environmental cause displayed by the company.
5. The **position in the value chain** of the product or service.
6. The nature of the **occupational profile** and whether it contributes to improving the environment in some way.

¹⁶ Morriss, Andrew P, William T. Bogart, Andrew Dorchak, & Roger E. Meiners, "7 Myths about Green Jobs". 2009. Page 2.

7. The **specialized green skills and abilities** required for the job.
8. The level of **job decency** and whether it provides adequate wages, job security, safe working conditions, etc.
9. The **green workload** of the job that is dedicated to performing green tasks versus work in traditional areas.¹⁷

So while there is some sort of standardization, there is also flexibility for governments and communities to choose a definition that best reflects local conditions and abilities.

Although the debate in defining green jobs is inconclusive, studies are consistent in stating that green jobs span across multiple, if not all, industries of the economy, and include a variety of activities. This is why it is extremely difficult to find a standard definition that will incorporate all the different features of green jobs.

Part two of this literature review will focus specifically on green jobs in the renewable energy and energy conservation sectors, but it is important to understand that green jobs can be found throughout the economy and that they encompass a variety of occupations and activities. Industries that are being most affected by the transition to a green economy are discussed in the next section.

¹⁷ OECD/Martinez-Fernandez, C, Hinojosa C, Miranda G., "Green Jobs and Skills: The Local Labour Market Implications of Addressing Climate Change". 8 February 2010. Pages 22-23.

SECTION 3: Areas of Opportunity

A close review of the literature reveals two approaches to identifying the sectors most affected by the transition to a green economy and creating the most green job opportunities:

- The **green sector approach**, which speaks about green job opportunities as though they are taking place in new sectors such as renewable energy or energy conservation.
- The **traditional sector approach**, which speaks about green job opportunities as though they are taking place in traditional sectors such as utilities or construction.

These two distinct ways of thinking found in the literature are likely due to the transitional phase of the green economy. Although in theory the green economy is not separate from the mainstream economy, there is currently a divide between industries that are shifting their activities and those that are not. This has led to the development of new “green” terminology to distinguish between green and non-green

activities, and many studies on green jobs have incorporated this terminology into their writing. On the other hand, once the economy completes its transition and all industries and sectors of the economy are incorporating more environmentally friendly practices and standards, the terms “green” and “green economy” may become unnecessary. Therefore, some studies have refrained from using any new “green” terminology in their reporting. These two approaches are outlined below in more detail.

Green Sector Approach

For the studies that follow the green sector approach, there is a lack of consistency in categorizing the green sectors and sub-sectors. One can see the differences by reviewing three labour market studies, (one that is Canada-wide and two that are province specific to Alberta and British Columbia) which are outlined in Figure 3. In one example, the Canada-wide study lists transportation as a sector, whereas the BC study includes it as a sub-sector of energy management and efficiency.

Figure 3: Comparing Three Labour Market Studies Using the Green Sector Approach

Defining the Green Economy – Labour Market Research Study	A Reference Guide to Green Jobs in British Columbia	New Workforce Development Opportunities in Alberta
<ul style="list-style-type: none"> • Renewable energy and energy efficiency • Buildings, retrofitting and construction • Transportation and alternative transportation • Waste recycling and waste management 	<ul style="list-style-type: none"> • Clean and Alternative Energy • Energy Management and Efficiency • Green Building • Environmental Efficiency • Carbon Finance and Investment • Green Knowledge and Support 	<ul style="list-style-type: none"> • Green construction • Renewable Energy • Environmental Remediation • Green Manufacturing • Recycling • Sustainable Landscaping and Gardening

The inconsistency of green sector names makes it challenging to identify opportunities for labour market growth. However, a close review of six studies¹⁸ using the green sector approach reveals that there are similarities between the sectors, making it possible to generate a list of green sectors most commonly identified as having the most employment opportunities. These sectors are as follows:

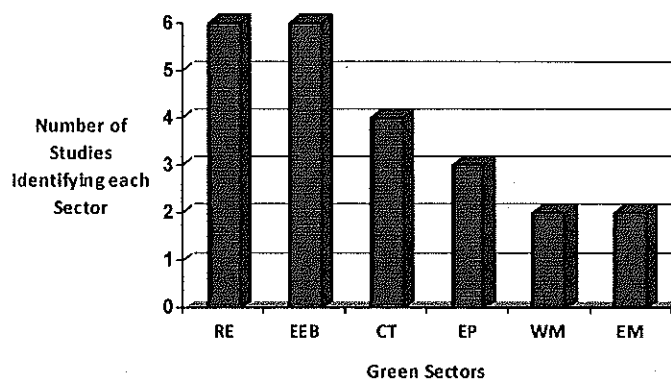
- **Renewable Energy (RE):** The generation and distribution of wind, solar, hydropower, and bioenergy.
- **Energy Efficient Building (EEB):** The construction of new buildings or retrofitting of existing buildings using new energy efficient techniques.
- **Clean Transportation (CT):** The development of new vehicles and technologies to reduce the amount of carbon emissions generated by the transportation sector.
- **Environmental Protection (EP):** The protection of and prevention of further damage to the environment's resources including water, air, and soil.

- **Waste Management and Recycling (WM):** the efforts made to collect, process and monitor waste to reduce negative environmental impacts of wasteful materials.
- **Energy Management (EM):** The storage and transmission of energy, such as a smart grid, in accordance with efficient and sustainable practices.

Figure 4 demonstrates the number of studies that identify each of the sectors and shows that the renewable energy and energy efficient building (a sub-sector of energy conservation) sectors are the two sectors most frequently identified. . For this reason, Part 2 of this report will focus specifically on renewable energy and energy conservation.

While the green sector approach does provide insight into the direction of the green economy and the areas that are particularly being affected, the approach can misrepresent the relationship between the green economy and the traditional economy. For example, the use of terminology such as "clean transportation" and "renewable energy" denotes separation from the traditional transportation and energy sectors, which is not the case.

Figure 4: Green Sectors Identified as Having Potential for Employment



¹⁸ The six studies are as follows:

1. Environmental Careers Organization Canada, "Defining the Green Economy: Labour Market Research Study". 2010.
2. Globe Foundation, "Careers for a Sustainable Future: A Reference Guide to Green Jobs in British Columbia". 2010.
3. Newfoundland and Labrador Federation of Labour, "Good Jobs, Green Jobs: Exploring Opportunities for Newfoundland and Labrador". May 2009.
4. RDA Global, "Green Collar Jobs: New Workforce Development Opportunities in Alberta". 2010.
5. Strietska-Illina, Olga; Christine Hofmann, Mercedes Durán Haro & Shinyoung Jeon, "Skills for Green Jobs: A Global View. 2011.
6. Thompson, David, "Green Jobs: It's Time to Build Alberta's Future.

Traditional Sector Approach

As previously mentioned, the green economy is not separate from the traditional economy; rather, it is an economy where traditional sectors are taking new approaches to producing goods and services that will result in a reduced negative impact. Therefore, it is worthwhile to identify the traditional sectors that are being most affected by the green economy. There are a number of studies that take this traditional approach, for example:

- A study conducted in the Greater Toronto Region identifies utilities, construction, manufacturing and retail trade as four sectors that are being greatly affected by the transition to the green economy.¹⁹
- A study and survey of employers conducted in California demonstrates the impact of the green economy on 20 traditional industries. The five most effected sectors include manufacturing, construction, professional, scientific, and technical services, wholesale trade, and agriculture, forestry, fishing and hunting.²⁰

A review of Canadian literature reveals that the energy, manufacturing and construction sectors are the primary sectors that are being most affected by the green economy. This is due to the influencing factors discussed in section one of this report. It is important to note that these

*sectors are very much intertwined. For example, Pollin and Garrett-Peltier's study, *Building the Green Economy: Employment Effects of Green Energy Investments for Ontario*, demonstrates that manufacturing and construction jobs take up at least 50% of the jobs found in generating renewable energy.*²¹

Other Labour Market Issues

It should be noted that the transition to a green economy is just one trend affecting labour markets. Some of the traditional sectors identified above are also projected to face a labour shortage in the coming years in Canada due to retirement of workers. Specifically:

- The construction sector will need to replace over 150,000 workers by 2017.²²
- The manufacturing sector will require 400,000 new workers by 2019.²³
- The electricity industry will see a decrease in its labour force by 5% per year.²⁴

¹⁹ Peel Halton Workforce Development Group, Toronto Workforce Innovation Group and Workforce Planning Board York Region, "Greening the Economy: Transitioning to New Careers". December 2009.

²⁰ State of California Employment Development Department Labor Market Information Division, "California's Green Economy: Summary of Survey Results". October 2010.

²¹ Polin, Robert, and Heidi Garrett-Peltier, "Building the Green Economy: Employment Effects of Green Energy Investments for Ontario". Page 29.

²² Skills Compétences Canada, "Media Fact Sheet: Skilled Trades Power Canada's Key Economic Sectors". 2009.. Page 1.

²³ Ibid

²⁴ Calvert, John and Marjorie Griffin Cohen, "Climate Change and the Canadian Energy Sector: Implications for Labour and Trade Unions". October 2011. Page 30

Part Two:

Occupations in Renewable Energy and Energy Conservation

SECTION 4:

Skills and Training for Jobs in Transition

Part one of this literature review identified renewable energy and energy conservation as the two green sectors that will experience the greatest labour market changes due to consumer habits and demands, policy, and investment. The following sections will discuss the skills required and occupational trends found in these sectors. The occupations available in these sectors range from lowly to highly skilled jobs, including but not limited to, general labourers, trades people, managers and engineers. The focus for this review is on the available entry level occupations. Job task analyses for six entry-level occupations can be found in Appendix A.

Literature suggests that the jobs in renewable energy and energy conservation require a combination of existing skills and new green skills or knowledge. Specifically, the skills needed for these jobs can be categorized as follows:

- Transferability of existing skills including:

Generic skills – basic and routine skills needed for any place of employment, such as good communication

Technical skills – more knowledge intensive skills that are usually developed through trades schools and apprenticeship programs

- Development of new green skills and knowledge through on-the-job training and specialized courses

The transferability of existing skills carries the most weight with respect to most green jobs. Some studies, such as *Greening the Economy: Transitioning to Green Careers*²⁵ and *Green Opportunities: Occupations in the Wind Industry*²⁶, will refer to the National Occupation Classification (NOC) system or the North American Industry Classification System (NAICS) and identify the skills that can be transferred over to related green occupations.

Eco Canada identifies four areas of skills and knowledge that are currently lacking in the green economy, which include both transferable and new skills and knowledge:

- Communication skills
- Adaptation to technological change
- Knowledge of sustainable development
- Interdisciplinary thinking²⁷

The skills and knowledge areas identified by Eco Canada are prevalent in most literature on green jobs, especially with regard to knowledge of sustainable development and interdisciplinary thinking.

With regard to training to develop new green skills and knowledge, there are currently no standard certifications that have been developed for jobs in the renewable energy sector, but there are discussions to do so in some provinces. There are a number of programs available that develop the skills necessary for occupations in renewable energy and energy conservation. These programs vary in length and intensity. Additionally, certifications and

²⁵ D. Parsons & Associates, "Greening the Economy: Transitioning to New Careers". December 2009.

²⁶ Niagara Workforce Planning Board, "Green Opportunities: Occupations in the Wind Industry". March 2010.

²⁷ Environmental Careers Organization Canada, "Defining the Green Economy: Labour Market Research Study". 2010. Page 5.

standards in traditional sectors are evolving and beginning to integrate green training into their curriculum. An inventory of training and educational programs across the province can be found in Appendix B, and an in-depth look into five green jobs trainings programs can be found in Appendix E.

Since many of the occupations within renewable energy and energy conservation are still emerging, there is currently no consensus among employers with regard to qualifications for new hires. A numbers of surveys conducted by various organizations suggest that while some employers identify work experience as being necessary, others are willing to take on new graduates of trades programs. Most companies will offer additional on-the-job training for new hires that display an enthusiasm for the green economy and the ability to learn new skills. An inventory of employers who provide services in renewable energy or energy conservation can be found in Appendix C.

The next two sections will provide a more in-depth look at the trends and occupations available in each of the renewable energies as well as in energy conservation.

SECTION 5

Occupations in Renewable Energy

Occupations in renewable energy include those found in the generation and distribution of wind energy, solar energy, hydropower, and bioenergy²⁸:

- **Wind energy** generates electricity through the use of wind turbines. Small scale wind turbines can generate power for a single house or farm, whereas wind farms can generate electricity for thousands of homes.
- **Solar energy** generates electricity from the sun's rays through the use of photovoltaic (PV) cells, which can be mounted on the ground or on rooftops. Solar PV cells are generally used in residential and commercial buildings, but a number of solar farms are emerging as well.
- **Bioenergy** generates electricity through the burning of wood waste and other organic matters, known as biomass.
- **Hydropower** generates electricity through the energy of flowing water. This can take several forms. The use of a dam and reservoir to retain water from a river is the most common.

Employment opportunities are increasing in all of the abovementioned renewable energies; however, there appears to be more Canadian literature available on occupations in wind and

solar energy. Eco Canada's labour market research study specifically identifies specialized skills in wind and solar as an emerging skills gap in the green economy.²⁹

Literature suggests that renewable energy not only creates more jobs per unit of electricity produced than traditional forms of energy do³⁰, but also creates more jobs for those with less education. According to one study, clean energy creates 3.6 times more jobs for people with high school degrees or less than fossil fuels do.³¹

For a map of renewable energy projects across Canada that serves to provide employment counsellors and job developers with potential leads for clients, please refer to Appendix D.

Occupations in renewable energy include a variety of activities and mostly mirror the occupations found in the generation of traditional forms of energy generation. For all the renewable energies, occupations are found in the following areas:

- Manufacturing and distribution of equipment
- Project development
- Construction and installation of energy facilities
- Operation and maintenance of energy facilities

Bioenergy includes one additional area:

- Growing and harvesting biomass

²⁸ The marine energy sector is also gaining momentum in Canada; however the current employment opportunities available are in Research and Development and are not entry level in nature. Therefore marine energy will not be discussed in further detail in this report, but it is important to note that this sector is moving forward and more opportunities will become available in the coming years.

²⁹ Environmental Careers Organization Canada, "Defining the Green Economy: Labour Market Research Study". 2010. Page 5.

³⁰ ClearSky Advisors Inc., "Economic Impacts of the Solar PV Sector in Ontario 2008-2018". July 2011. Page 15.

³¹ RDA Global, "Green Collar Jobs: New Workforce Development Opportunities in Alberta". 2010. Page 7

The International Labour Office's *Skills and Occupational Needs in Renewable Energy* provides a table that lists the occupations found in each of these areas, and indicates whether the occupations are highly skilled (H), medium skilled (M) or low skilled (L).³² A summarized version of this table is found in Figure 5.

Changing Profiles of Workers

The electricity industry workforce is primarily made up of white males; however, literature suggests that as many of the current workers begin to retire, the workforce will be undergoing changes to include more females, younger workers, immigrants and Aboriginal peoples.

The renewable energy and energy conservation sectors offer enormous opportunity for Aboriginal communities to be particularly influential for a number of reasons:

- The environmental sustainability principles of the green economy are already an integral part of Aboriginal culture.
- By law, companies must consult with Aboriginal communities before any project development on treaty or traditional land.³³
- Companies are being offered financial incentives to partner with Aboriginal communities including First Nations, Métis and Inuit people.³⁴

Wind Energy

The occupations in the wind industry sector are primarily found in operations and maintenance,

³² International Labour Office Skills and Employability Department, "Skills and Occupational Needs in Renewable Energy". 2011. Page xxii-xxii

³³ Aboriginal Human Resource Council and the Ontario Sustainable Energy Association, "Green Energy Outlook: Generating Opportunities for Aboriginal Communities". 2010. Page 2.

³⁴ *ibid*

manufacturing, construction and sales. The European Wind Energy Association identifies manufacturing as having the most opportunity.³⁵

The recommended training for jobs in wind energy is enrolment in courses that provide general exposure and familiarity of wind issues and technologies. Most companies will offer on-the-job training for new employees. Examples of such training include:

- Training to become familiar with the different types of turbines. This type of training is offered regardless of experience.
- Software training for monitoring facility operation

Most literature on the wind industry identify wind turbine maintenance technician as an emerging new job. Although there is no standard certification for this type of job, there are a number of courses and programs available to develop the new skills associated with this position.

Representative jobs in wind power include electrical tradesperson, construction worker, general construction labourer, heavy equipment operator, operations manager, technical sales person, electricity sales person, marketing specialist, manufacturing plant worker, and turbine maintenance worker.

Solar Energy

Solar PV creates the most job opportunities per unit of electricity produced when compared to the other renewable energies.³⁶

³⁵ Niagara Workforce Planning Board, "Green Opportunities: Occupations in the Wind Industry". March 2010. Niagara Workforce Planning Board. Page 6.

³⁶ ClearSky Advisors Inc., "Economic Impacts of the Solar PV Sector in Ontario 2008-2018". July 2011. Page 15.

The occupations in the solar energy sector can be found in operations and maintenance, construction labour, warehousing and distribution, manufacturing, installation and sales.

An occupation that is receiving noticeable attention is a solar PV panel installer, and industry informants identify that there is a shortage of skilled solar PV installers. There is currently no standardized certification program for a solar panel installer, but specialized training is needed. Some companies will hire graduates of electrical or technical trades programs and then offer on-the-job or external training to develop the specialized PV skills.

Representative jobs in solar energy include manufacturer, assembler, electrical tradesperson for system installation and integration, technical salesperson, marketing specialist, business and finance specialist, and plant and operations manager.

Bioenergy

Like wind and solar, bioenergy creates opportunities in construction, manufacturing, and operation and maintenance. Additional jobs include farmers and foresters to produce and harvest the biomass resources, as well as truckers to transport the biomass to bioenergy plants. A common finding in the literature is that of all the renewable energies, bioenergy

will create the most opportunity in rural areas.

The consensus in the literature is that the skills developed in trades and technical certificates are sufficient for jobs in the bioenergy sector. If additional specialized training is needed, employers will either offer on-the-job training or will provide outside training courses.

Representative jobs in bioenergy include plant operator, construction trades person, plumbing and pipefitting trades person, power systems trades person, maintenance engineering technician, component manufacturer, and technical salesperson.

Hydropower

Like the other renewable energies, occupations in hydro are primarily found in construction, manufacturing, and operation and maintenance. The average level of education suggested by the literature is engineering or trades programs. Most training is provided on the job.

The hydropower sector is more established than any of the other renewable energies. The major concern with this sector is in recruiting new workers due to the ageing workforce.

Representative jobs in hydropower include plant construction contractor and labourer, plant operator, maintenance engineering technician, and component manufacturer.

Figure 5: Summary of Job Skill Level

Area of Activity	Wind	Solar	Bioenergy	Hydro
Manufacturing and Distribution	H, M, L	H, M, L	H, M, L	Predominantly H and M
Project Development	H	H	H	H
Construction and Installation	H, M, L	H, M	H, M, L	H, M, L
Operation and Maintenance	M	Predominantly M, some H and L	H, M, L	H, M
Biomass Production	N/A	N/A	H, M, L	N/A

SECTION 6:

Occupations in Energy Conservation

Energy conservation for the purpose of this report includes those in energy efficient building, including new building construction and retrofitting of existing buildings. Building certifications and rating systems such as Leadership in Energy and Environmental Design (LEED) are driving the construction sector to adapt greener techniques in every stage of construction and renovation, from picking the location of a building, to installing new technologies such as ENERGY STAR products, to onsite practices of construction crews.

Drew Liming's *Careers in Green Construction*³⁷ demonstrates how the occupational profiles of those working in the construction sector are adapting in response to rating systems such as LEED. For some occupations, such as constructional labourers and machine operators, there is little change to the responsibilities and skills required in response to these standards. At the management level, enrolment in courses to become more familiar with sustainable building practices and building certification requirements may be necessary. For speciality trade occupations such as plumbers, electricians, carpenters, HVAC installers, more in-depth training is needed to become familiar with new green technologies and techniques. There are many courses and programs available, offered through community colleges, trade associations, and private companies. These courses and programs vary in length and intensity.

An important skill that is in demand for all construction workers is interdisciplinary or holistic thinking. A collaborative report by The Clean Air Partnership, the Canadian Urban

Institute, and the Toronto Training Board found that energy efficient construction requires workers to be familiar with how buildings work as a system and how the work of each trade involved interconnects with each other.³⁸ An easy to scan chart that lists the technologies and practices that may require new knowledge and training can be found starting on page ten of the abovementioned report.

New Occupations

Roofers are experiencing tremendous opportunity in the area of solar panel installation, as the skills needed for both occupations are quite similar. This is especially true for roofers who are also trained as electricians. Many courses are available for roofers to learn the new skills related to solar panel installation.

With regard to retrofitting existing residential and commercial buildings, energy auditing is a new occupation emerging in this field. Energy audits are required both before and after renovations are done in order to measure improvements. Energy auditing is not an entry-level job in that it requires experience in construction and home inspection as well as completion of a training course; however, this occupation is believed to be a great opportunity for career advancement. As demand for renovations increases, the demand for energy auditors will increase as well.

Representative jobs in energy conservation include construction manager, construction labourer, construction equipment operator, carpenter, electrician, HVAC installer, plumber, insulation installer, painter, glazier, and roofer.

³⁷ Liming, Drew, "Careers in Green Construction". June 2011.

³⁸ Penney, Jennifer, Ireen Wieditz, Brent Gilmour, Jeff Evenson and Karen Lior, "Skills for Energy Efficient Construction: A Report on Trades Training for Energy Efficient Buildings in the Greater Toronto Area". March 2007.

SECTION 7:

Conclusions and Recommendations for Employment Counsellors and Job Developers

The green economy offers great potential for youth to enter the labour market and obtain entry level positions. This potential is driven by a number of different factors including climate change, consumer habits and demands and, most significantly, government policy and investment. Although there are definitional challenges regarding green jobs, the consensus is that green jobs affect many, if not all, industries of the economy, although some are more affected than others.

The area of the green economy that offers the highest level of opportunity for youth is in the energy sector, specifically the generation of renewable energy and in energy conservation. In addition to the energy sector, the construction and manufacturing sectors are also being greatly affected by the transition to a green economy. The opportunities in these three sectors are increasing even further due to many of the current workers reaching the age of retirement.

The skills required for occupations in renewable energy and energy conservation include both generic and technical skills, some of which are new and need to be developed and others which are easily transferable from other non-green occupations. The training and employment requirements for the occupations are not uniform, but there are a number of training programs that can support youth in developing at least the basic skills, and employers are generally able to offer additional on the job training. Knowledge of sustainability and interdisciplinary thinking are highly encouraged.

The recommendations for employment counsellors are as follows:

1. Review the six job task analyses found in Appendix A of this report. These will provide further insight into the nature of more common entry-level green jobs.
2. Use the inventories of training programs and employers found in Appendix B and C to connect youth to the appropriate training program and/or employer. Contact the Green Skills Network if you know of a training program or an employer that is not included in the inventory.
3. Review the map of renewable energy and energy conservation projects in Canada found in Appendix D to become familiar with the types of activity occurring in your community and province. These projects provide potential leads for your clients. Contact the Green Skills Network if you know of a project that is not included in the inventory.
4. Review the case studies in Appendix E, which serve as examples of different models for green jobs training programs. Contact the Green Skills Network if you would like support in implementing a training program in your community.
5. Stay informed about Green policy and investment as it relates to your community.
6. Visit the Green Skills Network website at www.greenskillsnetwork.ca for more information on green jobs.