



Sarnia Lambton's  
**GREEN**  
**ECONOMY**

*powering sarnia lambton's green economy*



## **Acknowledgements**

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The Sarnia Lambton Workforce Development Board would like to thank the organizations and individuals who have helped us during this research initiative. We greatly appreciate your time, knowledge, and expertise.

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## **Special thanks**

The Sarnia Lambton Workforce Development Board would also like to extend our thanks and appreciation to the Toronto Workforce Innovation Group, Workforce Planning Board of York Region and Bradford West Gwillimbury and the Peel-Halton Workforce Development Group, as well as the Hamilton Training Advisory Board, Niagara Workforce Planning Board and the Workforce Planning Board of Grand Erie for their support and willingness to share their resources and related works, *Greening the Economy: Transitioning to New Careers* and *The Future of the Green Economy: Grand Erie, Hamilton, Niagara*.

We would also like to give a special thanks to all of the local businesses who took the time to fill out our online survey. Your time and input were greatly appreciated.

## **EMPLOYMENT ONTARIO**

This Employment Ontario Project is funded by the Government of Ontario.  
The views expressed in this document do not necessarily reflect those of Employment Ontario.

The information in this report is current at the time of printing March, 2011.

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## Executive Summary

The purpose of *Sarnia Lambton's Green Economy Report* is to define the green economy while identifying related industries and careers within the Sarnia Lambton region. The impact of the green economy on the economic region will be examined while also identifying current industries implementing new green practices. This will increase our knowledge and understanding of the green economy and how it affects occupations and key sectors.

With the combination of the global economic crisis of 2008-2009, and the introduction of Ontario's Green Energy Act (GEA), 2009, the need for new careers in the green economy is vital. With the abundance of renewable resources in the province of Ontario, the revitalization of traditional industries to greener practices could help Ontario become a leader in the green economy as well as helping to build a stronger economy.

The green economy has become a globally recognized term with multiple definitions. For the purposes of this report, we developed a working definition of the green economy. "The green economy encompasses work activities across various sectors with the primary goal of improving, preserving or restoring the environment, specifically the quality of land, air and water." Specifically, the green economy consists of economic activities related to the following: reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy<sup>1</sup>.

"Green collar jobs" however, 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<sup>2</sup>. According to the United Nations Environmental Programme (UNEP), the demand for green careers will affect employment in various industries in at least four ways: job creation, job substitutions, job elimination without direct replacement, and job transformation as current skill sets are redefined according to "green" demands<sup>3</sup>. Thus local organizations when planning for labour force development must determine how to effectively transition a traditional labour force to one that can easily move into green careers.

This report will provide a detailed occupational analysis across five key sectors including Agriculture, Forestry, Fishing and Hunting; Utilities; Construction; Manufacturing and Administration and Support; Waste and Remediation. These five sectors were chosen based on their importance to the Lambton County area in terms of employment size and potential growth as well as their proximity to green markets.

Section 1 provides a brief introduction to the green economy and green careers, as well as the research methodology undertaken.

Section 2 profiles five green industries, with an overview of green clusters. In detail it covers Agriculture, Forestry, Fishing and Hunting; Utilities; Construction; Manufacturing and Administration and Support, Waste Management and Remediation Services across the Lambton County area.

Section 3 provides an analysis of the survey findings and determines how businesses within Sarnia Lambton are adjusting to the emergence of the green economy.

## Section One : Introduction

With the growing concern and awareness of climate change, resource depletion and the need for more sustainable practices, the emerging green economy has become a global priority. Our current economy needs to make this shift towards a greener one with the creation of new opportunities for “green” careers and/or green jobs such as environmental engineers and the manufacturing and installation of solar panels.

This growing interest and investment in a green economy – coupled with the need for creation of new career opportunities in Sarnia Lambton and elsewhere has led the Sarnia Lambton Workforce Development Board to examine the potential of transitioning workers into growing or emerging sectors related to the green economy. The Sarnia Lambton Workforce Development Board specifically, is examining the top green industries within the region and how these industries impact the local labour market. The Sarnia Lambton Workforce Development Board is among the 25 Workforce Planning Boards in Ontario comprising Workforce Planning Ontario. These Boards are not-for-profit organizations who aim to identify significant labour market development, issues in their communities and develop innovative solutions to those issues through partnerships with local stakeholders.

The Recession of 2008-2009 caused great uncertainty in the global market place. Many sectors across the province and Canada have experienced significant job loss and have had to re-evaluate their priorities. Therefore the exploration of alternative areas for economic growth, the examination of the existing economic base for business retention and expansion, and the investigation of possibilities for new investment and employment have become necessary among the provinces, regions and communities. Ontario, possibly the province hit hardest by rising rates of unemployment in 2009, has developed innovative policies and programs to encourage investment and development in alternative energy.

In May of 2009, the Province of Ontario enacted the Green Energy Act. This was a landmark for the province and a strategic response to the growing need for renewable sources of energy and sustainable sources of fuel<sup>4</sup>. Since the act was put in place only a short time ago, many Ontario families and businesses have already become active energy conservers. Within the first three years, the GEA is expected to create 50,000 direct and indirect jobs in smart grid and transmission and distribution upgrades, renewable energy and conservation in Ontario<sup>5</sup>.

The McGuinty Government is aiming to move away from coal dependency to a clean, modern and reliable energy economy that will create new jobs. Energy is a major engine of Ontario and currently employs more than 95,000 people in the province. Government investments to help modernize the system by upgrading nuclear plants, building new, cleaner sources of electricity like wind and solar and putting an end to smog-producing coal plants are necessary steps according to *Ontario's Long-Term Energy Plan*. These modernizations to the system are helping to create and support jobs and opportunities for people and communities across the province. Examples of how clean energy is helping the province, in addition to the environmental and health benefits, is the up-coming introduction of the first-ever wind blade manufacturing plant in Tillsonburg. This project will bring as many as 300 permanent jobs and up to 600 additional construction and indirect service jobs in the region. In our community, the Sarnia Solar Project became one of five large solar farms in Ontario and the largest solar farm of its kind in the world. This project alone created 800 jobs during construction<sup>6</sup>. These new clean energy initiatives are all part of the green

economy, but there are many other projects emerging all over the province across various industries.

The definition of the green economy is still relatively unclear. Many institutions have proposed their own definitions of this emerging economy and consequently, there is no one commonly accepted definition. After reviewing various interpretations of this definition, we came to understand that the green economy encompasses work activities across various sectors with the primary goal of improving, preserving or restoring the environment, specifically the quality of land, air and water. Furthermore, the green economy includes economic activity related to the following: reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy<sup>7</sup>. This new economy has made a significant impact across various sectors with regards to employment. The green economy has resulted in the reallocation of existing jobs as well as the creation of new ones. Currently, it has been recognized that the primary impact of the green economy on employment has been job adaptation or reallocation. The need for workers to update their skills to meet the requirements of emerging regulations and utilizing new technologies is essential. In many industries, employees must learn to adapt to changing responsibilities and update their skills accordingly<sup>8</sup>. New jobs in areas such as agriculture and engineering have been created, but in many cases current employees are able to transfer their skills in order to meet new demands.

Green jobs are present among various economic sectors including Agriculture, Forestry, Fishing and Hunting, Construction, Manufacturing, Utilities, Transportation and Warehousing and others. In 2007, about three per cent of the national workforce in Canada were engaged in environmental-related occupations and about one in ten organizations had environmental employees<sup>9</sup>. It is projected that growth in environmental employment will surpass the average employment growth in the near future. This is due to the increased demand for environmental employment and the possible shortage of labour. Therefore the need for a close examination of the occupational requirements of this new economy is vital.

To better understand the green economy in the province and our area, we conducted a thorough literature review and analysis of the labour market data. We identified five key industry sectors in the green economy across the Sarnia Lambton region and included a local perspective by engaging employers via online survey on green occupations, education and skills. Understanding which industries and occupations will be influenced by the green economy is imperative as local organizations plan for labour development.

## Methodology

In order to begin the research for this report, we needed to determine a definition for the green economy or green jobs beforehand. However, we discovered there is no single accepted definition. Therefore, we decided to use three different sources, an international definition, a Canadian definition and an American definition. This way we are able to see three different perspectives on this emerging economy. The sources we consulted were the United Nations Environment Programme (UNEP)<sup>10</sup> for its international perspective and strong foundation supported by several other publications; The Environmental Careers Organization Canada (ECO Canada)<sup>11</sup> for their Canadian industry perspective; and lastly, the Occupational Information Network (O\*NET)<sup>12</sup>, sponsored by the US Department of Labor, and the Bureau of Labor Statistics (BLS).

**Table 1: Definitions of the Green Economy**

Source	Definition of Green Economy/Green Jobs
<b>Industry Council –Eco Canada</b>	Eco Canada defines the green economy as any activity operating with the primary intention of reducing current levels of resource consumption, harmful emissions and to minimize all forms of environmental impact. Green jobs consist of jobs that work directly towards minimizing environmental impact which require specialized skills, knowledge, training or experience related to these areas.
<b>US Department of Labor/Employment and Training Administration – O*NET Resource Center</b>	Defines the green economy as all economy activity with the primary goal of reducing the use of fossil fuels, pollution and greenhouse gas emissions, recycling materials, increasing the efficiency of energy use while also developing and adopting renewable sources of energy. Green jobs are jobs in the primary industries of a green economy that promote environmental protection and energy independence.
<b>International – UNEP</b>	Defines green jobs as positions in agriculture, manufacturing, construction, installation, and maintenance, as well as scientific and technical, administrative, and service-related activities that contribute substantially to preserving or restoring environmental quality. Examples of these may include jobs that help to protect and restore ecosystems and biodiversity; and reduce energy, materials, and water consumption through high efficiency strategies.

To determine the status of the green economy as it relates to Sarnia Lambton, in addition to a literature review, data was collected from a variety of recognized sources. To provide an industry analysis, we consulted the Canadian Business Patterns (CBP) data from 2008 to June 2010<sup>13</sup>. The CBP database provided by Statistics Canada identifies the number of business establishments within a Census Division. The database also identifies the number of employers by detailed industry and for nine different employee size ranges, including indeterminate employers<sup>14</sup>. Industries are categorized using the North American Industry Classification System (NAICS)<sup>15</sup>.

To begin our research on green occupations within the Sarnia Lambton area, we had to determine which industries would have the greatest potential for green employment. To do this we looked at

both business growth by analyzing the CBP data from 2008 to June 2010, as well as industrial importance across the County by calculating location quotients<sup>16</sup> at the 2-digit NAICS level. This data revealed that the industries with the most potential to grow with the green economy included: Agriculture, Forestry, Fishing and Hunting; Utilities; Construction; Manufacturing and Accommodation and Support, Waste Management and Remediation Services.

To determine our green occupations, we consulted the green economy profiles developed from the Peel Halton Workforce Development Group, the Toronto Workforce Innovation Group and the Workforce Planning Board for York Region and Bradford West Gwillimbury<sup>17</sup>. The O\*NET Resource Center was also helpful when identifying green occupations. The O\*NET Resource Center has their own list of green occupations which are divided by increased demand, enhanced skills and new and emerging green occupations<sup>18</sup>.

The Canadian National Occupational Classification (NOC)<sup>19</sup> is a nationally accepted reference on occupations that group over 30,000 job titles into 520 occupational groups, providing a standardized framework for organizing the workforce into a coherent system. This system is echoed in the O\*NET<sup>20</sup> Resource Center using the Standard Occupational Classification (SOC) codes used by American Federal statistics agencies to classify workers into occupational categories for the purposes of collecting, calculating, or disseminating<sup>21</sup>. Using the information provided by the NOC database, we were able to consult the O\*NET Resource Center to determine the NOC codes for new green occupations. We reviewed ten green occupations in the industries chosen in Ontario based on the 2006 Statistics Canada Census data<sup>22</sup>.

Many of the top green occupations are also categorized under other titles. Using the NOC database<sup>23</sup>, we were able to provide examples of other titles for the green occupations chosen.

Lastly, using the Matrix of Skills Transferability<sup>24</sup>, we were able to determine related occupations that share the same transferable skills while also analyzing labour market practices, such as inter-occupational mobility and internal progressions. This Matrix is an occupational model developed by Human Resources Skills Development Canada. Based on the National Occupational Classification System (NOC), it is designed to identify potential employment opportunities for workers in different occupations, inform possible paths of mobility between occupations based on nature of the work and knowledge required, occupational-specific skills and generic or basic skills.

For a local perspective on the emerging green economy, we engaged local employers, with assistance from the Sarnia Lambton Economic Partnership and The University of Western Ontario Research and Development Park – Sarnia Lambton, via an online survey. This survey helped us to collect information on green occupations, the education needed, skills required and the involvement of the green economy in Sarnia Lambton.

## Section Two : Industry Profiles

### Agriculture, Forestry, Fishing and Hunting (NAICS 11)

#### Industry Overview

The Agriculture, Forestry, Fishing and Hunting sector is comprised of establishments primarily engaged in growing crops, raising animals, harvesting fish and other animals from their natural habitats and providing related support activities. Establishments engaged mainly in agricultural research or that supply veterinary services are not included in this sector<sup>25</sup>. The main subsectors of the Agriculture, Forestry, Fishing and Hunting sector are:

- Crop Production (NAICS 111)
- Animal Production (NAICS 112)
- Forestry and Logging (NAICS 113)
- Fishing, Hunting and Trapping (NAICS 114)
- Support Activities for Agriculture and Forestry (NAICS 115)

Examples of green activities within these subsectors include:

- Organic Farming
- Organic Wineries
- Agroforestry
- Sustainable forestry management
- Reforestation

#### Industry Presence

The 2006 Statistics Canada Census revealed that 3,155 people were employed in Sarnia Lambton in the Agriculture, Forestry, Fishing and Hunting industry, accounting for 5% of their total workforce compared to 1.77% across Ontario. The table below shows the respective numbers in Sarnia Lambton and Ontario.

**Table 2: Number of People Employed in Agriculture, Forestry, Fishing and Hunting (NAICS 11)**

	Sarnia-Lambton	Ontario
Agriculture, Forestry, Fishing and Hunting (NAICS 11)	3,155	108,930
Total people employed across all industries	63,055	6,164,245
% employed in Agriculture, Forestry, Fishing and Hunting	5%	1.77%

Source: Statistics Canada, 2006 Census

In total, there are 108,930 people employed in the Agriculture, Forestry, Fishing and Hunting Industry across Ontario, 2.9% of which are employed throughout Sarnia Lambton. From December 2008 to June 2010, Canadian Business Patterns<sup>26</sup> data reports a total increase of approximately 30 businesses in the Agriculture industry across the Sarnia Lambton area. Business growth occurred in the small to medium-sized employer categories with the greatest increase in small size employers (0-4 and 5-9 employee range).

## **The Green Economy and Agriculture, Forestry, Fishing and Hunting**

Ontario's natural environment is unlike most other provinces in Canada. Ontario has over half of the "Class 1" (highest quality) agricultural land in Canada and even more Class 2 and Class 3 land, both of which are considered very suitable for agriculture<sup>27</sup>. Over 57,000 farms are located in the province and generate 10.3 billion in revenue, accounting for about 25% of all farm revenue in Canada. In addition, Ontario's vast and sustainable forests set a strong foundation for our forestry products industry. Agriculture is a significant industry in Ontario's economy overall.

There are many opportunities within the Agricultural sector where a shift to green energy is available. As the green economy continues to move forward, agriculture will transition to greener waste management solutions, green energy crops, and harvesting of green energy including wind and solar<sup>28</sup>. The move towards bio-based materials, farm-efficient technologies, micro-irrigation systems, bio-remediation, non-toxic cleaners and natural pesticides will become common changes in Southern Ontario<sup>29</sup>.

With the Agriculture and Agri-Food Canada's *Growing Forward* environmental initiative, \$199.5 million will help to develop new agri-environmental knowledge, programs and initiatives which will improve sustainable practices and bring both environmental and economic benefits for the agricultural sector. With this initiative program, farmers will be able to address key environmental challenges on water quality, water use, climate change and greenhouse gas emissions. The hope is that farmers will explore new economic opportunities that encourage additional environmental action<sup>30</sup>.

Agriculture is a significant contributor to Sarnia Lambton's economy. With 589,407 acres of farmland in the County, agriculture is the second largest sector in the region. The agriculture industry in Sarnia Lambton is already making headway in the green economy with the inclusion of state of the art greenhouse operations such as Envirofresh Produce Inc. and Enniskillen Pepper Co. Ltd., the addition of innovative heating systems such as the geothermal broiler barn at Cornelissen Farms Inc. and the installation of Ontario's first on-farm 250 KW windmill used to supply power for a dairy and hog farm<sup>31</sup>.

With agriculture being the second largest industry in the region, there are many opportunities for green economic growth. As this transition continues, the research suggests that the Agriculture, Forestry, Fishing and Hunting industry will be positively impacted by this change. Not only will this shift impact local farms, but it will also decrease our ecological footprint and increase food security.

## **Green Occupations**

A total of 3,155 people are employed throughout the Agriculture, Forestry, Fishing and Hunting industries in Sarnia Lambton. Using both secondary and primary research, we developed a list of ten green occupations in Agriculture in Ontario. We also used our employer survey to determine both business and subsector presence of these occupations. The Statistics Canada Census reveals the total number of people working in these occupations in Sarnia Lambton for 2006. See Table 3 for our list of emerging green occupations in the Agriculture, Forestry, Fishing and Hunting Industries and the employment numbers in Sarnia Lambton and Ontario.

**Table 3: Green Occupations in Agriculture, Forestry, Fishing and Hunting (NAICS 11)**

NOC	Occupation	Sarnia Lambton	Ontario	% in Sarnia Lambton
2122	Forestry Professionals	Data currently not available	310	Data currently not available
2123	Agrologist	25	235	10.6%
2221	Biological Technologists and Technicians	Data currently not available	155	Data currently not available
2223	Forestry Technologists and Technicians	Data currently not available	330	Data currently not available
2225	Landscape and Horticultural Technicians and Specialists	25	415	6%
8251	Farmers and Farm Managers	1,945	44,130	4.4%
8252	Agricultural and Related Service Contractors and Managers	10	270	3.7%
8253	Farm Supervisors and Specialized Live Stock Workers	40	1,975	2%
8254	Nursery and Greenhouse Operators and Managers	10	1,245	0.8%
8422	Silviculture and Forestry Workers	Data currently not available	365	Data currently not available

Source: Statistics Canada, 2006 Census

### Other Titles

The NOC is a nationally accepted reference on occupations that groups over 30,000 job titles into 520 occupational groups, providing a standardized framework for organizing the workforce into a coherent system<sup>32</sup>. All of the titles found in the NOC system are also classified under other titles. Table 4 provides examples of other titles listed in the NOC database.

**Table 4 : Other Titles for Green Occupations in Agriculture, Forestry, Fishing and Hunting (NAICS 11)**

NOC	NOC Title	Other Titles
2122	Forestry Professionals	Consulting Forester; District Forester; Forest Engineer; Forestry Superintendent; Professional Forester; Regional Inventory Officer – Forestry; Registered Professional Forester (RPF)
2123	Agrologist	Agricultural Representatives, Consultants and Specialists; Agricultural Consultant; Agricultural Extension Supervisor; Agricultural Livestock Specialist; Agricultural Soil and Crop Specialist; Agronomist; Crop Specialist; Farm Management Consultant; Grower's Advisor
2221	Biological Technologists and Technicians	Agricultural Technician; Agricultural Technologist; Agrology Technician; Aquaculture Technician; Bacteriological Technician; Botanical Technician; Fisheries Technician;

		Food Bacteriological Technician; Microbiology Quality Control Technologist; Plant Breeding Technician; Seed Technologist; Wildlife Biology Technician
2223	Forestry Technologists and Technicians	Conservation Technician – forestry; Extension Ranger – forestry; Forest Fire Technician; Forest Survey Technician; Forest Technician; Forestry Technician; Forestry Technologist; Resource Officer, Forest Inventory; Resource Technician – forestry; Scaler Technician – logging; Silviculture Technician
2225	Landscape and Horticultural Technicians and Specialists	Arborist; Greenskeeper; Horticultural Technician Horticulture Specialist; Horticulturist; Hydroponics Technician; Landscape Architectural Technician Landscaper; Lawn Care Specialist; Tree Service Technician
8251	Farmers and Farm Managers	Apiarist; Breeder, Domestic Animals; Chicken Farmer; Dairy Farmer; Feedlot Manager; Fruit Farmer; Grape Grower; Horse Breeder; Market Gardener; Potato Farmer; Rancher; Seed Grower; Sod Farmer; Vegetable Grower; Vineyard Manager; Viticulturist; Wheat Farmer
8252	Agricultural and Related Service Contractors and Managers	Crop Dusting Contractor; Livestock Breeding Service Manager; Manager, Artificial Insemination Service; Manager, Crop Harvesting Service; Soil-Testing Service Contractor
8253	Farm Supervisors and Specialized Live Stock Workers	Cattle Herdsperson; Farm Foreman/Woman; Farm Supervisor; Feedlot Foreman/Woman; Hog Operation Supervisor; Horse Trainer Ranch Foreman/Woman; Vegetable Farm Foreman/Woman
8254	Nursery and Greenhouse Operators and Managers	Greenhouse Farmer; Greenhouse Manager Greenhouse Operator; Nursery Farmer; Nursery Manager; Nursery Operator; Horticultural Greenhouse Operator; Hydroponic Greenhouse Operator
8422	Silviculture and Forestry Workers	Forest Firefighter; Forestry Crew Worker; Forestry Worker; Pieceworker – silviculture; Scarification Equipment Operator; Silviculture Worker; Spacing Saw Operator; Thinning Saw Operator

Source: Human Resources and Skills Development, National Occupational Classification, 2010

### Skills Transferability

By using the Matrix of Skills Transferability from the Department of Human Resources and Skills Development Canada (Appendix A) we were able to determine which occupations have the potential for skills transferability. Table 5 specifically outlines the green occupations we have chosen for the Agriculture, Forestry, Fishing and Hunting industry in Sarnia Lambton and then matches them, based on the Matrix, with other occupations where skills transferability is possible.

**Table 5: Green Occupations in Agriculture, Forestry, Fishing and Hunting (NAICS 11) and Skills Transferability Possibilities**

NOC	Occupations Occupation title	Occupation with Skills Transferability NOC Occupation Title
2122	Forestry Professionals	Forestry Technologists and Technicians (2223)
2123	Agrologist	Biological Technologists and Technicians (2221)
2221	Biological Technologists and Technicians	Medical Laboratory Technicians (3212)
2223	Forestry Technologists and Technicians	
2225	Landscape and Horticultural Technicians and Specialists	Very heterogeneous
8251	Farmers and Farm Managers	Heterogeneous
8252	Agricultural and Related Service Contractors and Managers	Heterogeneous group; internal progression
8253	Farm Supervisors and Specialized Live Stock Workers	Heterogeneous group; internal progression
8254	Nursery and Greenhouse Operators and Managers	Heterogeneous group; internal Progression
8422	Silviculture and Forestry Workers	

Source: Human Resources and Skills Development, Matrix of Skills Transferability, 2003

### Educational Programs and Certifications

In order to attain a green collar occupation within the Agriculture industry, the completion of a degree, diploma or certification program is generally required. The educational programs and certifications that relate specifically to the top green careers in the Agriculture industry are:

- **Arborist Apprenticeship**, Certificate of Apprenticeship – Lambton College
- **Horticultural Apprenticeship**, Certificate of Apprenticeship – Lambton College
- **Horticulture**, Associate Diploma – Ridgetown Campus, University of Guelph
- **Agriculture**, Associate Diploma – Ridgetown Campus, University of Guelph
- **Bio-Resource Management**, Degree Program – Ridgetown Campus, University of Guelph
- **Biology**, Bachelor of Science – University of Western Ontario; University of Windsor
- **Biology and Biotechnology**, Bachelor of Science – University of Windsor
- **Ecosystem Health**, Bachelor of Science – University of Western Ontario

## Utilities (NAICS 22)

### Industry Overview

The establishments that make up this sector are primarily engaged in operating electric, gas and water utilities. They generate, transmit, control, and distribute electric power; natural gas; treat and distribute water; operate sewer systems through a permanent infrastructure of lines, pipes and treatment and processing facilities<sup>33</sup>. The main subsectors in this industry are:

- Electric Power Generation, Transmission and Distribution (NAICS 2211)
- Natural Gas Distribution (NAICS 2212)
- Water, Sewage and Other Systems (NAICS 2213)

Examples of green activities within these subsectors include:

- Renewable Energy
- Bioenergy
- Hydrogen and Fuel Cells
- Energy Saving Lighting and HVAC
- Advanced Batteries, Energy Storage and Charging Systems

### Industry Presence

The Utilities industry across the Sarnia Lambton region is relatively small compared to other industries in terms of the number of employees and the number of business establishments. In 2006, 920 people were employed in the Utilities industry, 1.46% of the total workforce in Sarnia Lambton, compared to 0.79% across Ontario. Table 6 provides the respective numbers in the Sarnia Lambton area and Ontario.

**Table 6: Number of People Employed in Utilities (NAICS 22)**

	Sarnia-Lambton	Ontario
Utilities (NAICS 22)	920	48,640
Total people employed across all industries	63,055	6,164,245
% employed in Utilities	1.46%	0.79%

Source: Statistics Canada, 2006 Census

In total, there are 48,640 people employed in the Utilities industry across Ontario, and 1.9% work in Sarnia Lambton. From December 2008 to June 2010, the Utilities industry remained steady in employer numbers according to the Canadian Business Patterns<sup>34</sup> Data.

While growth in this industry appears small across the Sarnia Lambton region, Utilities are expected to develop more rapidly across Ontario. Secondary research suggests that the Utilities industry is one that is facing both large threats and opportunities in the wake of the green economy<sup>35</sup>.

## The Green Economy and Utilities

The core component of “going green” is reducing energy use and creating new and more efficient sources of energy. The Utilities industry is shifting from the traditional power plant format to one that is new, technologically advanced, environmentally conscious and economically promising. By 2011, there will be an estimated 24,000 or more environmental employees in the Utilities, and Transportation and Warehousing industries in Canada, an increase of 1.1% from 2006.

Over the past seven years, the McGuinty Government has made tremendous progress after inheriting a system with reduced supply and little planning for the future. Today, Ontario's system is cleaner, more modern and more reliable. In an effort to make electricity cleaner, the McGuinty Government is working hard towards their climate change initiative by eliminating coal by 2014. Ontario is currently on track with this goal and has already reduced the use of coal by 70%. Ontario's greenhouse gas emissions from the electricity sector have reached their lowest mark in 45 years. In 2009, more than 80 per cent of our generation came from emissions-free sources like wind, water, solar, biogas and nuclear<sup>36</sup>.

Biomass and natural gas are two areas that Ontario Power Generation (OPG) is looking towards to convert existing coal-fired plants. By converting the Atikokan Generation Station to biomass by 2013, approximately 200 new jobs will be created as well as saving existing jobs at the plant. This one plant, once converted is expected to generate 150 million kilowatt-hours of renewable power, enough to power 15,000 homes each year<sup>37</sup>.

Ontario is still considering the possible conversion of the units in Nanticoke and Lambton to natural gas and is still exploring the possibility of co-firing of biomass with natural gas for those units converted to natural gas<sup>38</sup>.

Ontario's landmark Green Energy and Green Economy Act, 2009 is projected to support more than 50,000 direct and indirect jobs in smart grid and transmission and distribution upgrades, renewable energy and conservation. One plan for future energy generation in Ontario is the focus on efficient localized generation from smaller, cleaner sources of electricity rather than from the current large centralized power plants that transmit power over long distances. This strategy is known as “distributed generation”. This will open up opportunities for smaller power producers, allowing individuals, Aboriginal communities and small co-operatives or partnerships to become generators<sup>39</sup>.

Renewable energy activities such as ethanol, solar and wind power are still relatively new ventures in the Sarnia Lambton area. Anecdotal evidence suggests that Sarnia Lambton will take greater advantage of future opportunities presented by these new emerging green energy industries as potential investments in this industry are expected. So far, Suncor's ethanol facility has created approximately 50 jobs in Sarnia Lambton and this number is expected to continue to increase slightly in the future. This ethanol facility is one of five in Ontario. Several other clean energy companies in the area have recently opened operations including Northern Ethanol, Greenfield Energy, Invenergy, Entropex, and Methes Energies, but employment rates are still relatively small within these new firms. The hope is that the economic landscape will change dramatically due to unanticipated significant new investments in the industry<sup>40</sup>.

## Green Occupations

A total of 920 people are employed throughout the Utilities industries in Sarnia Lambton. Using both primary and secondary research, we developed a list of ten green occupations in Utilities in Ontario. We also used our employer survey to determine both business and subsector presence of these occupations. The Statistics Canada 2006 Census reveals the total number of people working in these occupations in the Lambton area. See Table 7 for our list of emerging green occupations and the employment numbers in Sarnia Lambton and Ontario.

NOC	Occupation	Sarnia Lambton	Ontario	% in Sarnia Lambton
0912	Utilities Manager	40	2415	1.7%
1453	Customer Service, Information and Related Clerks	20	1445	1.4%
2112	Environmental Chemist	Data currently not available	2112	Data currently not available
2132	Energy Conservation Engineer	15	4120	0.36%
2133	Electrical and Electronics Engineer	10	1340	0.75%
2211	Chemical Technologists and Technicians	30	405	7.4%
2241	Electrical and Electronics Engineering Technologists and Technicians	35	1310	2.7%
7351	Stationary Engineers and Auxiliary Equipment Operators	75	480	15.6%
7352	Power System and Power Station Operators	90	3145	2.9%
9212	Supervisors, Petroleum, Gas and Chemical Processing and Utilities	30	1770	1.7%

Source: Statistics Canada, 2006 Census

## Other Titles

The NOC is a nationally accepted reference on occupations that groups over 30,000 job titles into 520 occupational groups, providing a standardized framework for organizing the workforce into a coherent system<sup>41</sup>. All of the titles found in the NOC system are also classified under other titles. Table 8 provides examples of other titles listed in the NOC database.

NOC	NOC Title	Other Titles
0912	Utilities Manager	Director of Waste Management; Director of Water Pollution Control; Director, Distribution Systems –

		utilities; Director, Electrical Power Transmission Operations; Director, Water Supply; Electric Power Plant Manager; Manager, Distribution, Refined Petroleum Products; Manager, Electric Generating Plant; Manager, Gas Supply Operations; Water Filtration Plant Manager
<b>1453</b>	Customer Service, Information and Related Clerks	Accounts Information Clerk; Call Centre Agent – Customer Service; Complaints Clerk – Customer Service; Counter Enquiries Clerk; Customer Service Clerk; Customer Service Representative – call centre; Enquiries Clerk Information Clerk – customer service; Public Relations Clerk
<b>2112</b>	Environmental Chemist	Agricultural Chemist; Analytical Chemist; Biochemist; Chemist; Food Chemist; Inorganic Chemist; Medicinal Chemist; Nuclear Magnetic Resonance (NMR) Spectroscopist; Organic chemist Organometallic Chemist; Physical Chemist; Quality Control Chemist; Research Chemist; Soil Chemist
<b>2132</b>	Energy Conservation Engineer	Acoustics Engineer; Design Engineer – mechanical; Engineer, Power Generation; Fluid Mechanics Engineer; Mechanical Engineer; Mechanical Maintenance Engineer; Nuclear Engineer; Robotics Engineer; Thermal Design Engineer
<b>2133</b>	Electrical and Electronics Engineer	Control Systems Engineer; Design Engineer, Electrical; Distribution Planning Engineer, Electrical; Electrical Engineer; Electrical Network Engineer; Electronics Engineer; Instrumentation and Control Engineer; Planning Engineer, Electrical Systems; Process Control Engineer, Electrical
<b>2211</b>	Chemical Technologists and Technicians	Biochemistry Technologist; Chemical Analyst; Chemical Engineering Technician; Chemical Engineering Technologist; Chemical Research Technician; Geochemical Technician; Industrial; Hygiene Technologist; Pilot Plant Technician; Quality Control Technician – chemical processing; Quality Control Technician – food processing
<b>2241</b>	Electrical and Electronics Engineering Technologists and Technicians	Electrical Engineering Technician; Electrical Engineering Technologist; Electricity Distribution Network technologist; Electronics Design Technologist; Electronics Engineering Technician; Electronics Engineering Technologist; Electronics Manufacturing Technician; Electronics Manufacturing Technologist
<b>7351</b>	Stationary Engineers and Auxiliary Equipment Operators	Auxiliary Plant Operator; Boiler Operator; Power Engineer; Stationary Engineer; Steam Plant Operator
<b>7352</b>	Power System and Power Station Operators	Chief Operator, Area Dispatch; Distribution Control Operator; Generating Station Operator; Nuclear Reactor Operator; Power Dispatcher; Power Plant Operator; Power System Operator

<b>9212</b>	Supervisors, Petroleum, Gas and Chemical Processing and Utilities	Chemical Processing Supervisor; Production Supervisor, Pharmaceuticals; Production Supervisor, Specialty Chemicals; Steam Engineer Leader; Supervisor, Petroleum Refining; Supervisor, Pipeline Operation; Supervisor, Power Station; Supervisor, Sewage Treatment Plant
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Source: Human Resources and Skills Development, National Occupational Classification, 2010

### Skills Transferability

By using the Matrix of Skills Transferability from the Department of Human Resources and Skills Development Canada (Appendix A) we were able to determine which occupations have the potential for skills transferability. Table 9 specifically outlines the green occupations we have chosen for the Utilities industry in Sarnia Lambton and then matches them, based on the Matrix, with other occupations where skills transferability is possible.

**Table 9: Green Occupations in Utilities (NAICS 22) and Skills Transferability Possibilities**

<b>NOC</b>	<b>Occupations Occupation title</b>	<b>Occupation with Skills Transferability NOC Occupation Title</b>
<b>0912</b>	Utilities Manager	
<b>1453</b>	Customer Service, Information and Related Clerks	
<b>2112</b>	Environmental Chemist	Chemical Technologists and Technicians (2211); Geological and Mineral Technologists and Technicians (2212); Medical Laboratory Technologists and Pathologists' Assistants (3211); Medical Laboratory Technicians (3212)
<b>2132</b>	Energy Conservation Engineer	Industrial and Manufacturing Engineers (2141); Aerospace Engineers (2146); Mechanical Engineering Technologists and Technicians (2232); Industrial Engineering and Manufacturing Technologists and Technicians (2233); Drafting Technologists and Technicians (2253)
<b>2133</b>	Electrical and Electronics Engineer	Computer Engineers (2147); Electrical and Electronics Engineering Technologists and Technicians (2241); Electronic Service Technicians (2242); Drafting Technologists and Technicians (2253)
<b>2211</b>	Chemical Technologists and Technicians 2211	Medical Laboratory Technicians (3212)
<b>2241</b>	Electrical and Electronics Engineering Technologists and Technicians	Electronic Service Technicians (2242); Industrial Instrument Technicians and Mechanics (2243); Aircraft Instrument, Electrical and Avionics Mechanics; Technicians and Inspectors (2244); Drafting

Technologists and Technicians 2253)		
7351	Stationary Engineers and Auxiliary Equipment Operators	
7352	Power System and Power Station Operators	
9212	Supervisors, Petroleum, Gas and Chemical Processing and Utilities	Very heterogeneous group; internal progression

Source: Human Resources and Skills Development, Matrix of Skills Transferability, 2003

### Educational Programs and Certifications

In order to attain a green collar occupation within the Utilities industry, the completion of a degree, diploma or certification program is generally required. The educational programs and certifications that relate specifically to the top green careers in the Utilities industry are:

- **Electrical Techniques**, Ontario College Certificate – Lambton College
- **Alternative Energy Engineering Technology**, Ontario College Advanced Diploma – Lambton College
- **Business Administration**, Ontario College Advanced Diploma – Lambton College
- **Chemical Production and Power Engineering Technology**, Ontario College Advanced Diploma – Lambton College
- **Power Engineering Technology (Chemical)**, Ontario College Advanced Diploma – Lambton College
- **Honours Business Administration**, Bachelor of Commerce – University of Windsor
- **Chemistry**, Bachelor of Science – University of Western Ontario; University of Windsor
- **Earth Sciences**, Bachelor of Science – University of Western Ontario
- **Environmental Science**, Bachelor of Science – University of Windsor
- **Biochemical and Environmental Engineering**, Bachelor of Engineering – University of Western Ontario
- **Chemical Engineering**, Bachelor of Engineering – University of Western Ontario
- **Civil Engineering (Environmental Option)**, Bachelor of Engineering – University of Western Ontario
- **Green Processes Engineering**, Bachelor of Engineering – University of Western Ontario
- **Electrical Engineering**, Bachelor of Engineering/Applied Science – University of Western Ontario; University of Windsor
- **Electrical Engineering (Power Systems Option)**, Bachelor of Engineering – University of Western Ontario
- **Environmental Engineering**, Bachelor of Applied Science – University of Windsor
- **Mechanical Engineering**, Bachelor of Engineering – University of Western Ontario
- **Mechanical Engineering (Environmental Option)**, Bachelor of Applied Science – University of Windsor

## Construction (NAICS 23)

### Industry Overview

This sector encompasses establishments primarily engaged in constructing, repairing and renovating buildings and engineering works, and in subdividing and developing land. Construction related establishments may operate completely on their own account or can be under contract to other establishments or property owners. They may produce complete projects or just parts of projects. Firms often subcontract some or all of the work involved in a project or work together in joint ventures. Companies may produce new construction, or undertake repairs and renovations to existing structures<sup>42</sup>. The main subsectors within the Construction industry are:

- Construction of Buildings
- Heavy and Civil Engineering Construction
- Specialty Trade Contractors

Examples of green activities within these subsectors include:

- Architecture, Community Design and Green Infrastructure
- Sustainable Development, Property Management
- Leed Certified Green Buildings
- Leed Eligible Building Materials
- Energy Star, Leed, & Efficient Equipment

### Industry Presence

The construction industry employed 4,865 people in 2006, which accounts for 7.8% of the total workforce of Sarnia Lambton. Sarnia Lambton has a relatively high concentration of employment in the construction industry with 7.7% compared to 5.88% across Ontario. Table 10 provides the respective numbers in the Sarnia-Lambton area and Ontario.

	Sarnia Lambton	Ontario
Construction (NAICS 23)	4,865	362,450
Total people employed across all industries	63,055	6,164,245
% employed in industry	7.7%	5.88%

Source: Statistics Canada, 2006 Census

In 2006, Ontario's construction industry employed 362,450 people, 1.3% of which are employed throughout Sarnia Lambton. In June 2010, Construction was the second ranked industry in terms of employers with 453 possible employers throughout the area, falling second only to Retail trade with 574 employers. Also, the Construction industry in Sarnia Lambton saw a significant increase in employee numbers in the small to medium-size employee range with one employer also reaching the 500+ employee range, indicating a growth in these companies and the industry<sup>43</sup>.

## The Green Economy and Construction

Changes to Ontario's building code in 2006 has made Ontario a leader in energy efficiency in Canada. With the emergence of the GEA in 2009, the importance of energy efficiency in Ontario's building code was stressed even further. These new measures in the building sector include the construction of new green buildings, retrofitting and improving efficiency of individual building components, such as heating, ventilation, air conditioning systems and lighting. By moving towards green construction, Ontario is helping the environment, saving money in the long run, and creating jobs; jobs for those who conduct audits to carry out retrofits, for those who install solar or geothermal equipment, and for those specializing in energy efficient construction<sup>44</sup>.

The Leadership in Energy and Environmental Design (LEED)<sup>45</sup> is a third-party internationally recognized certification system and an internationally accepted benchmark for the design, construction, and operation of high performance green buildings. The point-based system covers six areas: site development, water efficiency, energy efficiency, material selection, indoor air quality and innovation in design. Ontario as of April 2009 is leading the way in LEED certified buildings with a total of 57 buildings; more than any other province in the Country<sup>46</sup>.

Ontario is also investing approximately \$100 million in perhaps one of the largest ever retrofits in North America, creating 1,000 new jobs and 455,000 square feet of state-of-the-art green office space. The retrofit began in the summer of 2009 and is scheduled to be completed by the spring of 2011. While the exact number of jobs impacted by this shift towards green building construction cannot be confirmed, the national estimate is that energy-efficient building measures and municipal building retrofits will create between 5,600 to 7,840 full time jobs<sup>47</sup>. The number of workers employed across various environmental positions within the Construction sector across Canada is anticipated to reach over 43,000 by 2011, and increase of 0.9% from 2006<sup>48</sup>.

In 2008, Lambton's 'Going Green' committee developed a new initiative titled the *Corporate Clean Air Plan*. The purpose of the *Corporate Clean Air Plan* is to reduce emissions of harmful greenhouse gases (GHG's) into the air, to alleviate health and environmental impacts associated with air pollution and climate change in our community. The primary goal is to improve the health and quality of life of residents in Lambton County by reducing the amount of air pollution released through sustainable municipal actions. In demonstrating a leadership role, the County of Lambton hopes to encourage other local businesses and organizations to adopt similar clean air plans to improve air quality<sup>49</sup>.

In terms of green construction, a few of the strategies suggested in the *Corporate Clean Air Plan* include: promoting energy efficiency in new design and construction, requiring new buildings constructed within the municipality to meet the LEED Gold and Silver certification standard, require new developers to submit energy efficiency and conservation plans for new developments, replace windows and glass entry doors with low-E argon gas filled windows and doors, and encourage green roofs through outreach and education to developers<sup>50</sup>. This is just a small sample of the many strategies and corporate activities the Corporate Clean Air Plan has brought forth.

Currently in Lambton County, construction is underway on the Blue Water Bridge Phase I Canadian Plaza Improvements project in Point Edward. This building is believed to be a LEED certified building in Sarnia Lambton. Construction began in 2009 and is expected to be finished this year with the Blue Water Bridge Authority incorporating many new "green" features into the design.

This project is also completely funded by bridge tolls with no government subsidies<sup>51</sup>. Also, a new “green building” was constructed in Sarnia Lambton at the University of Western Ontario’s Research Park, Sarnia Lambton location. Building 1050 has been designed to the LEED gold standard and incorporates many new green initiatives both in the building and during construction. A “boulder highway” was created to scrub soil from the tires of those exiting the site as well as complete recycling of all building materials used. In the building itself they included slats that will help shade windows in the summer and allow solar heating in the winter. The washrooms in the building use zero-water urinals and complete “no-touch” and minimal water flow elements. The building also include a white roof to reflect up to 80% of the summer sun, green insulation, recycled materials such as the carpeting, and minimal automobile parking to encourage eco-friendly transportation to and from work.

In September of 2010, the “green light” was given to begin construction on the \$1.2-million “Sustainable Smart Home” facility which will serve as a learning lab for students in both trades and alternative energy programs at Lambton College, as well as a resource for the community. Because the Smart Home will feature solar, geothermal and hydrogen fuel cell technology, it will help to educate the public of Sarnia Lambton, especially the youth, about new energy conservation advancements and how to apply these innovations into their everyday lives<sup>52</sup>.

### Green Occupations

A total of 4,865 people are employed throughout the Construction industry in Sarnia Lambton. Using both primary and secondary research, we developed a list of ten green occupations in Utilities in Ontario. We also used our employer survey to determine both business and subsector presence of these occupations. The Statistics Canada 2006 Census reveals the total number of people working in these occupations in the Lambton area. See Table 11 for our list of emerging green occupations and the employment numbers in Sarnia Lambton and Ontario.

NOC	Occupation	Sarnia Lambton	Ontario	% In Sarnia Lambton
0711	Construction Managers	165	17,405	0.95%
0712	Residential Home Builders and Renovators	115	14,440	0.80%
2131	Environmental Engineer	25	2,365	1.1%
2231	Environmental Technologists and Technicians	Data currently not available	420	Data currently not available
2253	Drafting Technologists and Technicians	Data currently not available	625	Data currently not available
2264	Construction Inspector and Tester	15	815	1.8%
7219	Contractors, Supervisors, Other Construction Trades, Installers, Repairers and Servicers	75	8,490	0.88%
7291	Roofers and Shinglers	90	8,225	1.1%
7293	Insulators	240	2,115	11.3%

7441	Solar Installers and Technicians	90	7,790	1.1%
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Source: Statistics Canada, 2006 Census

### Other Titles

The NOC is a nationally accepted reference on occupations that groups over 30,000 job titles into 520 occupational groups, providing a standardized framework for organizing the workforce into a coherent system<sup>53</sup>. All of the titles found in the NOC system are also classified under other titles. Table 12 provides examples of other titles listed in the NOC database.

**Table 12 : Other Titles for Green Occupations in Construction (NAICS 23)**

NOC	NOC Title	Other Titles
0711	Construction Managers	Commercial Construction Manager; Construction Manager; Construction Superintendent; General Contractor; Housing Construction Manager; Industrial Construction Manager; Project Manager, Construction; Residential Construction Manager
0712	Residential Home Builders and Renovators	Contractor, Home Renovation; Contractor, Residential Homes; Home Builder, Home Renovator; Renovation Contractor; Residential home builder
2131	Environmental Engineer	Bridge Engineer; Civil Engineer; Construction Engineer; Geodetic Engineer; Geomatics Engineer; Highway Engineer; Hydraulics Engineer; Municipal Engineer; Project Engineer, Construction; Structural Engineer; Surveying Engineer; Traffic Engineer
2231	Environmental Technologist and Technicians	Building Materials Technician; Civil Engineering Technician; Civil Engineering Technologist; Construction Technologist; Municipal Engineering Assistant; Soil Technologist – Civil Engineering; Structural Design Technologist; Structural Investigator
2253	Drafting Technologists and Technicians	Architectural Draftsperson; Computer-Assisted Design and Drafting; Technologist; Computer-Assisted Drafting (CAD) Technician; Drafting Technician; Drafting Technologist; Electromechanical Draftsperson; Electronic Draftsperson; Mechanical Draftsperson; Steel Detailer – Drafting; Structural Draftsperson; Structural Steel Drafter-Detailer; Supervisor, Drafting Office
2264	Construction Inspector and Tester	Bridge Inspector; Building Construction Inspector; Highway Construction Inspector; Home Inspector; Housing Construction Inspector; Mine Inspector, Construction; Plumbing Inspector; Pre-stressed Concrete Inspector; Safety Officer – construction
7219	Contractors, Supervisors, Other Construction Trades, Installers, Repairers and Servicers	Bricklaying Contractor; Cement Finishing Contractor; Foreman/Woman, Glaziers; Foreman/Woman, Insulators; Foreman/Woman, Plasterers; Painting Contractor; Pest Control Supervisor; Roofing Contractor; Supervisor, Painters and Decorators; Supervisor, Tilessetters
7291	Roofers and Shinglers	Apprentice Roofer; Asphalt Roofer; Built-up Roofer; Flat

<b>7293</b>	Insulators	Roofer; Residential Steep Roofer; Single-ply Roofer Boiler and Pipe Insulator; Building Insulator; Firestopping Insulator; Heat and Frost Insulator; Insulation Applicator; Insulation Mechanic; Insulator Apprentice; Sound Insulator
<b>7441</b>	Solar Installers and Technicians	Aluminum Window Installer; Eavestrough Installer Electric Appliance Installer; Exterior Cladder; Recreation Structure Erector; Siding Installer; Sign Installer; Window Installer

Source: Human Resources and Skills Development, National Occupational Classification, 2010

### Skills Transferability

By using the Matrix of Skills Transferability from the Department of Human Resources and Skills Development Canada (Appendix A) we were able to determine which occupations have the potential for skills transferability. Table 13 specifically outlines the green occupations we have chosen for the Construction industry in Sarnia Lambton and then matches them, based on the Matrix, with other occupations where skills transferability is possible.

<b>NOC</b>	<b>Occupations Occupation title</b>	<b>Occupation with Skills Transferability NOC Occupation Title</b>
<b>0711</b>	Construction Managers	
<b>0712</b>	Residential Home Builders and Renovators	
<b>2131</b>	Environmental Engineer	Land Surveyors (2154); Architectural Technologists and Technicians (2251); Drafting Technologists and Technicians (2253); Land Survey Technologists and Technicians (2254)
<b>2231</b>	Environmental Technologist and Technicians	
<b>2253</b>	Drafting Technologists and Technicians	
<b>2264</b>	Construction Inspector and Tester	
<b>7219</b>	Contractors, Supervisors, Other Construction Trades, Installers, Repairers and Servicers	Very heterogeneous group; internal progression
<b>7291</b>	Roofers and Shinglers	
<b>7293</b>	Insulators	
<b>7441</b>	Solar Installers and Technicians	

Source: Human Resources and Skills Development, Matrix of Skills Transferability, 2003

### **Educational Programs and Certifications**

In order to attain a green collar occupation within the Construction industry, the completion of a degree, diploma or certification program is generally required. The educational programs and certifications that relate specifically to the top green careers in the Construction industry are:

- **Home Inspection**, Board of Governors Certificate – Lambton College
- **Construction Carpentry Techniques**, Ontario College Certificate – Lambton College
- **Industrial Managers**, Ontario College Diploma – Lambton College
- **Renovation Technician**, Ontario College Diploma – Lambton College
- **Mechanical Technician (Industrial Maintenance)**, Ontario College Diploma – Lambton College
- **Bio-Resource Management**, Degree Program – Ridgetown Campus, University of Guelph
- **Environmental Engineering**, Bachelor of Applied Science – University of Windsor
- **Civil Engineering (Environmental Option)**, Bachelor of Engineering – University of Western Ontario
- **Mechanical Engineering (Environmental Option)**, Bachelor of Applied Science – University of Windsor

## Manufacturing (NAICS 31-33)

### Industry Overview

This sector comprises establishments primarily engaged in the physical or chemical transformation of materials or substances into new products. These products may be finished, in the same sense that they are ready to be used or consumed, or semi-finished, in the sense of becoming a raw material for an establishment to use in further manufacturing. Related activities such as assembling the component parts of manufacturing goods, blending materials, and finishing manufactured products by dyeing, heat-treating or plating are also treated as manufacturing activities. Manufacturing companies are known by a variety of trade designations, such as plants, factories or mills<sup>54</sup>. The main subsectors within the Manufacturing industry are:

- Food Manufacturing (NAICS 311)
- Beverage and Tobacco Product Manufacturing (NAICS 312)
- Textile Product Mills (NAICS 314)
- Clothing Manufacturing (NAICS 315)
- Leather and Allied Product Manufacturing (NAICS 316)
- Wood Product Manufacturing (NAICS 321)
- Paper Manufacturing (NAICS 322)
- Printing and Related Support Activities (NAICS 323)
- Petroleum and Coal Product Manufacturing (NAICS 324)
- Chemical Manufacturing (NAICS 325)
- Plastics and Rubber Products Manufacturing (NAICS 326)
- Non-Metallic Mineral Product Manufacturing (NAICS 327)
- Primary Metal Manufacturing (NAICS 331)
- Fabricated Metal Product Manufacturing (NAICS 332)
- Machinery Manufacturing (NAICS 333)
- Computer and Electronic Product Manufacturing (NAICS 334)
- Electrical Equipment, Appliance and Component Manufacturing (NAICS 335)
- Transportation Equipment Manufacturing (NAICS 336)
- Furniture and Related Manufacturing (NAICS 337)

Examples of green activities within these subsectors include:

- Organic Certified Food
- Paper Products made from Recycled Inputs
- Use of Recovered Scrap Metals in Metal Manufacturing

### Industry Presence

Manufacturing is the largest industry in Sarnia Lambton in terms of employment numbers. In 2006, 9,130 people in the region worked in manufacturing related sectors accounting for 14.48% of the total workforce, compared to 13.86% across Ontario. Table 14 provides the respective numbers in Sarnia Lambton and Ontario.

**Table #: Number of People Employed in Manufacturing (NAICS 31-33)**

	Sarnia Lambton	Ontario
Manufacturing (NAICS 31-33)	9,130	854,380
Total People employed across all industries	63,055	6,164,245
% employed in industry	14.48%	13.86%

Source: Statistics Canada, 2006 Census

According to the 2006 Census, Ontario's manufacturing sector employs 845,830 people, 1.07% of which are in Sarnia Lambton. The industry has remained relatively steady in terms of employers from December 2008 to June 2010 in the region. The Canadian Business pattern data<sup>55</sup> suggests a gradual flow back and forth for many employers in their employee numbers. Relatively small increases and decreases were present in all sized employers. The transition from traditional manufacturing to green manufacturing is expected to create more opportunity across various occupations.

### **The Green Economy and Manufacturing**

Manufacturing in Ontario is a very significant industry as it currently has the second highest number of manufacturing employees of any jurisdiction in North America after California<sup>56</sup>. Although the economic crisis of 2008 had a huge impact on the industry in many areas throughout the province, it is expected that the industry will see positive growth with the creation of emerging Manufacturing sectors related to the green economy. Proof of this would be the opening of a new wind turbine factory in Windsor which is said to create 174 new jobs by 2012, in addition to bringing forth new capabilities to the province's manufacturing and alternative energy sectors<sup>57</sup>.

Several new funding programs have been announced by the new Federal Economic Development Agency for Southern Ontario with a total of about \$30 million. The Canadian Manufacturers and Exporters (CME) SMART program will receive approximately \$16 million to provide grants of up to \$50,000 for small and medium-sized manufacturers who are looking to increase productivity through efforts such as lean manufacturing, energy efficiency, environmental impact reduction and improved industrial design<sup>58</sup>. This should help the green manufacturing economy in smaller markets like Sarnia Lambton by providing many new green manufacturing positions.

Sarnia Lambton is said to see some job prospects with the potential for more wind turbines in the near future. Sky Generation built the first six wind turbines in the county in 2008 and has built four more since then. Several other developers have also proposed the creation of several more wind farms. There is the possibility for the introduction of more than 300 turbines in Lambton County. One large proposal is the Sydenham Wind Energy Centre which is hoping to bring wind farms in the townships of Dawn-Euphemia and Brooke-Alvinston along with neighbouring Chatham-Kent<sup>59</sup>. With this increase for alternative energy, the need for the manufacturing of wind turbines is also increased. There are about 8,000 parts needed in the production of a wind turbine tower, the manufacturing of which creates demand for trades'

workers and manufacturers that are knowledgeable about the latest processes used in green manufacturing<sup>60</sup>.

### Green Occupations

A total of 9,130 people were employed throughout the Manufacturing industry in Sarnia Lambton in 2006. Using both primary and secondary research, we developed a list of ten green occupations in Utilities in Ontario. We also used our employer survey to determine both business and subsector presence for these occupations. The Statistics Canada 2006 Census reveals the total number of people working in these occupations in the Lambton area. See Table 15 for our list of emerging green occupations and the employment numbers in Sarnia Lambton and Ontario.

**Table 15: Green Occupations in Manufacturing (NAICS 31-33)**

NOC	Occupation	Sarnia Lambton	Ontario	% In Sarnia Lambton
0911	Manufacturing Managers	265	29,055	0.91%
2112	Environmental Chemists/Chemists	80	3,460	2.3%
2132	Energy Conservation Engineer	55	7,705	0.71%
2134	Environmental Chemical Engineer	35	4,770	0.73%
2211	Chemical Technologists and Technicians	255	4,340	5.8%
2232	Mechanical Engineering Technologists and Technicians	40	2,950	1.4%
2233	Industrial Engineering and Manufacturing Technologists	80	6,770	1.9%
2241	Electrical and Electronics Engineering Technologists and Technicians	25	4,040	0.62%
2263	Director of Environment, Health and Safety	45	1,380	3.2%
7351	Stationary Engineers and Auxiliary Equipment Operators	30	3,180	0.94%

Source: Statistics Canada, 2006 Census

### Other Titles

The NOC is a nationally accepted reference on occupations that groups over 30,000 job titles into 520 occupational groups, providing a standardized framework for organizing the workforce into a coherent system<sup>61</sup>. All of the titles found in the NOC system are also classified under other titles. Table 16 provides examples of other titles listed in the NOC database.

**Table 16 : Other Titles for Green Occupations in Manufacturing (NAICS 31-33)**

NOC	NOC Title	Other Titles
0911	Manufacturing Managers	Automobile Production Manager; Clothing Factory

		Manager; Dairy Plant Manager; Distillery Manager; Factory Superintendent; Foundry Manager; Manufacturing Manager; Operations Manager, Manufacturing; Plant Manager, Manufacturing; Printing Plant Manager; Production Manager – manufacturing; Textile Mill Manager; Tire Plant Manager
<b>2112</b>	Environmental Chemists/Chemists	Agricultural Chemist; Analytical Chemist; Biochemist; Chemist; Food Chemist; Inorganic Chemist; Medicinal Chemist; Nuclear Magnetic Resonance (NMR) Spectroscopist; Organic chemist Organometallic Chemist; Physical Chemist; Quality Control Chemist; Research Chemist; Soil Chemist
<b>2132</b>	Energy Conservation Engineer	Acoustics Engineer; Design Engineer – mechanical; Engineer, Power Generation; Fluid Mechanics Engineer; Mechanical Engineer; Mechanical Maintenance Engineer; Nuclear Engineer; Robotics Engineer; Thermal Design Engineer
<b>2134</b>	Environmental Chemical Engineer	Adhesives Engineer; Biochemical Engineer; Biotechnical Engineer; Chemical Process Engineer; Industrial Hygiene Engineer; Liquid Fuels Engineer; Petrochemical Engineer; Polymer Engineer; Process Control Engineer, Chemical; Pulp and Paper Engineer; Refinery Engineer; Waste Treatment Engineer
<b>2211</b>	Chemical Technologists and Technicians	Biochemistry Technologist; Chemical Analyst; Chemical Engineering Technician; Chemical Engineering Technologist; Chemical Research Technician; Geochemical Technician; Industrial; Hygiene Technologist; Pilot Plant Technician; Quality Control Technician – chemical processing; Quality Control Technician – food processing
<b>2232</b>	Mechanical Engineering Technologists and Technicians	Aeronautical Technologist; Heating Designer; Machine Designer; Marine Engineering Technologist; Mechanical Technologist; Mould Designer; Thermal Station Technician; Tool and Die Designer; Tool Designer
<b>2233</b>	Industrial Engineering and Manufacturing Technologists	CAD/CAM Programmer; Industrial Engineering Technician; Loss Prevention Technologist; Manufacturing Technician; Manufacturing Technologist; Planning Technician; Plastics Manufacturing Technician; Pulp and Paper Manufacturing Technologist; Quality Assurance Technologist; Textile Technologist
<b>2241</b>	Electrical and Electronics Engineering Technologists and Technicians	Electrical Engineering Technician; Electrical Engineering Technologist; Electricity Distribution Network technologist; Electronics Design Technologist; Electronics Engineering Technician; Electronics Engineering Technologist; Electronics Manufacturing Technician; Electronics Manufacturing Technologist

<b>2263</b>	Director of Environment, Health and Safety	Environmental Health Officer; Hazardous Waste Inspector; Health and Safety Officer; Health Standards Inspector; Occupational Health and Safety Officer; Pollution Control Inspector; Public Health Inspector; Rodent Control Inspector; Supervisor, Public Health Inspectors; Water Inspector
<b>7351</b>	Stationary Engineers and Auxiliary Equipment Operators	Auxiliary Plant Operator; Boiler Operator; Power Engineer; Stationary Engineer; Steam Plant Operator

Source: Human Resources and Skills Development, National Occupational Classification, 2010

### Skills Transferability

By using the Matrix of Skills Transferability from the Department of Human Resources and Skills Development Canada (Appendix A) we were able to determine which occupations have the potential for skills transferability. Table 17 specifically outlines the green occupations we have chosen for the Manufacturing industry in Sarnia Lambton and then matches them, based on the Matrix, with other occupations where skills transferability is possible.

**Table 17: Green Occupations in Manufacturing (NAICS 31-33) and Skills Transferability Possibilities**

<b>NOC</b>	<b>Occupations Occupation title</b>	<b>Occupation with Skills Transferability NOC Occupation Title</b>
<b>0911</b>	Manufacturing Managers	
<b>2112</b>	Environmental Chemists/Chemists	Chemical Technologists and Technicians (2211); Geological and Mineral Technologists and Technicians (2212); Medical Laboratory Technologists and Pathologists' Assistants (3211); Medical Laboratory Technicians (3212)
<b>2132</b>	Energy Conservation Engineer	Industrial and Manufacturing Engineers (2141); Aerospace Engineers (2146); Mechanical Engineering Technologists and Technicians (2232); Industrial Engineering and Manufacturing Technologists and Technicians (2233); Drafting Technologists and Technicians (2253)
<b>2134</b>	Environmental Chemical Engineer	Chemical Technologists and Technicians (2211); Metallurgical and Materials Engineers (2142); Drafting Technologists and Technicians (2253)
<b>2211</b>	Chemical Technologists and Technicians	Medical Laboratory Technicians (3212)
<b>2232</b>	Mechanical Engineering Technologists and Technicians	Drafting Technologists and Technicians (2253)
<b>2233</b>	Industrial Engineering and	Drafting Technologists and Technicians

	Manufacturing Technologists	(2253)
2241	Electrical and Electronics Engineering Technologists and Technicians	Electronic Service Technicians (2242); Industrial Instrument Technicians and Mechanics (2243); Aircraft Instrument, Electrical and Avionics Mechanics, Technicians and Inspectors (2244); Drafting Technologists and Technicians (2253)
2263	Director of Environment, Health and Safety	Very heterogeneous group; discipline specific
7351	Stationary Engineers and Auxiliary Equipment Operators	

Source: Human Resources and Skills Development, Matrix of Skills Transferability, 2003

### Educational Programs and Certifications

In order to attain a green collar occupation within the Manufacturing industry, the completion of a degree, diploma or certification program is generally required. The educational programs and certifications that relate specifically to the top green careers in the Manufacturing industry are:

- **Electrical Techniques**, Ontario College Certificate – Lambton College
- **Industrial Managers**, Ontario College Diploma – Lambton College
- **Mechanical Technician (Industrial Maintenance)**, Ontario College Diploma – Lambton College
- **Chemical Production and Power Engineering**, Ontario Advanced College Diploma – Lambton College
- **Environmental Management**, Associate Diploma – Ridgeway Campus – University of Guelph
- **Chemistry**, Bachelor of Science – University of Western Ontario; University of Windsor
- **Earth Sciences**, Bachelor of Science – University of Western Ontario
- **Biochemical and Environmental Engineering**, Bachelor of Engineering – University of Western Ontario
- **Chemical Engineering**, Bachelor of Engineering – University of Western Ontario
- **Civil Engineering (Environmental Option)**, Bachelor of Engineering – University of Western Ontario
- **Electrical Engineering**, Bachelor of Engineering – University of Western Ontario; University of Windsor Ontario
- **Environmental Engineering**, Bachelor of Applied Science – University of Windsor
- **Green Processes Engineering**, Bachelor of Engineering – University of Western Ontario
- **Mechanical Engineering**, Bachelor of Engineering – University of Western Ontario
- **Mechanical Engineering (Environmental Option)**, Bachelor of Applied Science – University of Windsor

## Administration and Support, Waste Management and Remediation Services (NAICS 56)

### Industry Overview

This sector comprises two different types of establishments: those primarily engaged in activities that support the day-to-day operations of other organizations, and those primarily engaged in waste management<sup>62</sup>. This new green economy has a significant impact on waste management and more sustainable practices. Establishments within the waste management sector are engaged in the collection, treatment and disposal of waste material, the operation of material recovery facilities, the remediation of polluted sites and the cleaning of septic tanks<sup>63</sup>. The main subsectors of this industry include:

- Administrative and Support Services (NAICS 561)
- Waste Management and Remediation Services (NAICS 562)

Examples of green activities within these subsectors include:

- Pollution Mitigation, Control and Remediation
- Waste Management, Reduction and Recycling
- Environmental Consulting
- Energy Efficient Landscaping

### Industry Presence

There are 3,480 people employed in the Administration and Support, Waste Management and Remediation Services industry in Sarnia Lambton. This accounts for 5.5% of the total workforce compared 4.66% across Ontario. Table 18 displays the respective numbers of both Sarnia Lambton and Ontario.

**Table 18: Number of People Employed in Administration and Support, Waste Management and Remediation Services (NAICS 56)**

	Sarnia Lambton	Ontario
Administration and Support, Waste Management and Remediation Services (NAICS 56)	3,480	286,960
Total people employed across all industries	63,055	6,164,245
% employed in industry	5.5%	4.66%

Source: Statistics Canada, 2006 Census

Administration and Support, Waste Management and Remediation Services in Sarnia Lambton account for a small percent of the total workforce in this industry throughout Ontario as only 1.2% of the employees in this industry can be found in Sarnia Lambton.

Employers in this industry in Sarnia Lambton have remained relatively steady in their numbers from December of 2008 to June 2010. There have been a few employer ranges that have seen a

decline in their numbers as well as a few employer ranges that have seen an increase. This suggests that the industry is remaining stable in Sarnia Lambton area.

### **The Green Economy and Administration and Support, Waste Management and Remediation Services**

Improving waste management and restoring land quality to reduce risks to environmental and human health has become a major responsibility by Ontario's Ministry of the Environment. Waste diversion programs enforced by the Waste Diversion Act are one example of the huge steps Ontario is taking towards a cleaner environment. These programs include: Blue Box Waste, Used Tires, Waste Electrical and Electronic Equipment, and Municipal Hazardous and Special Waste plans<sup>64</sup>. Ontario is also involved in other activities related to proper waste management such as the 3Rs Regulation and exemptions under Regulation 347 (general waste regulation) which both have the intentions of recognizing and promoting diversion activities<sup>65</sup>.

In 2007, the Ontario Deposit and Return Program was introduced which applies to wine and spirit bottles purchased from the LCBO, agency stores and retail distillery stores. There has also been a proposed update to Ontario's compost framework. This will provide improved guidance for composting facility operators and the potential for a wider range of composting opportunities<sup>66</sup>.

Ontario is working hard to ensure that Brownfield sites are redeveloped properly to be used for other purposes. "Brownfields" are commercial or industrial sites that are abandoned or underused and are available for restoration. These sites need to be redeveloped to meet current environmental and health standards. Soil and groundwater often become contaminated by untreated sites and this poses a risk to human health and the environment. By redeveloping these sites, benefits in addition to the improvement of air, water and land quality, include: the protection of valuable green spaces and agricultural lands, support to local economies through the promotion of urban intensification, and encouragement for the reuse of lands, buildings and infrastructure<sup>67</sup>.

These initiatives in waste management and remediation suggest that new career opportunities will be in demand. A recent study on the waste management industry supports this theory. The study suggests that over the next three years, there will be an annual growth of 6%, with 80% of new positions comprised of labourers (45%) and operators (35%)<sup>68</sup>.

Recently in Sarnia Lambton, Waste Management officials opened the region's first private landfill-gas-to-energy plant. This new facility uses methane gas created from the natural decomposition of waste to power up to 2,500 homes. This facility opened in Petrolia in late 2010 and is the second facility of its kind in Ontario and the third in all of Canada. Future projections of the facility suggest that the site will continue to receive waste for another three to four years which should produce enough gas to convert to energy for at least another 20 years<sup>69</sup>.

## Green Occupations

A total of 3,480 people are employed throughout the Administration and Support, Waste Management and Remediation Service industries in Sarnia Lambton. Using both primary and secondary research, we developed a list of ten green occupations in Utilities in Ontario. We also used our employer survey to determine both business and subsector presence for these occupations. The Statistics Canada 2006 Census reveals the total number of people working in these occupations in the Sarnia Lambton area. See table 19 for our list of emerging green occupations and the employment numbers in Sarnia Lambton and Ontario.

**Table #: Green Occupations in Administration and Support, Waste Management and Remediation Services (NAICS 56)**

NOC	Occupation	Sarnia Lambton	Ontario	% In Sarnia Lambton
0721	Facility Operation and Maintenance Managers	10	820	1.02%
0912	Director of Waste Management	10	605	1.7%
2134	Waste Treatment Engineer	10	75	13.3%
2211	Chemical Technologists and Technicians	40	290	13.8%
2253	Drafting Technologists and Technicians	15	70	21.4%
2263	Director of Environment, Health and Safety	20	250	8%
4161	Environmental Impact Analyst	10	175	5.7%
7621	Public Works and Maintenance Labourers	40	1,705	2.3%
9212	Supervisors, Petroleum, Gas and Chemical Processing and Utilities	10	115	8.7%
9424	Waste and Water Plant Operator	10	125	8%

Source: Statistics Canada, 2006 Census

## Other Titles

The NOC is a nationally accepted reference on occupations that groups over 30,000 job titles into 520 occupational groups, providing a standardized framework for organizing the workforce into a coherent system<sup>70</sup>. All of the titles found in the NOC system are also classified under other titles. Table 20 provides examples of other titles listed in the NOC database.

**Table 20 : Other Titles for Green Occupations in Administration and Support, Waste Management and Remediation (NAICS 56)**

NOC	NOC Title	Other Titles
0721	Facility Operation and Maintenance Managers	Chief, Maintenance Support Services; Facility Operations Manager; Head, facilities Maintenance; Maintenance Manager; Mechanical Services

		Superintendent; Plant Maintenance Superintendent; Recreation Facility Manager; Superintendent, Maintenance and Service; Warehouse Manager
0912	Director of Waste Management	Director of water pollution control; Director, Electrical Power Transmission Operations; Director, Water Supply; Electric Power Plant Manager; Liquid Waste Facility Manager; Manager, Distribution, Refined Petroleum products; Manager, Sewage Treatment Plant; Water Filtration Plant Manager
2134	Waste Treatment Engineer	Adhesives Engineer; Biochemical Engineer; Biotechnical Engineer; Chemical Process Engineer; Industrial Hygiene Engineer; Liquid Fuels Engineer; Petrochemical Engineer; Polymer Engineer; Process Control Engineer, Chemical; Pulp and Paper Engineer; Refinery Engineer; Waste Treatment Engineer; Chemical Engineer, Environmental
2211	Chemical Technologists and Technicians	Biochemistry Technologist; Chemical Analyst; Chemical Engineering Technician; Chemical Engineering Technologist; Chemical Research Technician; Geochemical Technician; Industrial; Hygiene Technologist; Pilot Plant Technician; Quality Control Technician – chemical processing; Quality Control Technician – food processing
2253	Drafting Technologists and Technicians	Architectural Draftsperson; Computer-Assisted Design and Drafting; Technologist; Computer-Assisted Drafting (CAD) Technician; Drafting Technician; Drafting Technologist; Electromechanical Draftsperson; Electronic Draftsperson; Mechanical Draftsperson; Steel Detailer – Drafting; Structural Draftsperson; Structural Steel Drafter-Detailer; Supervisor, Drafting Office
2263	Director of Environment, Health and Safety	Environmental Health Officer; Hazardous Waste Inspector; Health and Safety Officer; Health Standards Inspector; Occupational Health and Safety Officer; Pollution Control Inspector; Public Health Inspector; Rodent Control Inspector; Supervisor, Public Health Inspectors; Water Inspector
4161	Environmental Impact Analyst	Energy policy analyst; Environmental Impact Analyst; Environmental Issues Lobbyist; Ergonomist; Fisheries Analyst; Natural Resources Policy Analyst; Program Officer, Natural and Applied Sciences; Recycling Program Co-ordinator; Scientific Consultant; Supervisor, Environmental Program Development; Transportation program analyst; Transportation Safety Analyst
7621	Public Works and Maintenance Labourers	Dumpman/Woman; Garbage Collector; Garbage Receptacle Maintainer; Garbage Truck Loader; Garbage man/Woman; Labourer – sanitary service; Labourer Crew Leader – public works; Maintenance Labourer – public works; Manual Sewer Pipe Cleaner; Municipal Labourer; Refuse Collector; Road Maintenance Worker

		– public works; Sanitation Worker; Sewer Maintenance Worker; Sewer System Maintenance Worker; Sidewalk-Cleaning Equipment Operator
9212	Supervisors, Petroleum, Gas and Chemical Processing and Utilities	Chemical Processing Supervisor; Production Supervisor, Pharmaceuticals; Production Supervisor, Specialty Chemicals; Steam Engineer Leader; Supervisor, Petroleum Refining; Supervisor, Pipeline Operation; Supervisor, Power Station; Supervisor, Sewage Treatment Plant
9424	Waste and Water Plant Operator	Environmental Systems Operator – water treatment; Operator, Water Purification Plant Process Operator, Liquid Waste; Sewage Plant Operator; Wastewater Treatment Plant Operator; Water Filtration Plant Operator; Water Treatment Plant Operator

Source: Human Resources and Skills Development, National Occupational Classification, 2010.

### Skills Transferability

By using the Matrix of Skills Transferability from the Department of Human Resources and Skills Development Canada (Appendix A) we were able to determine which occupations have the potential for skills transferability. Table 21 specifically outlines the green occupations we have chosen for the Administration and Support, Waste Management and Remediation Services industry in Sarnia Lambton and then matches them, based on the Matrix, with other occupations where skills transferability is possible.

**Table 21: Green Occupations in Administration and Support, Waste Management and Remediation Services (NAICS 56) and Skills Transferability Possibilities**

NOC	Occupations Occupation title	Occupation with Skills Transferability NOC Occupation Title
0721	Facility Operation and Maintenance Managers	
0912	Director of Waste Management	
2134	Waste Treatment Engineer	Chemical Technologists and Technicians (2211); Metallurgical and Materials Engineers (2142); Drafting Technologists and Technicians (2253)
2211	Chemical Technologists and Technicians	Medical Laboratory Technicians (3212)
2253	Drafting Technologists and Technicians	
2263	Director of Environment, Health and Safety	Very heterogeneous group; discipline specific
4161	Environmental Impact Analyst	
7621	Public Works and Maintenance Labourers	
9212	Supervisors, Petroleum, Gas and Chemical Processing and Utilities	Very heterogeneous group; internal progression
9424	Waste and Water Plant Operator	

Source: Human Resources and Skills Development, Matrix of Skills Transferability, 2003

## Educational Programs and Certifications

In order to attain a green collar occupation within the Administration and Support, Waste Management and Remediation Services industry, the completion of a degree, diploma or certification program is generally required. The educational programs and certifications that relate specifically to the top green careers in the Administration and Support, Waste Management and Remediation Services industry are:

- **Industrial Managers**, Ontario College Diploma – Lambton College
- **Mechanical Technicians**, Ontario College Diploma – Lambton College
- **Alternative Energy Engineering Technician**, Ontario College Advanced Diploma – Lambton College
- **Chemical Production and Power Engineering**, Ontario College Advanced Diploma – Lambton College
- **Environmental Management**, Associate Diploma Program – Ridgetown Campus – University of Guelph
- **Bio-Resource Management**, Degree Program – Ridgetown Campus – University of Guelph
- **Geography**, Bachelor of Social Science – University of Western Ontario
- **Biology**, Bachelor of Science – University of Western Ontario; University of Windsor
- **Chemistry**, Bachelor of Science – University of Western Ontario; University of Windsor
- **Ecosystem Health**, Bachelor of Science – University of Western Ontario
- **Environmental Science**, Bachelor of Science – University of Western Ontario
- **Biochemical and Environmental Engineering**, Bachelor of Engineering – University of Western Ontario
- **Civil Engineering**, Bachelor of Engineering – University of Western Ontario; University of Windsor
- **Civil Engineering (Environmental Option)**, Bachelor of Engineering – University of Western Ontario
- **Civil Engineering (Power Systems Option)**, Bachelor of Engineering – University of Western Ontario
- **Chemical Engineering**, Bachelor of Engineering – University of Western Ontario
- **Mechanical Engineering (Environmental Option)**, Bachelor of Applied Science – University of Windsor

### **Section Three : Employer Survey**

To help us gain a greater understanding of the green economy in our local area, a survey was developed and sent to local employers via email. The survey was distributed to selected employers across Sarnia Lambton within the five key industries we chose as the basis for our study. The purpose of the survey was to understand the experiences, or lack thereof, of local employers in the green economy. More specifically, why are employers choosing to switch to more greener practices, what education and skills are they looking for when hiring employees for green-collar jobs and what green collar occupations they employ.

The survey was distributed across the Sarnia Lambton area to employers within each of the five sectors. Due to a higher volume of employers in certain industries over others, a higher response rate did transpire among the Manufacturing, Agriculture and Construction industries. In total, the survey resulted in 53 responses across all industries in the area resulting in a very small sample of our local economy, however not all of these respondents completed the survey in its entirety. Certain industries specifically received a very low response rate, including Utilities and Administration and Support, Waste Management and Remediation Services. Therefore we advise readers to use caution when examining the survey results as this information may not be representative of the wider employer experience.

#### Summary:

The following provides a brief summary of the age, size, and their involvement, or lack thereof, in the green economy.

- 93% of the employers who responded to our survey fall under the SME (Small to Medium Enterprises) category, with the majority in the 1-4 employee range. Indeterminate businesses are not represented.
- 59% of employers who responded have been in operation for 20 to 49 years. Very few of respondents are relatively new operations, only 8% have been in operation at least 9 years.
- 79% of businesses who responded claimed to be involved in some form with the green economy. The majority of those who are not currently engaged in any green activities state that these activities are not currently required of their business.

One respondent within the Agricultural, Forestry, Fishing and Hunting Industry stated that they would like to properly recycle materials but are unsure where to go.

- The majority of those who are currently engaged in green activities stated that their businesses decided to go green because of their commitment to improving environmental quality. 41% of respondents stated this. The second highest response with 24%, chose increase market demand as a reason for going green.

Some other responses informed us that businesses are going green because of provincial initiatives and because of their company core values, while another respondent stated that they are teaming up with other industries to help the environment together. One respondent from the Manufacturing industry manufacture green clothing for both the benefits of the consumer and the environment.

**Table 22: Green Employer Survey Responses: Agriculture, Forestry, Fishing and Hunting (NAICS 11)**

<b>Reasons employers are “going green”</b>	66.7% of respondents stated commitment to improving environmental quality as the main reason for going green 55.6% stated cost reduction 33.3% stated increased market demand 22.2% stated legal compliance
<b>Reasons for not “going green”</b>	N/A
<b>Green occupations hired by employers (listed in order of occurrence)</b>	85.7% of those who answered employ 8251 Farmers and Farm Managers 42.9% employ 2123 Agrologists 14.3% employ the following: 2122 Forestry Professionals 2223 Forestry Technologists and Technicians 2225 Landscape and Horticultural Technicians and Specialists 8253 Farm Supervisors and Specialized Live Stock Workers 8254 Nursery and Greenhouse Operators and Managers 8422 Silviculture and Forestry Workers
<b>Additional green occupations provided by employers</b>	N/A
<b>Top skills or experiences identified by employers when hiring green-collar workers</b>	<ul style="list-style-type: none"> <li>• Specific environmental training/education</li> <li>• Effective communication/customer service, public and government relations/marketing training/experience</li> <li>• Resource management training/experience</li> </ul>
<b>Additional skills or experiences provided by employers</b>	<ul style="list-style-type: none"> <li>• Active in the outdoors</li> </ul>
<b>Difficulty finding qualified individuals</b>	85.7% of employers stated they have no difficulty finding qualified individuals 14.3% of employers stated they do have difficulty finding qualified individuals
<b>Level of education required for most green-collar jobs (listed in order of occurrence)</b>	Not applicable No post-secondary
<b>Method used to develop the skills of existing workers</b>	57.1% of employers train in house 28.6% of employers provide or suggest upgrading and/or professional development training

**Table 23: Green Employer Survey Responses: Utilities (NAICS 22)**

<b>Reasons employers are “going green”</b>	100% of those who answered stated Commitment to environmental quality
<b>Reasons for not “going green”</b>	100% of those who answered stated there is a lack of skilled workforce
<b>Green occupations hired by employers (listed in order of occurrence)</b>	0% of respondents hire any of the listed green occupations
<b>Additional green occupations provided by employers</b>	Conservation and Demand Side Management
<b>Top skills or experiences identified by employers when hiring green-collar workers</b>	<ul style="list-style-type: none"> <li>• Specific environmental training/education</li> <li>• Engineering training/education</li> <li>• Effective communication/customer service, public and government relations/marketing experience/training</li> <li>• Resource management experience/education</li> </ul>
<b>Additional skills or experiences provided by employers</b>	N/A
<b>Difficulty finding qualified individuals</b>	100% of employers stated they have no difficulty finding qualified individuals
<b>Level of education required for most green-collar jobs (listed in order of occurrence)</b>	College diploma
<b>Method used to develop the skills of existing workers</b>	100% of employers both train in house and provide or suggest upgrading and/or professional development training

**Table 24: Green Employer Survey Responses: Construction (NAICS 23)**

<b>Reasons employers are “going green”</b>	72.7% stated commitment to improving environmental quality as main reason for going green 45.5% stated increased market demand 27.3% stated cost reduction 18.2% stated legal compliance
<b>Reasons for not “going green”</b>	66.7% stated that it was not required of their business at this time.
<b>Green occupations hired by employers (listed in order of occurrence)</b>	88.9% employ 7219 Contractors, Supervisors, Other Construction Trades, Installers, Repairers and Servicers 37.5% employ 2231 Environmental Technician/Technologists 22.2% employ the following: 0711 Construction Managers 0712 Residential Home Builders and Renovators 2131 Environmental Engineers 7441 Solar Installers and Technicians 11.1% employ the following: 2253 Drafting Technologists and Technicians 2264 Construction Inspector and Tester 7291 Roofers and Shinglers
<b>Additional green occupations provided by employers</b>	N/A
<b>Top skills or experiences identified by employers when hiring green-collar workers</b>	<ul style="list-style-type: none"> <li>• Industrial Tradesperson</li> <li>• Effective communication/customer service, public and government relations/marketing experience/training</li> <li>• Specific environmental training/education</li> <li>• Engineering training/education</li> <li>• Resource management experience/training</li> </ul>
<b>Additional skills or experiences provided by employers</b>	<ul style="list-style-type: none"> <li>• Sarnia Lambton Union Building Trades</li> </ul>
<b>Difficulty finding qualified individuals</b>	44.4% of employers stated that they do have difficulty finding qualified individuals 55.6% of employers stated that they have no difficulty finding qualified individuals
<b>Level of education required for most green-collar jobs (listed in order of occurrence)</b>	Apprenticeship certificate College diploma No post-secondary Not applicable
<b>Method used to develop the skills of existing workers</b>	77.8% of employers train in house 33.3% of employers provide or suggest upgrading and/or professional development training

**Table 25: Green Employer Survey Responses: Manufacturing (NAICS 31-33)**

<b>Reasons employers are “going green”</b>	60% stated commitment to improving environmental quality 50% stated increased market demand 30% stated cost reduction 10% stated legal compliance
<b>Reasons for not “going green”</b>	50% stated it was not required of their business at this time
<b>Green occupations hired by employers (listed in order of occurrence)</b>	20% employ 0911 Manufacturing Managers 20% employ 2263 Director of Environment, Health and Safety
<b>Additional green occupations provided by employers</b>	N/A
<b>Top skills or experiences identified by employers when hiring green-collar workers</b>	<ul style="list-style-type: none"> <li>• Effective communication/customer service, public and government relations/marketing experience/training</li> <li>• Industrial tradesperson</li> <li>• Specific environmental training/education</li> <li>• Engineering training/education</li> </ul>
<b>Additional skills or experiences provided by employers</b>	N/A
<b>Difficulty finding qualified individuals</b>	40% of employers stated they have difficulty finding qualified individuals. 60% of employers stated they have no difficulty finding employers
<b>Level of education required for most green-collar jobs (listed in order of occurrence)</b>	College diploma None – not applicable Apprenticeship certificate
<b>Method used to develop the skills of existing workers</b>	80% of employers train in house 10% of employers provide upgrading and/or professional development

**Table 26: Green Employer Survey Responses: Administration and Support, Waste Management and Remediation Services (NAICS 56)**

<b>Reasons employers are “going green”</b>	100% stated commitment to improving environmental quality 33.3% also stated increased market demand
<b>Reasons for not “going green”</b>	N/A
<b>Green occupations hired by employers (listed in order of occurrence)</b>	100% employ 0721 Facility Operation and Maintenance Managers 66.7% employ the following: 2211 Chemical Technologists and Technicians 9424 Waste and Water Plant Operator 33.3% employ the following: 0912 Director of Waste Management 2134 Waste Treatment Engineer 2263 Director of Environment, Health and Safety 9212 Supervisors, Petroleum, Gas and Chemical Processing and Utilities
<b>Additional green occupations provided by employers</b>	N/A
<b>Top skills or experiences identified by employers when hiring green-collar workers</b>	<ul style="list-style-type: none"> <li>• Remediation/pollutants/waste disposal management/treatment</li> <li>• Specific environmental training/education</li> <li>• Engineering training/education</li> <li>• Effective communication/customer service, public and government relations/marketing experience/training</li> </ul>
<b>Additional skills or experiences provided by employers</b>	N/A
<b>Difficulty finding qualified individuals</b>	100% of employers stated they have difficulty finding qualified individuals
<b>Level of education required for most green-collar jobs (listed in order of occurrence)</b>	University degree College diploma No post-secondary
<b>Method used to develop the skills of existing workers</b>	100% of employers both train in house and provide or suggest upgrading and/or professional development training

## **Section Four : Summary**

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The green economy is making a huge impact on various industries across the province. Not only is this new economy creating shifts in current operations, but also creating shifts in the labour market with both the creation of new jobs and the transformation of existing ones. Because of the influence this new economy is making on our province, it is important for us to learn and understand these changes and the impact they are making in our area.

A total of five industries and 50 occupations were profiled for the purpose of this report, however, this provides only a small sample of the influence in our area and the province. The employer survey provided insight to the education and skills employers in Sarnia Lambton are looking for. It also gave us a indication of the changes local companies are making towards greener practices.

The green economy is still relatively new and we can expect to see greater changes in the years to come. We can already see some changes and shifts towards a greener economy in Sarnia Lambton in terms of agriculture, construction, energy, manufacturing and waste management and remediation. We anticipate that the green economy will continue to flourish and greater changes will be seen in terms of both the environment and our local economy.

## Section Five : Appendix

### Appendix A : Matrix of Skills Transferability

NOC Occupations	Occupations to which potential for skills transferability exists
<b>PROFESSIONAL — BUSINESS, FINANCE AND ADMINISTRATION</b>	
1111 Financial auditors and accountants	1221 Administrative officers 1225 Purchasing agents and officers 1231 Bookkeepers
1112 Financial and investment analysts	1122 Professional occupations in business services to management
1113 Securities agents, investment dealers and traders	
1114 Other financial officers	Very heterogeneous group, unable to identify transferability
1121 Specialists in human resources	1223 Personnel and recruitment officers
1122 Professional occupations in business services to management	
<b>PROFESSIONAL — NATURAL AND APPLIED SCIENCES</b>	
2111 Physicists and astronomers	2212 Geological and mineral technologists and technicians 2147 Computer engineers (except software engineers and designers)
2112 Chemists	2211 Chemical technologists and technicians 2212 Geological and mineral technologists and technicians 3211 Medical laboratory technologists and pathologists' assistants 3212 Medical laboratory technicians
2113 Geologists, geochemists and geophysicists	2212 Geological and mineral technologists and technicians
2114 Meteorologists	2213 Meteorological technicians
2115 Other professional occupations in physical sciences	Very heterogeneous unit group; unable to identify transferability
2121 Biologists and related scientists	2221 Biological technologists and technicians 3211 Medical laboratory technologists and pathologists' assistants 3212 Medical laboratory technicians
2122 Forestry professionals	2223 Forestry technologists and technicians
2123 Agricultural representatives, consultants and specialists	2221 Biological technologists and technicians
2131 Civil engineers	2154 Land surveyors 2230 Technical occupations in civil, mechanical & industrial engineering 2251 Architectural technologists and technicians 2253 Drafting technologists and technicians 2254 Land survey technologists and technicians
2132 Mechanical engineers	2141 Industrial and manufacturing engineers 2146 Aerospace engineers 2232 Mechanical engineering technologists and technicians 2233 Industrial engineering & manufacturing

	technologists and technicians
	2253 Drafting technologists and technicians
<b>2133 Electrical and electronics engineers</b>	2147 computer engineers (except software engineers and designers)
	2241 Electrical and electronics engineering technologists and technicians
	2242 Electronic service technicians (household and business equipment)
	2253 Drafting technologists and technicians
<b>2134 Chemical engineers</b>	2211 Chemical technologists and technicians
	2142 Metallurgical and materials engineers
	2253 Drafting technologists and technicians
<b>2141 Industrial and manufacturing engineers</b>	2132 Mechanical engineers
	2233 Industrial engineering & manufacturing technologists and technicians
	2253 Drafting technologists and technicians
<b>2142 Metallurgical and materials engineers</b>	2211 Chemical technologists and technicians
	2212 Geological and mineral technologists and technicians
	2253 Drafting technologists and technicians
<b>2143 Mining engineers</b>	2212 Geological and mineral technologists and technicians
	2253 Drafting technologists and technicians
<b>2144 Geological engineers</b>	2212 Geological and mineral technologists and technicians
	2253 Drafting technologists and technicians
<b>2145 Petroleum engineers</b>	2211 Chemical technologists and technicians
	2212 Geological and mineral technologists and technicians
	2253 Drafting technologists and technicians
<b>2146 Aerospace engineers</b>	2232 Mechanical engineering technologists and technicians
	2253 Drafting technologists and technicians
<b>2147 Computer engineers</b>	2133 Electrical and electronics engineers
	2162 Computer systems analysts
	2163 Computer programmers
	2241 Electrical and electronics engineering technologists and Technicians
	2242 Electronic service technicians (household and business equipment)
	2253 Drafting technologists and technicians
<b>2148 Other professional engineers</b>	Very heterogeneous unit group; unable to identify transferability
<b>2151 Architects</b>	2251 Architectural technologists and technicians
	2253 Drafting technologists and technicians
<b>2152 Landscape architects</b>	2225 Landscape and horticulture technicians and specialists
	2253 Drafting technologists and technicians
<b>2153 Urban and land use planners</b>	1122 Professional occupations in business services to Management
<b>2154 Land surveyors</b>	
<b>2161 Mathematicians, statisticians and actuaries</b>	2147 Computer engineers (except software engineers

	and designers)
<b>2162 Computer systems analysts</b>	1122 Professional occupations in business services to Management 2147 Computer engineers (except software engineers and designers) 2161 Mathematicians, statisticians and actuaries
<b>2163 Computer programmers</b>	2161 Mathematicians, statisticians and actuaries
<b>PROFESSIONAL — HEALTH OCCUPATIONS</b>	
<b>3111 Specialist physicians</b>	2221 Biological technologists and technicians 3112 General practitioners and family physicians 3211 Medical laboratory technologists and pathologists assistants 3212 Medical laboratory technicians
<b>3112 General practitioners and family physicians</b>	2221 Biological technicians and technologists 3112 General practitioners and family physicians 3211 Medical Laboratory technologists and pathologists' assistants 3212 Medical laboratory technicians
<b>3113 Dentists</b>	3221 Denturists 3222 Dental hygienists and dental therapists
<b>3114 Veterinarians</b>	2221 Biological technologists and technicians 3211 Medical laboratory technologists and pathologists' assistants 3212 Medical laboratory technicians 3213 Veterinary and animal health technologists and technicians
<b>3121 Optometrists</b>	3231 Opticians
<b>3122 Chiropractors</b>	
<b>3123 Other professional occupations in health diagnosing and treating</b>	Very heterogeneous unit group; unable to identify transferability
<b>3131 Pharmacists</b>	2211 Chemical technologists and technicians 2221 Biological technologists and technicians 3211 Medical laboratory technologists and pathologists' assistants 3212 Medical laboratory technicians
<b>3132 Dietitians and nutritionists</b>	2211 Chemical technologists and technicians 2221 Biological technologists and technicians 3211 Medical laboratory technologists and pathologists' assistants 3212 Medical laboratory technicians
<b>3141 Audiologists and speech-language pathologists</b>	
<b>3142 Physiotherapists</b>	2221 Biological technologists and technicians 3211 Medical laboratory technologists and pathologists' assistants 3212 Medical laboratory technicians
<b>3143 Occupational therapists</b>	
<b>3144 Other professional occupations in therapy and assessment</b>	Very heterogeneous unit group; unable to identify transferability
<b>3151 Head nurses and supervisors</b>	3152 Registered nurses 3233 Licensed practical nurses

3152 Registered nurses	3233 Licensed practical nurses 3234 Ambulance attendants and other paramedical occupations 4212 Community and social service workers
<b>PROFESSIONAL — SOCIAL SCIENCE, EDUCATION, GOVERNMENT ETC.</b>	
4111 Judges	Eliminate Unit Group; no direct hiring
4112 Lawyers and Quebec notaries	4211 Paralegal and related occupations
4121 University professors	Highly specialized; no mobility within unit group
4122 Post-secondary teaching and research assistants	Highly specialized; no mobility within unit group
4131 College and other vocational instructors	Highly specialized; no mobility within unit group
4141 Secondary school teachers	4142 Elementary school and kindergarten teachers 4215 Instructors and teachers of persons with disabilities
4142 Elementary school and kindergarten teachers	4141 Secondary school teachers 4215 Instructors and teachers of persons with disabilities
4143 School and guidance counsellors	4141 Secondary school teachers 4142 Elementary school and kindergarten teachers 4212 Community and social service workers 4213 Employment counsellors 4215 Instructors and teachers of persons with disabilities
4151 Psychologists	4153 Family, marriage and other related counselors 4155 Probation and parole officers and related occupations 4212 Community and social service workers
4152 Social workers	4153 Family, marriage and other related counsellors 4155 Probation and parole officers and related occupations 4212 Community and social service workers
4153 Family, marriage and other related counsellors	4212 Community and social service workers
4154 Ministers of religion	Highly specialized; no mobility within unit group
4155 Probation and parole officers and related occupations	4212 Community and social service workers
4160 Health and social policy researchers, consultants and program officers	Very Heterogeneous unit group; unable to identify transferability
4161 Natural and applied science policy researchers, consultants and program officers	Very Heterogeneous unit group; unable to identify transferability
4162 Economists and economic policy researchers and analysts	1112 Financial and investment analysts 1113 Securities agents, investment dealers and brokers 4163 Economic development officers, marketing researchers & consultants
4163 Economic development officers and marketing researchers and consultants	
4166 Education policy researchers, consultants and program officers	
4167 Recreation and sports program supervisors and consultants	5254 Program leaders and instructors in recreation, sport and fitness
4168 Program officers unique to government	
<b>PROFESSIONAL — ART, CULTURE, RECREATION AND SPORT</b>	
5111 Librarians	5211 Library and archive technicians and assistants
5112 Conservators and curators	
5113 Archivists	5111 Librarians

	5211 Library and archive technicians and assistants
<b>5121 Writers</b>	5122 Editors
	5123 Journalists
	5124 Professional occupations in public relations and communications
<b>5122 Editors</b>	5121 Writers
	5123 Journalists
	5124 Professional occupations in public relations and Communications
<b>5123 Journalists</b>	5121 Writers
	5122 Editors
	5124 Professional occupations in public relations and communications
<b>5124 Professional occupations in public relations and communications</b>	5121 Writers
	5122 Editors
	5123 Journalists
<b>5125 Translators, terminologists and interpreters</b>	
<b>5131 Producers, directors, choreographers and related occupations</b>	
<b>5132 Conductors, composers and arrangers</b>	5133 Musicians and singers
<b>5133 Musicians and singers</b>	
<b>5134 Dancers</b>	
<b>5135 Actors</b>	5231 Announcers and other broadcasters
<b>5136 Painters, sculptors and other visual artists</b>	
<b>SKILLED — BUSINESS, FINANCE AND ADMINISTRATION</b>	
<b>1211 Supervisors, General Office &amp; Administrative Support Clerks</b>	Very heterogeneous unit group, unable to identify transferability. Internal progression through unit group is high
<b>1212 Supervisors, Finance &amp; Insurance Clerks</b>	Very heterogeneous unit group, unable to identify transferability. Internal progression through unit group is high
<b>1213 Supervisors, Library, Correspondence &amp; Related Clerks</b>	Very heterogeneous unit group, unable to identify transferability. Internal progression through unit group is high
<b>1214 Supervisors, Mail and Message Distribution</b>	Very heterogeneous unit group, unable to identify transferability. Internal progression through unit group is high
<b>1215 Supervisors, Recording, distributing &amp; Scheduling Occupations</b>	Very heterogeneous unit group, unable to identify transferability. Internal progression through unit group is high
<b>1221 Administrative officers</b>	1222 Executive assistants
	1241 Secretaries (except legal and medical)
<b>1222 Executive assistants</b>	1221 Administrative officers
	1241 Secretaries (except legal and medical)
<b>1223 Personnel and recruitment officers</b>	
<b>1224 Property administrators</b>	Internal Progression through unit group is high
<b>1225 Purchasing agents and officers</b>	
<b>1226 Conference and event planners</b>	1221 Administrative officers
	1222 Executive assistants
<b>1227 Court officers and justices of the peace</b>	Eliminate Unit Group; no direct hiring

1228 Immigration, unemployment insurance and revenue officers	4168 Program officers unique to government
1231 Bookkeepers	
1232 Loan officers	
1233 Insurance adjusters and claims examiners	6231 Insurance agents and brokers
1234 Insurance underwriters	6231 Insurance agents and brokers
1235 Assessors, valuers and appraisers	Eliminate Unit Group. Very heterogeneous & specialized
1236 Customs, ship and other brokers	Eliminate Unit Group. Very heterogeneous & specialized
1241 Secretaries (except legal and medical)	
1242 Legal secretaries	1241 Secretaries (except legal and medical)
1243 Medical secretaries	1241 Secretaries (except legal and medical)
1244 Court recorders and medical transcriptionists	Eliminate Unit Group. Very heterogeneous & specialized
<b>TECHNICAL — SCIENCE AND APPLIED SCIENCES</b>	
2211 Applied chemical technologists and technicians	3212 Medical laboratory technicians
2212 Geological and mineral technologists and technicians	
2213 Meteorological technicians	
2221 Biological technologists and technicians	3212 Medical laboratory technicians
2222 Agricultural and fish products inspectors	Eliminate Unit Group. Very heterogeneous & product specific
2223 Forestry technologists and technicians	
2224 Conservation and fishery officers	
2225 Landscape and horticultural technicians and specialists	Eliminate Unit Group. Very heterogeneous
2230 Civil engineering technologists and technicians and construction estimators	2253 Drafting technologists and technicians 2254 Land survey technologists and technicians 2264 Construction Inspectors
2232 Mechanical engineering technologists and technicians	2253 Drafting technologists and technicians
2233 Industrial engineering and manufacturing technologists and technicians	2253 Drafting technologists and technicians
2234 Construction estimators (NOC only)	Eliminate Unit Group; NOC only
2241 Electrical and electronics engineering technologists and technicians	2242 Electronic service technicians (household and business equipment) 2243 Industrial instrument, electrical & avionics mechanics, technicians and inspectors 2244 Aircraft instrument, electrical & avionics mechanics technicians and inspectors 2253 Drafting technologists and technicians
2242 Electronic service technicians (household and business equipment)	
2243 Industrial instrument technicians and mechanics	
2244 Aircraft instrument, electrical and avionics mechanics, technicians and inspectors	2242 Electronic service technicians (household and business equipment)
2251 Architectural technologists and technicians	2231 Civil engineering technologists and technicians 2253 Drafting technologists and technicians 2264 Construction inspectors
2252 Industrial designers	2253 Drafting technologists and technicians
2253 Drafting technologists and technicians	
2254 Survey technologists and technicians	

2255 Mapping and related technologists and technicians	Eliminate Unit Group. Very heterogeneous group; little mobility within group
2261 Nondestructive testers and inspectors	Eliminate Unit Group. Very heterogeneous group; internal progression
2262 Engineering inspectors and regulatory officers	Eliminate Unit Group. Very heterogeneous group
2263 Inspectors in public and environmental health and occupational health and safety	Eliminate Unit Group. Very heterogeneous group; discipline specific
2264 Construction inspectors	
2271 Air pilots, flight engineers and flying instructors	
2272 Air traffic control occupations	
2273 Deck officers, water transport	
2274 Engineer officers, water transport	
2275 Railway and marine traffic controllers	Eliminate Unit Group. Very heterogeneous group; no mobility within group
<b>TECHNICAL — HEALTH OCCUPATIONS</b>	
3211 Medical laboratory technologists and pathologists' assistants	3212 Medical laboratory technicians
3212 Medical laboratory technicians	
3213 Animal health technologists	
3214 Respiratory therapists and clinical perfusionists	
3215 Medical radiation technologists	
3216 Medical Sonographers	
3217 Cardiology Technologies	
3218 Electroencephalographic and other diagnostic technologists n.e.c.	
3219 Other medical technologists and technicians (except dental health)	Eliminate Unit Group. Very heterogeneous group
3220 Dental Technicians & Laboratory Bench Workers (SOC 91 only; NOC: 3223 & 3412)	Eliminate Unit Group; NOC only
3221 Denturists	
3222 Dental hygienists and dental therapists	
3223 Dental Technicians (NOC only)	Eliminate Unit Group; NOC only
3231 Opticians	
3232 Midwives and practitioners of natural healing	Eliminate Unit Group. Very heterogeneous group; no mobility within group
3233 Registered nursing assistants	
3234 Ambulance attendants and other paramedical occupations	
3235 Other technical occupations in therapy and assessment	Eliminate Unit Group. Very heterogeneous group
<b>TECHNICAL — SOCIAL SCIENCE, EDUCATION GOVERNMENT ETC.</b>	
4211 Paralegal and related occupations	Eliminate Unit Group. Very heterogeneous group; no mobility within group
4212 Community and social service workers	
4213 Employment counsellors	1223 Personnel and recruitment officers
4214 Early Childhood Educators (NOC only — counted with 6470)	Eliminate Unit Group; NOC only
4215 Instructors and teachers of disabled persons	

4216 Other instructors	Eliminate Unit Group. Very heterogeneous group; no mobility within group
4217 Other religious occupations	Eliminate Unit Group. Very heterogeneous group; no mobility within group
<b>TECHNICAL — ART, CULTURE, RECREATION &amp; SPORT</b>	
5211 Library and archive technicians and assistants	
5212 Technical occupations related to museums and galleries	Eliminate Unit Group. Very heterogeneous group; no mobility within group
5221 Photographers	
5222 Film and video camera operators	
5223 Graphic arts technicians	
5224 Broadcast technicians	5225 Audio and video recording technicians
5225 Audio and video recording technicians	5224 Broadcast technicians
5226 Other technical occupations in motion pictures, broadcasting and the performing arts	5227 Support and assisting occupations in motion pictures, broadcasting and the performing arts
5227 Support and assisting occupations in motion pictures, broadcasting and the performing arts	5226 Other technical occupations in motion pictures, broadcasting and the performing arts
5231 Announcers and other broadcasters	
5232 Other performers	Eliminate Unit Group. Very heterogeneous group; no mobility within group
5241 Graphic designers and illustrating artists	5223 Graphic arts technicians
5242 Interior designers	
5243 Theatre, fashion, exhibit and other creative designers	Eliminate Unit Group. Very heterogeneous group; little mobility within group
5244 Artisans and craftspersons	Eliminate Unit Group. Very heterogeneous group; little mobility within group
5245 Patternmakers - Textile, leather and fur products	
5251 Athletes	Eliminate Unit Group. Very heterogeneous group; no mobility between sports
5252 Coaches	Eliminate Unit Group. Very heterogeneous group; no mobility between sports
5253 Sports Officials and Referees	Eliminate Unit Group. Very heterogeneous group; no mobility between sports
5254 Program leaders and instructors in recreation and sport	
<b>SKILLED — SALES &amp; SERVICE</b>	
6211 Retail trade supervisors	Eliminate Unit Group. Very heterogeneous group; internal progression
6212 Food service supervisors	Eliminate Unit Group. Very heterogeneous group; internal progression
6213 Executive housekeepers	Eliminate Unit Group. Very heterogeneous group; internal progression
6214 Dry Cleaning & Laundry Supervisors	Eliminate Unit Group. Very heterogeneous group; internal progression
6215 Cleaning supervisors	Eliminate Unit Group. Very heterogeneous group; internal progression
6216 Other service supervisors	Eliminate Unit Group. Very heterogeneous group; internal progression
6221 Technical sales specialists, wholesale trade	Eliminate unit group. Very heterogeneous group
6231 Insurance agents and brokers	1233 Insurance adjusters and claims examiners

6232 Real estate agents and salespersons	
6233 Retail and wholesale buyers	1225 Purchasing agents and officers
6234 Grain elevator operators	Occupation dominated by internal progression; direct hiring unlikely
6241 Chefs	6242 Cooks
6242 Cooks	
6251 Butchers and meat cutters, retail and wholesale	
6252 Bakers	
6261 Police officers (except commissioned)	
6262 Fire-fighters	
6271 Hairstylists and barbers	
6272 Funeral directors and embalmers	
<b>SKILLED — TRADES &amp; TRANSPORT OPERATORS</b>	
7211 Supervisors, machinists and related occupations	Eliminate Unit Group. Very heterogeneous group; internal progression
7212 Contractors and supervisors, electrical trades and telecommunications occupations	Eliminate Unit Group. Very heterogeneous group; internal progression
7213 Contractors and supervisors, pipefitting trades	Eliminate Unit Group. Very heterogeneous group; internal progression
7214 Contractors and supervisors, metal forming, shaping and erecting trades	Eliminate Unit Group. Very heterogeneous group; internal progression
7215 Contractors and supervisors, carpentry trades	Eliminate Unit Group. Very heterogeneous group; internal progression
7216 Contractors and supervisors, mechanic trades	Eliminate Unit Group
7217 Contractors and supervisors, heavy construction equipment crews	Eliminate Unit Group
7218 Supervisors, printing and related occupations	Eliminate Unit Group
7219 Contractors and supervisors, other construction trades, installers, repairers and servicers	Eliminate Unit Group
7221 Supervisors, railway transport operations	Eliminate Unit Group
7222 Supervisors, motor transport and other ground transit operators	Eliminate Unit Group
7231 Machinists and machining and tooling inspectors	7316 Machine fitters
7232 Tool and die makers	
7241 Electricians (except industrial and power system)	
7242 Industrial electricians	
7243 Power system electricians	
7244 Electrical power line and cable workers	
7245 Telecommunications line and cable workers	
7246 Telecommunications installation and repair workers	
7247 Cable television service and maintenance technicians	
7251 Plumbers	
7252 Steamfitters, pipefitters and sprinkler system installers	7316 Machine fitters
7253 Gas fitters	

<b>7261 Sheet metal workers</b>	
<b>7262 Boilermakers</b>	7263 Structural metal and platework fabricators and fitters
<b>7263 Structural metal and platework fabricators and fitters</b>	7262 Boilermakers
<b>7264 Ironworkers</b>	
<b>7265 Skilled Welders (NOC only)</b>	Eliminate Unit Group
<b>7266 Blacksmiths &amp; Die setters</b>	
<b>7271 Carpenters</b>	7293 Insulators 7295 Floor covering installers
<b>7272 Cabinetmakers</b>	
<b>7281 Bricklayers</b>	
<b>7282 Cement finishers</b>	
<b>7283 Tilesetters</b>	
<b>7284 Plasterers, drywall installers and finishers, and lathers</b>	
<b>7291 Roofers and shinglers</b>	
<b>7292 Glaziers</b>	
<b>7293 Insulators</b>	
<b>7294 Painters and decorators</b>	
<b>7295 Floor covering installers</b>	
<b>7311 Construction millwrights and industrial mechanics (except textile)</b>	7316 Machine fitters
<b>7312 Heavy-duty equipment mechanics</b>	7316 Machine fitters
<b>7313 Refrigeration and air conditioning mechanics</b>	
<b>7314 Railway carmen/women</b>	Eliminate Unit Group. Occupation dominated by internal progression; no direct hiring
<b>7315 Aircraft mechanics and aircraft inspectors</b>	7316 Machine fitters
<b>7316 Machine fitters</b>	
<b>7317 Textile machinery mechanics &amp; repairers</b>	
<b>7318 Elevator constructors and mechanics</b>	
<b>7321 Motor vehicle mechanics, technicians and mechanical repairers</b>	7316 Machine fitters
<b>7322 Motor vehicle body repairers</b>	
<b>7331 Oil and solid fuel heating mechanics</b>	
<b>7332 Electric appliance servicers and repairers</b>	
<b>7333 Electrical mechanics</b>	
<b>7334 Motorcycle and other related mechanics</b>	
<b>7335 Other small engine and equipment mechanics</b>	
<b>7341 Upholsterers</b>	
<b>7342 Tailors, dressmakers, furriers and milliners</b>	
<b>7343 Shoe repairers and Shoemakers</b>	
<b>7344 Jewellers, watch repairers and related occupations</b>	Eliminate unit group. Very Heterogeneous group; little mobility within group
<b>7351 Stationary engineers and auxiliary equipment operators</b>	
<b>7352 Power systems and power station operators</b>	
<b>7361 Railway and yard locomotive engineers</b>	Eliminate unit group. Occupation dominated by internal progression; no direct hiring
<b>7362 Railway conductors and brakemen/women</b>	Eliminate unit group. Occupation dominated by internal progression; no direct hiring

<b>7371 Crane operators</b>	
<b>7372 Drillers &amp; Blasters</b>	
<b>7373 Water Well Drillers</b>	
<b>7381 Printing Press Operators</b>	
<b>7382 Commercial divers</b>	
<b>7383 Other trades and related occupations (e.g. gunsmith, locksmith, etc.)</b>	Eliminate unit group. Very heterogeneous group; little mobility within group
<b>SKILLED — PRIMARY INDUSTRIES</b>	
<b>8211 Supervisors, logging and forestry</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>8221 Supervisors, mining and quarrying</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>8231 Underground production and development miners</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>8232 Oil &amp; gas well drillers, servicers, testers &amp; related workers</b>	Eliminate unit group. Unit group dominated by internal progression; outside hiring unlikely
<b>8241 Logging machinery operators</b>	
<b>8251 Farmers and farm managers</b>	Eliminate unit group. Heterogeneous group
<b>8252 Agricultural and related service contractors and managers</b>	Eliminate unit group. Heterogeneous group; internal progression
<b>8253 Farm supervisors and specialized livestock workers</b>	Eliminate unit group. Heterogeneous group; internal progression
<b>8254 Nursery and greenhouse operators and managers</b>	Eliminate unit group. Heterogeneous group; internal progression
<b>8255 Landscaping and grounds maintenance contractors and managers</b>	Eliminate unit group. Heterogeneous group; internal progression
<b>8256 Supervisors, landscape and horticulture</b>	Eliminate unit group. Heterogeneous group; internal progression
<b>8257 Aquaculture operators and managers</b>	Eliminate unit group. Heterogeneous group; internal progression
<b>8261 Fishing masters and officers</b>	8262 Fishing vessel skippers and fishermen/women
<b>8262 Fishing vessel skippers and fishermen/women</b>	
<b>SKILLED - MANUFACTURING &amp; PROCESSING</b>	
<b>9211 Supervisors, mineral and metal processing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9212 Supervisors, petroleum, gas and chemical processing and utilities</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9213 Supervisors, food, beverage and tobacco processing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9214 Supervisors, plastic and rubber products manufacturing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9215 Supervisors, forest products processing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9216 Supervisors, textile processing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9221 Supervisors, motor vehicle assembling</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9222 Supervisors, electronics manufacturing</b>	Eliminate unit group. Very heterogeneous group; internal progression

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<b>9223 Supervisors, electrical products manufacturing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9224 Supervisors, furniture and fixtures manufacturing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9225 Supervisors, fabric, fur and leather products manufacturing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9226 Supervisors, other mechanical and metal products manufacturing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9227 Supervisors, other products manufacturing and assembly</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9231 Central control and process operators, mineral and metal processing</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9232 Petroleum, gas and chemical process operators</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9233 Pulping control operators</b>	Eliminate unit group. Very heterogeneous group; internal progression
<b>9234 Papermaking and coating control operators</b>	Eliminate unit group. Very heterogeneous group; internal progression

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## Appendix B : Environmentally Related Education Programs

ENVIRONMENTALLY RELATED DEGREE PROGRAMS		
Program	Certification	Length
<b>LAMBTON COLLEGE</b>		
Arborist Apprenticeship	Certificate of Apprenticeship	12 weeks
Horticulture Apprenticeship	Certificate of Apprenticeship	12 weeks
Home Inspection	Board of Governors Certificate	N/A
Construction Carpentry Techniques	Ontario College Certificate	1 year
Electrical Techniques	Ontario College Certificate	1 year
Industrial Managers	Ontario College Diploma	2 years
Mechanical Technician – Industrial Maintenance	Ontario College Diploma	2 years, Co-op
Renovation Technician	Ontario College Diploma	1 year
Alternative Energy Engineering Technology	Ontario College Advanced Diploma	3 years, Co-op
Business Administration	Ontario College Advanced Diploma	3 years, Co-op
Chemical Production and Power Engineering Technology	Ontario College Advanced Diploma	3 years, Co-op
Power Engineering Technology – Chemical	Ontario College Advanced Diploma	3 years, Co-op
<b>RIDGETOWN CAMPUS: UNIVERSITY OF GUELPH</b>		
Bio-Resource Management	Degree Program	4 years
Horticulture	Associate Diploma	2 years, 3 years
Agriculture	Associate Diploma	2 years, 3 years
Environmental Management	Associate Diploma	2 years, 3 years
<b>UNIVERSITY OF WESTERN ONTARIO</b>		
Biology	Bachelor of Science	3 years, 4 years
Geography	Bachelor of Social Science	3 years, 4 years
Ecosystem Health	Bachelor of Science	3 years, 4 years
Chemistry	Bachelor of Science	3 years, 4 years
Earth Sciences	Bachelor of Science	3 years, 4 years
Environmental Science	Bachelor of Science	3 years, 4 years
Biochemical and Environmental Engineering	Bachelor of Engineering Science	4 years
Civil Engineering	Bachelor of Engineering Science	4 years
Civil Engineering – Environmental Option	Bachelor of Engineering Science	4 years
Civil Engineering – Power Systems Option	Bachelor of Engineering Science	4 years
Green Processes Engineering	Bachelor of Engineering Science	4 years
Electrical Engineering	Bachelor of Engineering Science	4 years
Chemical Engineering	Bachelor of Engineering Science	4 years
Biochemical and Environmental Engineering	Bachelor of Engineering Science	4 years
Mechanical Engineering	Bachelor of Engineering Science	4 years
<b>UNIVERSITY OF WINDSOR</b>		
Biology	Bachelor of Science	4 years
Biology and Biotechnology	Bachelor of Science	4 years
Chemistry	Bachelor of Science	4 years
Environmental Science	Bachelor of Science	4 years
Honours Business Administration	Bachelor of Commerce	4 years

<b>Civil Engineering</b>	Bachelor of Applied Science	4 years
<b>Electrical Engineering</b>	Bachelor of Applied Science	4 years
<b>Environmental Engineering</b>	Bachelor of Applied Science	4 years
<b>Mechanical Engineering with an Environmental Engineering Option</b>	Bachelor of Applied Science	4 years

## Appendix C : Green Employer Survey

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1. How many employees do you have?

- |                                |                                  |
|--------------------------------|----------------------------------|
| <input type="checkbox"/> 1-4   | <input type="checkbox"/> 100-199 |
| <input type="checkbox"/> 5-9   | <input type="checkbox"/> 200-499 |
| <input type="checkbox"/> 10-19 | <input type="checkbox"/> 500+    |
| <input type="checkbox"/> 20-49 |                                  |
| <input type="checkbox"/> 50-99 |                                  |

2. Which subsector of [insert industry] do you represent?

- List all applicable subsectors

3. How many years have you been in business?

- |                                |                                |
|--------------------------------|--------------------------------|
| <input type="checkbox"/> 1-4   | <input type="checkbox"/> 20-49 |
| <input type="checkbox"/> 5-9   | <input type="checkbox"/> 50+   |
| <input type="checkbox"/> 10-19 |                                |

4. Name of your business

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5. Contact names and email address.

Name:

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Email address:

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6. The green economy encompasses the economic activity related to the following: reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials and developing, manufacturing and adopting renewable sources of energy. Would you identify your business as being currently involved in any of these green activities?

- No  
 Yes

7. Those who answered no: Can you please explain why your business is not engaged in any of these green activities?

- Too costly
- Lack of knowledge or understanding
- Not required of our business at this time
- Lack of skilled workforce
- Other (please specify)

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(Then taken to end of survey)

8. Those who answered yes to question 5: Many businesses engage in environment-friendly practices. Why did your business decide to "go green"?

- Legal compliance
- Cost reduction
- Commitment to improving environmental quality
- Increased market demand
- Other (please specify)

9. In a few words, tell us what your company's experience has been in the green economy?

10. The terms "green-collar worker" describes occupations employed in the environmental sectors of the economy. Environmental green-collar workers (or green jobs) satisfy the demand for green development. Generally, they implement environmentally conscious design, policy and technology to improve conservation and sustainability. Are there particular occupations in your business that you would consider "green-collar jobs"? Select all that apply

- Inserted list of possible green-collar jobs specific to industry.

11. Select 3 skills of work related experiences your company looks for when hiring "green-collar" workers.

- Specific environmental training/education
- Industrial tradesperson
- Engineering training/education
- Remediation/pollutants/waste disposal management/treatment
- Effective communication/customer service, public and government relations/marketing experience/training
- Resource management experience/training
- Other (please specify)

12. When you are hiring green occupations, is it difficult to find qualified individuals with the necessary training and education?

- Yes
- No

13. Please specify the level of education and program(s) required for green-collar workers at your business.

- University degree
  - College diploma
  - Apprenticeship certificate
  - No post secondary
  - Not applicable
- Please specify College or University program(s) required.
- 

14. How does your business develop the skills of existing workers to meet the needs of the green economy?

- Train in house
  - Upgrading and/or professional development training
  - Other (please specify)
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