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Green Data *for a* Growing Green Economy

Green Jobs in the District of Columbia, Maryland, and Virginia



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1. Executive Summary

The green economy provides the regions throughout the country with a dynamic opportunity to expand their job base, attract new investment, and diversify their economy. The Washington DC metropolitan area, in particular, has been a leader in the green economy since 2006. At that time, the area had the nation's second largest concentration of green jobs when compared to other metropolitan areas, and the regional green economy was expected to continue to grow by more than 8 percent annually, outpacing economy-wide average job growth.[1],[2] Knowledge of the size, sectors, geographic locations, workforce requirements, and other characteristics of the regional green economy is critical to ensure that the region is well positioned to fully capitalize on opportunities for continued job creation today and in the future; to do this it is critical to understand the current state of the green economy.

In 2009, the Mid-Atlantic Regional Collaborative (MARC) Green Consortium obtained funding from DOL to work with a group of official Project Partners to conduct a study of the green economy in the District of Columbia (DC), Maryland, and Virginia region. The project included: a green jobs survey of regional employers; the development of an interactive web-based labor exchange portal; research related to green employment and training issues; policies to supplement survey findings; and broad-based outreach on the process and findings. Ultimately, the study's findings provide the necessary background information that allows policymakers, Workforce Investment Area leaders, training providers, employers, job seekers, and other stakeholders to make accurate and informedt workforce decisions.

Maryland Department of Labor, Licensing, and Regulation was the lead applicant for the project and served as the Project Leader. The official Project Partners included Maryland Workforce Corporation as the grant administrator, Ed Trumbull from TCA, LLC as the Project Director, ICF International (ICF) as the team responsible for conducting the labor market information survey and research, and Geographic Solutions as the group responsible for building the interactive labor exchange portal. This report, written by ICF, includes a summary of the green labor market information collected during the project.

Approach

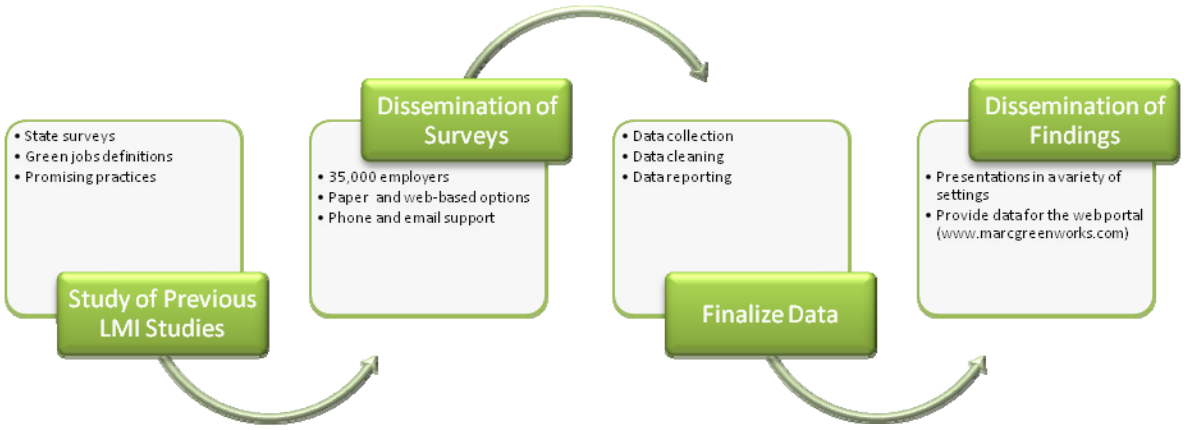
ICF employed a multi-pronged approach to the survey implementation and analysis effort. We first performed an extensive analysis of green-related studies conducted in other states in order to obtain information about promising practices as well as to establish a definition of green jobs that would be appropriate for the MARC region. We also reviewed green definitions released by Federal agencies, such as the Bureau of Labor Statistics (BLS), which we adapted and used for the survey. After establishing a definition of green jobs for the MARC region, we disseminated both paper and web-based survey options to the sample population while ensuring that telephone and email inquiries were promptly addressed. In addition to the survey, we conducted two follow-up studies with non-responding employers in an attempt to complete surveys by phone and to determine why certain types of employers tended to have lower

[1] "Current and Potential Green Jobs in the U.S. Economy." October 2008. The United States Conference of Mayors and the Mayors Climate Protection Center.

[2] "Greater Washington 2009 Regional Report." August 2009. Greater Washington Initiative.

response rates. Once we completed data collection activities, we conducted an extensive analysis of responses received. Figure 1 below summarizes the approach and key objectives of the MARC.

Figure 1. MARC Key Activities and Objectives



Survey Methodology

The MARC Survey Administration Team (MARC-SAT) employed a mixed-methods approach to the regional study of employers. Specifically, we made surveys available to respondents via paper and state-specific web sites and provided phone outreach and support throughout the survey administration period. Part of the survey process included defining green jobs as a basis for data collection.To establish this definitition, MARC-SAT reviewed green job reports from other states and preliminary definitions released by Federal agencies. The definition that MARC-SAT adapted for the survey was based on the output aspect of the definition released by the Bureau of Labor Statistics (BLS) in March 2010. We define green jobs as those that involve any amount of time spent in providing services or producing products in one of the following 7 core areas[3]:

1. Renewable energy and alternative fuels
2. Energy efficiency and energy conservation
3. Greenhouse gas reduction
4. Pollution reduction and cleanup

[3] The definition for green jobs was chosen as it is aligned with BLS best-practices and other on-going state surveys. We chose an output definition (versus a process definition), defining a job as "green" when *any* portion of an employee's workload includes producing a product or supplying a service in one or more of the following seven core areas MARC-SAT acknowledges that this definition is broad, however was chosen because it is critical that our perameters be consistant with future government-collected (BLS) green job surveys.

5. Recycling and waste reduction
6. Sustainable agriculture and natural resource conservation
7. Education, compliance, public awareness and training related to green jobs

- *How green is the MARC Region?*
- *Are there any areas that are emerging in terms of employment opportunities in the next two years for the MARC region?*
- *Which training methods do employers in the MARC region prefer when preparing green workers?*
- *Which credentials increase a worker's likelihood of being hired in the MARC region?*

Survey Findings

The questions to the right are a sampling of the questions that are addressed by the MARC survey findings.

We found that the MARC region has approximately 236,000 green jobs, with a majority (87 percent) of those jobs being full time employment. In other words, three to five percent of the region's public and private workforce is green. These green employees are working in an estimated 29,000 green establishments. This estimate indicates that 8 to 9 percent of the establishments in the region have green jobs.

The MARC region has green employment in more than 300 industries, although over half of the green jobs were concentrated in five industries related to construction, technical services, and education/policy. Specifically, 30 percent of all green jobs in the MARC region are in Construction, 21 percent are in Professional, Scientific and Technical Services, and 16 percent are in Other Services (includes political, social, and civic organizations). Seven of the top 15 regional occupations relate to building/construction/design.This finding is generally consistent with studies from several other states' LMI studies. There are some jurisdictional differences with regard to the industries that account for the highest concentrations of green jobs. For example, the Professional, Scientific, and Technical Services industry is the top green industry in DC and accounts for 3,300 jobs in that jurisdiction while Specialty Trade Contractors represent the top green industry in both Maryland and Virginia where it accounts for 31,000 jobs and 17,506 jobs, respectively. In terms of specific occupations, green employment in DC was concentrated in the smallest number of occupations, while jobs in Virginia were distributed throughout the largest number of occupations relative to DC and Maryland.

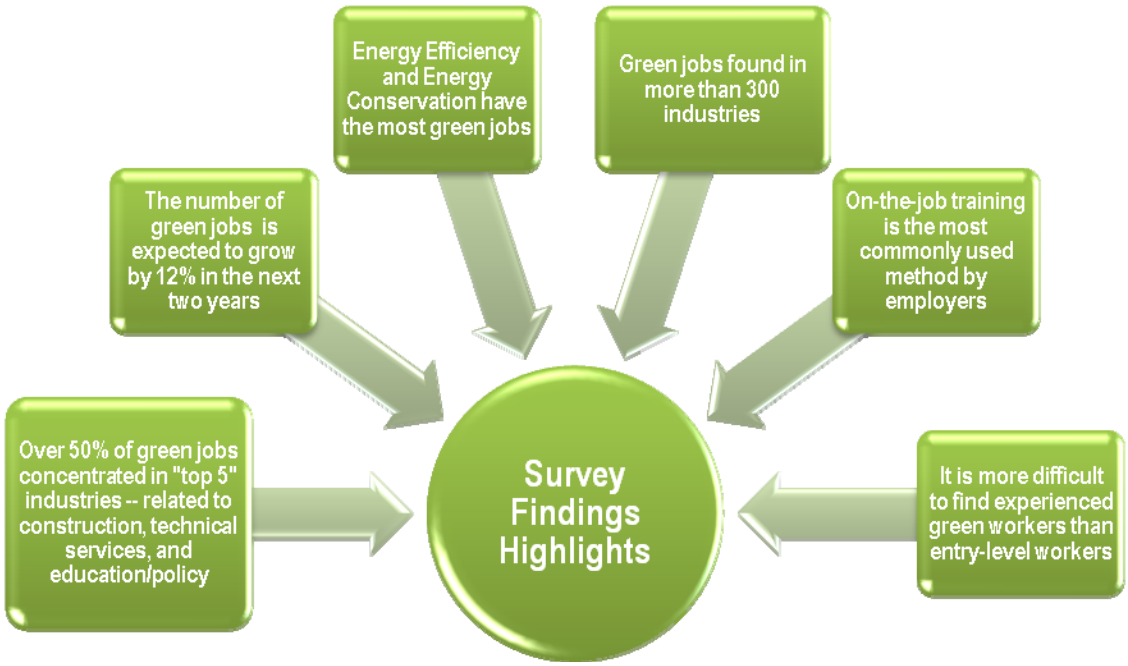
In addition to the number of current green jobs, employers in the MARC region anticipate having approximately 28,000 open green positions over the next two years. Ninety-six percent of those openings are distributed almost equally between Virginia and Maryland; the remaining 4 percent are in DC. Hiring projections indicate that green activities in Construction, Professional, Scientific, and Technical Services and Support and Waste Management Services can expect to grow. Overall, the number of green jobs in the region is expected to grow by 12 percent over the next two years (i.e., two years from mid-2010 survey responses). This is quite remarkable since all jobs in this region are expected to show a net growth of about four percent.

In terms of recruitment and retention of green employees, employers reported that experienced workers were more difficult to find than entry-level workers, particularly in Maryland. Retaining green workers posed about the same level of challenge for establishments throughout the region—almost half of respondents report that is "very or somewhat difficult" to retain green workers.

In addition to the industry-specific information that employers provided, the survey asked employers about their preferred training methods for preparing their green workers. Over 75 percent of employers in the region cited a preference for on-the-job training. In addition, respondents indicated their willingness to provide financial support for specialized offsite workshops, occupation-specific certificate programs, and community college training programs. When asked about credentials that would increase a potential worker's likelihood of being hired, 28 percent of employers indicate that Leadership in Energy and Environmental Design (LEED) certification and sustainability training would increase the likelihood of hiring an applicant. In fact, LEED certification is the most widely-known credential in the region. In the same vein, employers were asked whether they would be likely to hire long term unemployed workers for on-the-job-training if at least 50% of those employees' wages would be paid by Federal funding. Throughout the region, 41% of respondents indicated that they would be "somewhat likely" to hire long-term unemployed workers under such a program.[4] The findings are presented in greater detail in Chapter 3.

Figure 2 illustrates additional highlights of the survey findings.

Figure 2. Survey Finding Highlights



[4] The DOL has funding available at the state-level for employers to hire long term unemployed workers for on the job traiing.

Source: ICF MARC Regional Employer Survey

Conclusion

This report represents the most current and comprehensive examination of the green economy in DC, Maryland, and Virginia to date. Although variations between jurisdictions are discussed in more detail in the report, the findings indicate that green employment is largely encompassed in the core areas of Energy Efficiency and Energy Conservation and Recycling and Waste Reduction. We found that on-the-job training is the current dominant mode of preparing green employees and that many employers cited challenges in recruiting entry level and skilled green employees, expressing a preference for hiring skilled green employees. Regional green employment is expected to grow by 12 percent over the next two years, with credentialed candidates possessing a strong hiring advantage over their non-credentialed counterparts. As residents of DC, Maryland, and Virginia often cross into other jurisdictions to work and/or obtain training, these findings have implications for job seekers, employers, policymakers, workforce development practitioners, and other stakeholders throughout the entire MARC region. This report will equip these stakeholders with the necessary background context to make evidence-based decisions about green employment, training opportunities, and trends in DC, Maryland, and Virginia.

2. Introduction

This section provides background context for the research, a description of the "lessons learned" from other labor market studies, and an outline of the rest of the report.

2.1. Research Context

The green economy provides the DC, Maryland, Virginia region with a dynamic opportunity to expand its job base, attract new investment, and diversify the regional economy. The Washington DC metropolitan area, in particular, has been a leader in the green economy since 2006. At that time, the area had the nation's second largest concentration of green jobs when compared to other metropolitan areas, and the regional green economy was expected to continue to grow by more than 8 percent annually, outpacing economy-wide average job growth.[5],[6] The region's green industries have continued to expand in spite of recessionary pressures, providing workers and the economy with robust and unique opportunities for continued growth.

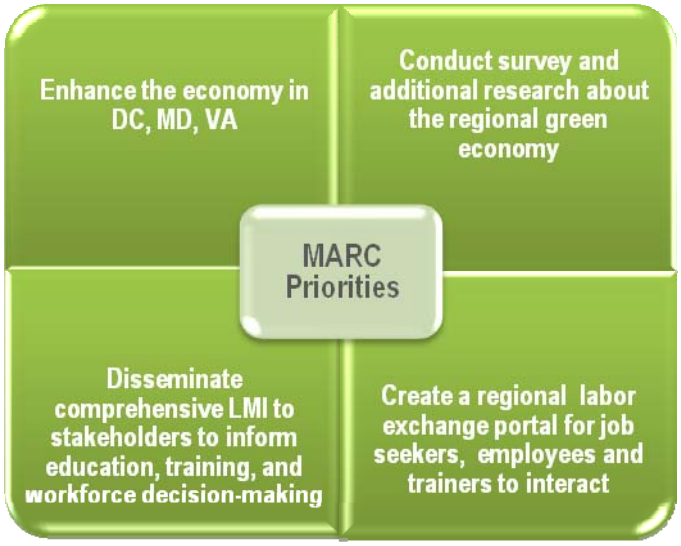
Knowledge of the size, sectors, geographic locations, workforce requirements, and other characteristics of the regional green economy is critical to ensure that the region is well positioned to fully capitalize on opportunities for continued job creation. The green industry, however, is particularly challenging to measure, as traditional industry and occupation data sources have not kept pace with this nascent and dynamic industry. No standard definition of green industries or occupations exists, and none of the traditional government-collected datasets has captured the green economy at the requisite level of granularity. It is critical to analyze the current state of the green economy to plan for its expansion.

2.2. Project Background

In June 2009, the United States Department of Labor (DOL) released a competitive Solicitation for Grant Applications for State Labor Market Information Improvement Grants. Eligible entities included individual or consortia of State Workforce Agencies. The Maryland Department of Labor, Licensing, and Regulation submitted a grant application on behalf of the Mid-Atlantic Regional Collaborative (MARC) Green Consortium, and the region was awarded a grant to conduct innovative Labor Market Information (LMI) activities to support the strategic and systematic expansion of a region-wide green economy.

[5] "Greater Washington 2009 Regional Report." August 2009. Greater Washington Initiative.

[6] "Current and Potential Green Jobs in the U.S. Economy." October 2008. The United States Conference of Mayors and the Mayors Climate Protection Center.



Established in 2008, MARC is a cross-regional coalition committed to preserving the economic vitality of the District of Columbia (DC), Maryland (Maryland), and Virginia (Virginia) during Base Realignment and Closure (BRAC) activities initiated by the United States Department of Defense in 2005. MARC is dedicated to enhancing the economic vitality of DC, Maryland, and Virginia and is focused on building a globally competitive regional talent development system to drive and fuel regional prosperity. Members include leaders from the State Workforce Agencies for DC, Maryland, and Virginia. The development of a robust Mid-Atlantic green workforce offers employment opportunities and generates local economic activity in an arena that will grow substantially over the next few decades while supporting efforts to make the region more environmentally sustainable. Following are key objectives and activities of the MARC Green Consortium:

1. Conduct a survey and additional research to develop estimates of labor market data indicating green job skills requirements and occupational characteristics at local, state and regional levels.

2. Estimate the impact on job creation resulting from green technologies and investments.

3. Conduct workforce gap analysis and develop approach for matching dislocated and under-employed workers with emerging green employment opportunities.

4. Disseminate research and data to inform stakeholders of the occupational skills and growing needs of the energy efficiency and renewable energy industries.

5. Publish data – including information on careers, competency models, and job guidance – through multiple modes and formats for various target audiences.

6. Create a regional labor market exchange system for green jobs, education and training.

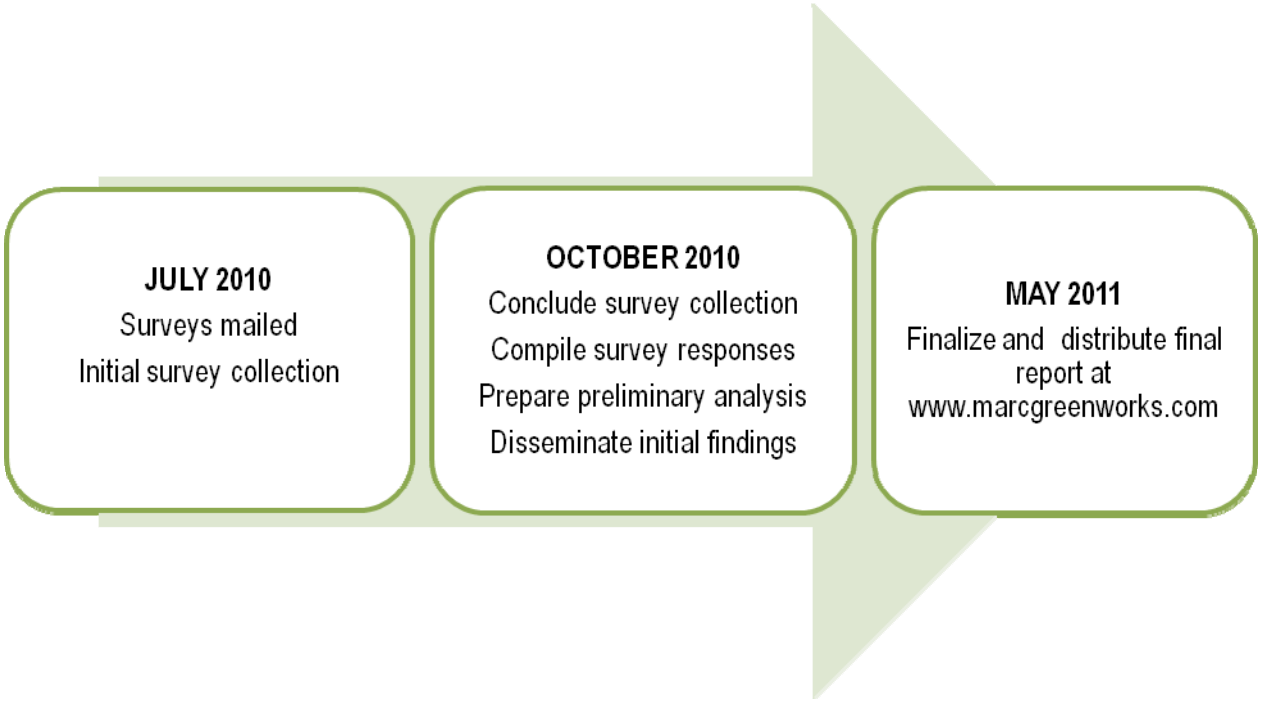
The MARC requested that ICF International (ICF) conduct a comprehensive survey of public- and private-sector employers in DC, Maryland, and Virginia. A survey was needed because traditional information sources and databases on industries and occupations are not specific enough to accurately measure the number of green jobs in the economy. Specifically, the goals of the survey were to: 1) define the region's green economy; 2) identify the number and type of green jobs in the region; and 3) establish a baseline measure that could be used to track industry and job growth over time. ICF's team of survey methodologists, sampling experts, data analysts, and other subject matter experts formed the MARC

Survey Administration Team (MARC-SAT) in order to survey approximately 35,000 employers over a three-month period; approximately 10,000 employers responded.

The MARC members established a LMI Directors' Steering Committee to provide meaningful and substantive input throughout the project. The Steering Committee provided oversight to the project, worked with project members to engage other key stakeholders, design the survey instrument, analyze the results and understand the anomalies. The Steering Committee provided quality assurance for deliverables.

Figure 3 depicts a timeline of key milestones of the project.

Figure 3. Timeline of Key Survey and Analysis Milestones



2.3. Lessons Learned from Existing Labor Market Studies on Green Jobs

As an initial step, ICF conducted an extensive literature review of state and regional green job surveys and related research. There were a limited number of completed statewide green jobs survey analyses available. Our review focused on six survey studies conducted in California (2010), Michigan (2009), Minnesota (2010), Missouri (2009), Oregon (2009), and Washington State (2008).[7] As we developed the study approach and survey design for this study, we leveraged the lessons learned from these individual state research efforts as well as the recommendations in the summary report, *Measuring and Analysis of*

[7] The timeframes for the completion of the surveys and the release of the report were as follows (respectively): California, January 2010 and April 2010 (preliminary results); Michigan, the first quarter of 2009 and May of 2009; Minnesota, beginning of 2010 and June 2010 (preliminary results); Missouri, third quarter of 2009 and December 2009; Oregon, May 2009 and June 2009; and Washington, latter half of 2008 and January of 2009.

Employment in the Green Economy, published by the Workforce Information Council's Green Jobs Study Group in October of 2009. Although each state has a unique mix of green industries and policies, the results of these studies provide useful context for the MARC study. In addition, our survey design was influenced by survey instruments developed by California, Florida, Michigan, Oregon, and Washington. Note that the web-based Florida survey instrument was made available just before we conducted our survey mailing.

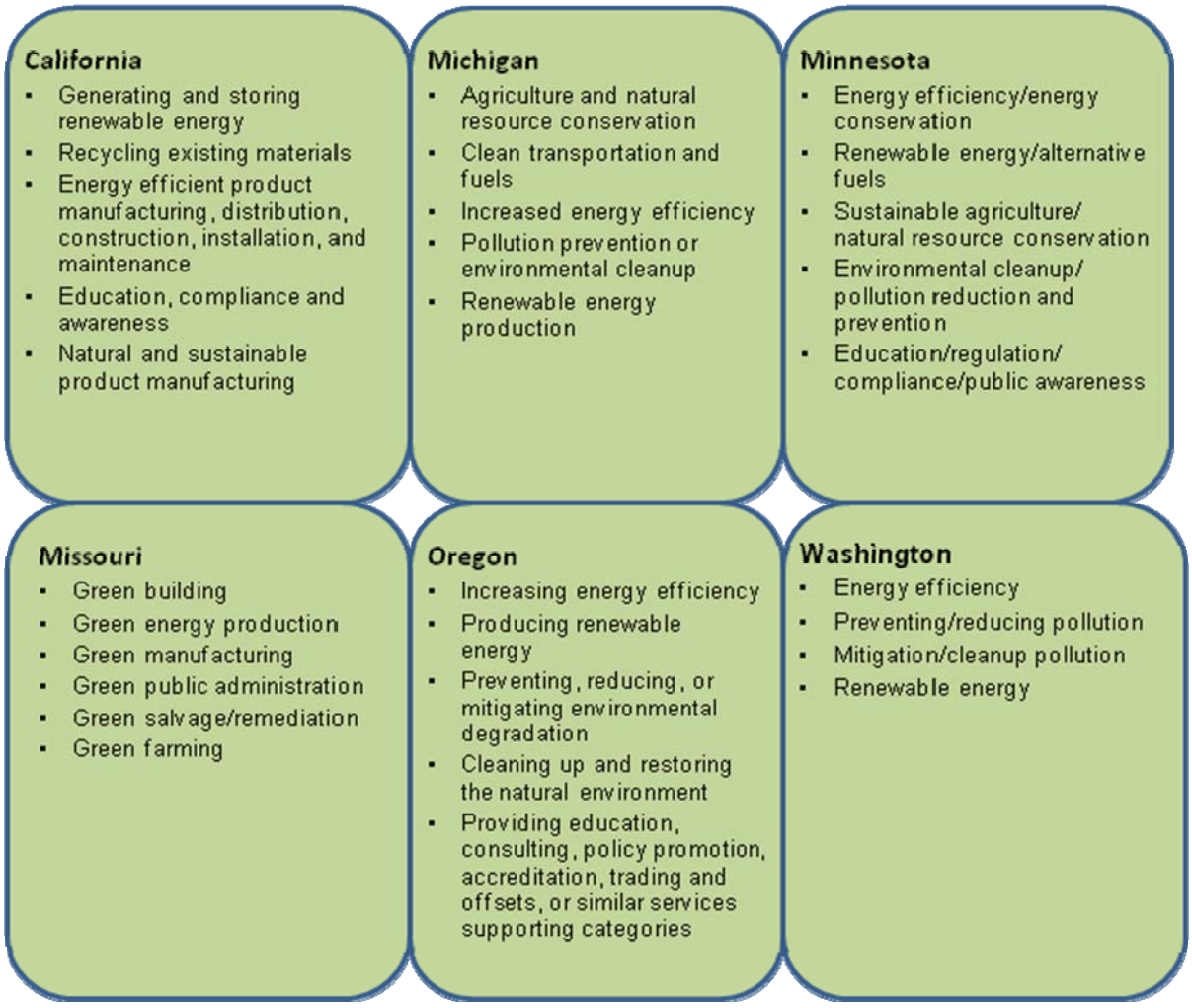
We also reviewed the available studies and other data on green industries and jobs in Maryland, Virginia, and the District of Columbia to obtain a better understanding of region-specific green industry trends. This background research allowed us to customize the study approach and survey instrument.

In the following sections, we present the results of our review of existing research on green jobs. Note, however, that results should not be directly compared across states due to differing survey samples and green jobs definitions. For example, California, Michigan, Minnesota, Missouri, and Washington only included private businesses in their survey, while Oregon included private businesses as well as state and local government agencies.

Green Employment by Core Area

The analyses conducted for California, Michigan, Missouri, Oregon, and Washington found that green jobs comprise about 3 to 5 percent of state employment. This range goes from 3 percent in Oregon to 4.8 percent in Missouri. Each state created a unique green category classification system customized to represent its economy which makes quantitiave comparision across region meaningless. There were, however, common classification features across states. Five of the six studies had one sector dedicated to energy efficiency and one sector to renewable generation. In addition, four of the six studies included a sector related to pollution control. Figure 3 below presents the core sector definitions for each study that we evaluated.

Figure 3. Core Green Segments by State



The economic sector employing the largest number of green workers varies by state. Only four of the six studies provided employment results by core green sector. In Washington, the largest sector is energy efficiency, accounting for 53 percent of green jobs. In Michigan, 41 percent of green jobs are in clean transportation and fuels. In California, the largest core segment is recycling, followed closely by energy efficiency and natural or sustainable product manufacturing (with 22 percent of green jobs each). In Missouri, green building is the largest sector at 52 percent of green workers.

Green Employment by Industry

The majority of green employment in California, Michigan, Oregon, and Washington is concentrated in a few industries. All of the studies, except for Minnesota and Missouri, provided detailed survey results related to industry employment.

- In Washington, 86 percent of green employment is represented by six industries, with 44 percent of total green employment in the two construction-related sectors.

- In Oregon, 47 percent of green jobs are concentrated in three industries: construction, wholesale and retail trade, and administrative and waste services.
- In Michigan, a majority of the core green segments are dominated by one or two key industries with the exception of renewable energy production segment, which has a larger range of industries. Not surprisingly, the transportation equipment manufacturing industry, measured by the total direct green jobs and total industry employment, is the largest green industry in Michigan.
- In California, the majority of green jobs are concentrated in several industries including manufacturing, construction, and professional and technical services.

Green Employment by Occupation

The results point to a trend that green jobs are heavily concentrated in a handful of occupations.

- In Washington, the largest construction-related occupations represent 40 percent of green jobs, and the most common 25 occupations represent 74 percent of all green jobs.
- Similarly, more than 70 percent of green workers in Michigan are concentrated in three occupational categories including production (28 percent), engineering (24 percent), and construction (19 percent).
- In Oregon, 20 percent of all green jobs are in construction and extraction occupations. In Missouri, five occupations employ the most workers, including architects; chemical technicians; plumbers, pipe fitters and steamfitters; heating, air conditioning and refrigeration mechanics and installers; and refuse and recyclable material collectors.

The majority of occupations listed by respondents across all states were traditional job titles. Survey respondents in some cases, however, listed several "new" occupations that do not have a corresponding Standard Occupational Classification (SOC) system code, such as solar panel installers, wind turbine technicians, and LEED consultants. California reported the most non-traditional occupations -- 12 percent of all jobs listed.[8]

Green Job Vacancies and Hiring Plans

Although job vacancies and hiring plans were addressed by only a few of the green job surveys conducted to date, a few themes emerge. Green job openings in Minnesota were estimated at about 2 percent of all vacancies in the state. This finding is consistant with findings in California, Michigan, and Washington (however a true quantitative comparison is impossible due to the differences in analysis approach across the studies).

In Minnesota, 40 percent of the green job openings were in environmental cleanup/pollution reduction and prevention, while 26 percent of the green job openings were in designated Science, Technology,

[8] Differences in survey-respondents' level of specificity affected the job categorization. For example, solar panel installers could be considered production; wind turbine technicians and LEED consultants could be categorized as engineering services.

Engineering, and Mathematics (STEM) occupations (compared to only 12 percent of all vacancies in the state). Occupations in the transportation and production sectors were occupations in highest demand.[9]

In Michigan, employers responding to the survey indicated occupations they believed would be difficult to fill. These occupations require specialized skills, education, and experience and include green engineers, sales management, and construction trade jobs.

Green Employment Projections

Surveys in Michigan, Washington, and Oregon questioned respondents about expected growth rates in green jobs. Estimates varied widely across the three states from 1 to 2 percent annually in Michigan to 7 percent annually in Oregon.

- In Michigan, job levels for green-related occupations were projected to grow by 6.4 percent between 2006 and 2016 and expected to produce nearly 12,000 openings each year. The green occupations that are predicted to have the largest employment are industrial engineers, surveyors, and landscaping and grounds keeping workers.
- The Washington State survey found that the annual growth rate for several green occupations would be higher than the predicted statewide average of 1.4 percent.[10] The occupations that are predicted to grow fastest are architects (3 percent), production workers (2.1 percent), and civil engineers (2 percent).
- Employers in Oregon projected that the number of green jobs in the state will grow by 14 percent between 2008 and 2010 (for a gain of 7,400 jobs) with most growth coming from farming, fishing and forestry, transportation and material moving, and production.

Education and Training

The importance of formal education and industry training varied across the studies. In Minnesota, nearly 70 percent of all green vacancies require some level of training beyond a high school diploma, compared to only 44 percent of overall jobs requiring training beyond a high school diploma. Respondents indicated that bachelor's degrees in engineering, business, natural resources (such as ecology or hydrology), and other life sciences, as well as knowledge of environmental compliance policies, is the preferred educational background for open green positions. Respondents frequently requested both engineering and marketing/business skill sets.

[9] The Minnesota report indicated that there was bias in the results for construction industries, including Architectural Services, because of the season in which the survey was conducted (winter off-season) and the effects of the recent recession. It was expected that occupations in the construction industries would also make up a large portion of green vacancies in Minnesota.

[10] Washington State Employment Security Department. (2008). 2008 Green Economy Jobs in Washington State. Retrieved March 8, 2011 from http://www.nawb.org/portals/0/Resource%20Center/Washington%20State%20Green%20Jobs%20Report.pdf

In Oregon, however, two-thirds of the reported green jobs require no education beyond high school, 7 percent of green jobs require some college, 15 percent require a bachelor's degree, and 3 percent require a graduate degree.

Despite these differences across states, it was generally agreed that on-the-job training is particularly important in a green economy. In both California and Michigan, over 70 percent of employers said that future training would be workplace-based and critical to career advancement. The Missouri survey also found that the majority of green employers use in-house classroom and on-the-job training to prepare workers for green jobs.

Green Worker Certifications and Licenses

Only two of the studies addressed green worker certifications and licenses. In Oregon, nearly one-third of green jobs require a special license or certificate. The most common are those associated with a specific occupation, such as an electrician's license. Other required certifications or credentials include environmental cleanup or abatement certifications, equipment operator licenses and commercial driver's licenses. In Minnesota, the survey identified state commercial drivers' licenses and professional engineers' licenses as important credentials.

2.4. Organization of the Remainder of the Report

The remainder of the report provides greater detail about the research approach including: the green jobs definition that was adopted for the study; an overview of the survey methodology; detailed findings by green core area, jurisdiction, and the Workforce Investment Areas (WIA); a description of future research; and several appendices, which include copies of the survey instruments that were distributed to each of the jurisdictions, a detailed narrative of the survey methodology, a listing of green industries and green occupations, and letters of support from State Workforce Agencies. The analysis presented in the findings section profiles the MARC region's green economy through the following themes: green employment by core area, green employment by industry, green employment by occupation, green job vacancies and hiring plans, green employment projections, education and training directly related to the green economy, green worker certifications, and green business revenues.

Note. It is important to note the distinctions between industry and occupation when reviewing findings in the report. An *occupation* refers to what an employee does, such as Architectural Drafter in a given *industry*, such as Construction. In some instances, we make references to North American Industry Classification System (NAICS) and Standard Occupational Classification (SOC) codes; the former is an industry classification whereas the latter is an occupational or job classification.

3. Approach

This section outlines the survey administration approach, includes detailed descriptions of how green jobs were defined for the MARC region, and presents an overview of our survey methodology.

3.1. Defining Green Jobs for the MARC Region

To create a definition of green jobs for the MARC region, we first reviewed the definitions used in previous green jobs studies (California, Michigan, Minnesota, Oregon, and Washington) as well as the "Principles for Developing a Measurable Definition of Green Jobs" section in the Workforce Information Council (*WIC) Green Jobs Study Group Final Report*.[11] We also reviewed the new BLS definition for "green" employment and training activities that was issued for public comment in the *Federal Register* on March 16, 2010 and finalized in the September 21, 2010 *Federal Register*.[12] Our review of existing green job definitions confirmed that there are many different – sometimes competing – definitions of a green jobs, green businesses, and green industries.

In addition to reviewing current definitions, we considered a number of different factors while developing the definition of a green job for the MARC region survey. First, the definition for green jobs needs to be specific enough so that it is defensible and reproducible, but the definition should not be so broad that it leads to catch-all sectors that include any industry or job that is remotely related to environmental sustainability. This helps ensure the integrity of the definition, of any research based on it, and to the industry itself. We wanted to ensure, however, that the definition be sufficiently broad and flexible to encompass the multidisciplinary supply-chain of a perpetually advancing industry. This allows the list of applicable industries/occupations to be broadened or refined over time depending on industry trends.

Finally, we considered that many traditional occupations have green components, such as architecture and production occupations, and that an employee's job may not be dedicated entirely to "green" activities. Consequently, definitions could span the spectrum, from requiring that 100 percent of the workload be green-related to any portion of activity that is green. Because of this broad spectrum, the definition needs to address the portion of time an employee dedicates to green tasks for that job to be considered green.

After we evaluated the existing definitions and considered the above issues, we decided to define green industries/occupations relatively broadly but provide specific examples of each sector to clarify applicable industries/occupations. Ultimately, we chose an output definition (versus a process definition), defining a job as "green" when *any* portion of an employee's workload includes producing a product or supplying a service in one or more of the following seven core areas issued by the BLS in March 2010:

[11] The Secretary of Labor, through the BLS, acts with other Federal agencies and State employment statistics agency representatives elected by their peers. Collectively known as the WIC, this group works together to plan, guide, and oversee the nationwide workforce information system.

[12] On September 21, 2010, BLS published responses to comments they had received on the draft definition as well as the final definition of green jobs. Our definition closely matches and is easily cross-walked with the final BLS definition.

1. Renewable energy and alternative fuels.
2. Energy efficiency and conservation.
3. Greenhouse gas reduction.
4. Pollution reduction and cleanup.
5. Recycling and waste reduction.
6. Sustainable agriculture and natural resource conservation.
7. Education, compliance, public awareness, and training directly related to activities 1-6 above.

The following table of examples provides context for what is considered to be "green" in this study. The table, however, is not comprehensive and not all green activities are listed.

Table 1. Green Job Categories and Examples

Number	Green Job Category[13]	Examples
1	Renewable energy and alternative fuels	Activities related to manufacturing, production, construction, design, research, delivery, operation, storage, maintenance and distribution of energy (electricity, heat, and fuel) from renewable sources, including wind, solar, biomass, hydrogen fuel cells, alternative transportation fuels, geothermal, ocean, methane, and waste incineration as a fuel source.
2	Energy efficiency and energy conservation	Manufacturing, construction, installation, production of energy efficient products (such as Energy Star rated appliances, more efficient lighting), energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements (smart grid), transportation technology, and battery development and storage improvement. Overall increasing the energy efficiency of production processes, distribution, construction, installation, and maintenance.
3	Greenhouse gas reduction	Includes controlling and reducing emissions of CO2, other greenhouse gases, waste water, and other pollutants through approaches other than renewable energy generation and energy conservation. Includes generation of electricity from nuclear sources and reduction of greenhouse gas emissions in electricity generation from fossil fuels.
4	Pollution reduction and cleanup	Activities related to controlling commercial, transportation, and industrial emissions and pollution; water treatment, recycling operations, waste product management and treatment, activities to remove pollutants and hazardous waste from the environment.
5	Recycling and waste reduction	Environmental remediation including the cleanup and disposal of pollution, waste, waste water, and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.
6	Sustainable agriculture and natural resource	Products and services to conserve, maintain, and improve natural resources and environment, including low carbon agriculture, land management, water management and conservation, wetlands restoration, and environmental conservation. Includes bioscience related activities. Includes reducing the environmental impact of

[13] As mentioned above, our definition is easily cross-walked to the recently released BLS definition of green jobs. Our categories 1 and 2 map directly to BLS categories 1 and 2. Our categories 3, 4, and 5 maps directly to the three sub-sections in the BLS category 3: Pollution reduction and removal, greenhouse gas reduction and recycling and reuse. Finally, our categories 6 and 7 map to BLS categories 4 and 5.

Number	Green Job Category[13]	Examples
	conservation	agricultural production and improve natural resources conservation, including reducing use of chemical fertilizers and pesticides, soil and water conservation, sustainable forestry, land management, and wildlife conservation.
7	Education, compliance, public awareness, and training directly related to green jobs	Activities to educate the public, business, and government on energy efficiency, renewable energy, energy rating systems certifications (Energy Star, LEED), and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy related products and processes. In theory, energy trading could include buying and selling of power or fuels related to energy efficiency and renewable energy as well as cap and trade activity to control pollution.

3.2. Methodology Overview – Survey Data Collection

We employed a mixed-mode approach to the regional study of employers. Specifically, we collected quantitative data via web- and paper-based surveys and phone outreach and support. As noted by de Leeuw (2005), mixed-mode surveys have become the norm as survey managers seek to use collection procedures that produce the best possible data within existing constraints of time and budget.[14] According to a BLS (2008) article titled *Challenging Research Issues in Statistics and Survey Methodology at the BLS,* "one of the most recent, significant innovations is the Internet, and federal statistical agencies are increasingly attempting to move surveys to the Internet, or to offer it as a reporting option" (para. 11).[15] Therefore, we used mixed-modes for the employer survey to provide respondents with multiple options for response.

The objectives of the study included: a) collecting regional and employer data about green occupations (including how those occupations are defined); b) defining projected growth sectors, particularly for renewable energy and energy efficiency jobs; c) outlining recruitment and retention opportunities and challenges; d) identifying training gaps and opportunities; e) providing estimates on the number and types of available green jobs; and f) providing information to enhance the labor exchange portal for employees and employers in DC, Maryland, and Virginia to connect around green occupations.

We distributed approximately 35,000 surveys to private and public employers (federal, state, local) and non-profit employers in DC, Maryland, and Virginia. The survey included company-wide questions about whether the organization was still functioning in an identified city or county, the number of employees throughout the company regardless of location, and revenue information. In addition, the survey asked establishment- or site-specific questions about the organization's employees, green jobs, training and education, and other questions intended to gauge the employer's labor gaps. With regard to green employment, respondents were asked to include workers engaged in producing or providing any green-

[14] de Leeuw, E. D. (2005). To Mix or Not to Mix Data Collection Modes in Surveys. *The Journal of Official Statistics*, 21(2), 233-255.

[15] Bureau of Labor Statistics. (2008). Challenging Research Issues in Statistics and Survey Methodology at the BLS. Retrieved on October 10, 2010 from http://www.bls.gov/osmr/challenging_issues/mixedmode.htm.

related products or services and to report employees, job openings, and recruitment according to the seven green categories discussed above.

MARC-SAT researched lessons-learned and promising practices from other jurisdictions in drafting survey questions. Specifically, MARC-SAT reviewed data collection items, green jobs definitions, survey findings, and best practices from previously administered green jobs/labor market studies in California, Michigan, Missouri, New York, Oregon, Washington State, and other jurisdictions in drafting the survey questions. The team also evaluated information issued by the BLS and participated in the BLS webinar discussing green jobs definitions, data collection, survey practices, and accounting methodology. The survey development team also evaluated the State of Florida's survey when it was issued in mid-June, after the MARC survey was near completion. In addition, MARC-SAT conducted pretests with Human Resources and Operations Managers in Virginia and the District of Columbia. Feedback from the pretests was used to revise and refine the questionnaire.

MARC Green Jobs Survey

- ⇨ 35,000 private and public employers in Maryland, DC, and Virginia
- ⇨ Paper and Internet-based surveys
- ⇨ Dedicated toll-free phone support
- ⇨ Gathered LMI to make the region more competitive (employment, education, training)

In addition to the paper-based survey, we developed a web-based survey available to participants approximately two weeks after the first paper survey was distributed to respondents; respondents were invited to complete the web survey via a reminder postcard. Both versions of the survey asked the same questions; however, the web-based survey structured the questions in a manner that was more conducive to completing the survey online. For example, skip patterns were incorporated into the web-based version to reduce confusion and time required from respondents. Overall, a majority of the respondents completed the survey via the paper-based option - 7,557 respondents returned the survey via paper; 2,335 did so via the web. See Appendix A for copies of questionnaires.

MARC-SAT identified 732 as "Green NAICS Codes" and were used in sampling and analysis activities for the MARC survey. The list of 732 was compiled using information and green-related NAICS codes from the BLS and numerous regional and state green employment surveys conducted over the past five years.

4. Findings

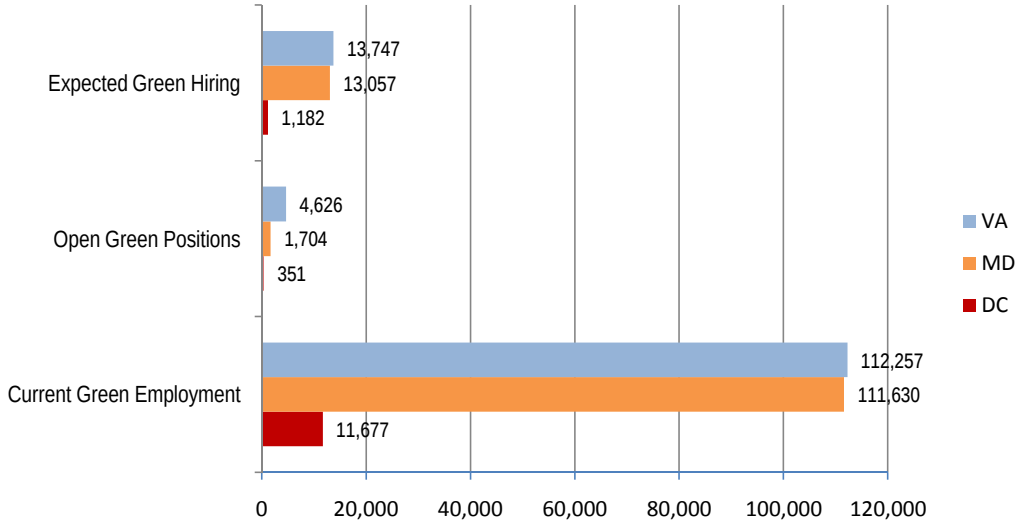
This section of the report presents the results of the MARC Regional Employer survey through a series of charts and tables of findings with accompanying narrative.

4.1. General Findings

The MARC region has approximately 235,600 workers engaged in the production or provision of green products or services who are employed by more than 29,300 establishments. This constitutes a green employment base that represents approximately 3 to 4 percent of the total regional jobs. The number of green jobs in each jurisdiction, however, varies significantly. The District of Columbia has almost 11,700 green jobs (2 percent of its total workforce), Maryland has roughly 111,600 green jobs (4.8 percent of the state's total workforce), and Virginia has more than 112,300 green jobs (3.4 percent of the state's total workforce).

Figure 4 presents the current green employment, the number of open positions, and hiring expectations over the next two years, by jurisdiction.

Figure 4. Current and Expected Green Jobs (2010)



Source: ICF MARC Regional Employer Survey

At the close of the survey, there were approximately 350 open green positions in DC, 1,700 open green positions in Maryland, and more than 4,600 open green positions in Virginia. The number of open green positions relative to current green employment is highest in Virginia, where the number of open green positions is equal to 4.1 percent of current green employment, followed by DC at 3 percent and Maryland at

1.5 percent. Over the next two years, employers in DC expect to hire approximately 1,180 new green employees (10.1 percent of current green employment), employers in Maryland expect to hire more than 13,000 new green employees (11.7 percent of current green employment), and employers in Virginia expect to hire more than 13,700 new green employees (12.2 percent of current green employment).

Approximately 87 percent of the green employment in the region is full-time labor, while the remaining 13 percent is part-time labor. This pattern holds true for each jurisdiction and is consistent with findings from a similar study conducted in the State of Washington.[16]

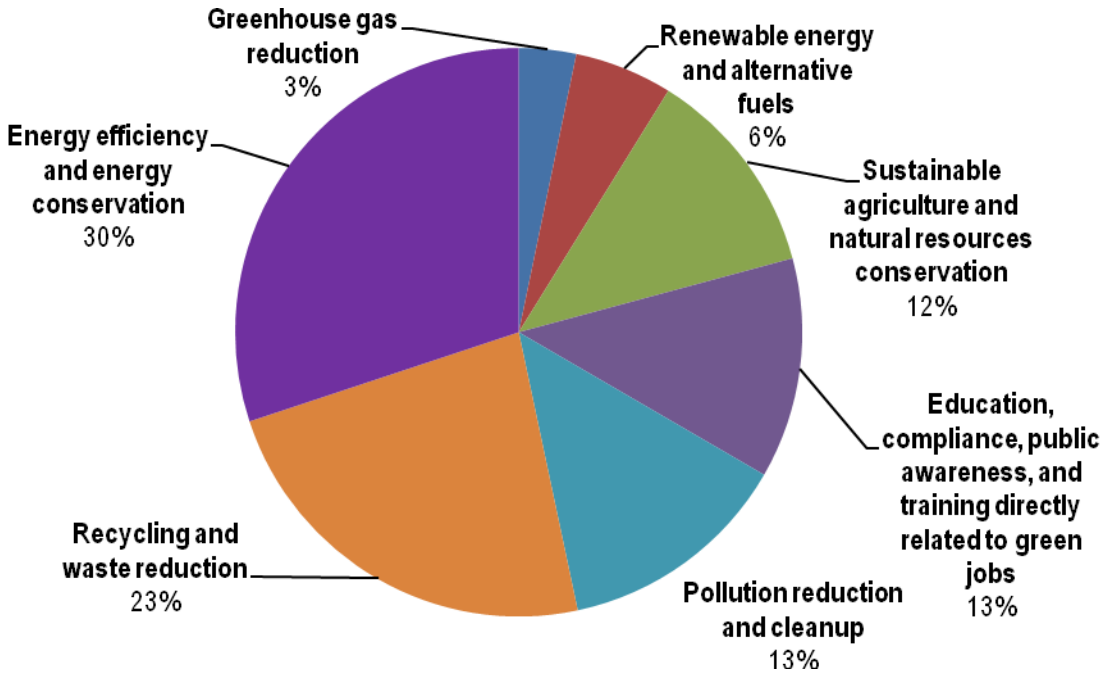
The size of green establishments is also relatively consistent across jurisdictions.[17] On average, green establishments in Virginia are slightly larger than their DC or Maryland counterparts. The average size of a green establishment in Virginia is 47 employees compared to 39 employees in Maryland and 34 in DC.[18]

4.2. Green Employment by Core Area

MARC Region

Figure 5 presents the employment by green core area as a percent of total green employment.

Figure 5. Green Jobs by Core Area in MARC Region
(Employment in Green Categories as a Percentage of Total Green Employment)



Source: ICF MARC Regional Employer Survey

[16] Washington State Employment Security Department, "2008 Washington State Green Economy Jobs," January 2009, 4.

[17] The term "establishment" refers to an individual geographic location of a company not the entire enterprise

[18] Employee counts include both part-time and full-time employees.

Energy Efficiency and Conservation constitutes the largest segment at 30 percent of regional green employment followed closely by Recycling and Waste Reduction at 23 percent. Pollution Reduction and Cleanup; Education, Compliance, Public Awareness, and Training; and Sustainable Agriculture and Natural Resource Conservation each account for 12 to 13 percent of the regional green employment. The Renewable Energy and Alternative Fuels and Greenhouse Gas Reduction categories make up smaller percentages (6 and 3 percent, respectively) of regional green jobs.

These patterns of employment by green core area are similar to those identified by other green job survey analyses completed across the country. Studies in California, Missouri, and Washington State, for example, find that job categories related to energy efficiency represent the largest segment of each state's green employment, and a study in Michigan finds that energy efficiency constitutes the second largest segment of its green economy.[19,20,21,22] Similarly, the California, Michigan, and Washington State studies show that renewable energy production accounts for less than 10 percent of total green employment.[23,24,25] The prevalence of the core areas of green employment, however, varies by state in some instances. The Michigan study, for example, finds Clean Transportation and Fuels to be the largest green sector in the state, while the equivalent categories in this study (roughly a combination of the Greenhouse Gas Reduction category and a portion of the Renewable Energy and Alternative Fuels category) account for less than 10 percent of green employment in the MARC region.[26]

Figure 6 presents a breakdown of the green jobs by green core area and jurisdiction.

[19] State of California Employment Development Department, Labor Market Information Division, "California's Green Economy: Summary of Survey Results," October 2010, 17.

[20] Michigan Department of Energy, Labor & Economic Growth, Bureau of Labor Market Information & Strategic Initiatives, "Michigan Green Jobs Report: Occupations & Employment in the New Green Economy," 13.

[21] Missouri Department of Economic Development, Missouri Economic Research & Information Center, "The Missouri Green Jobs Report," 12.

[22] Washington State Employment Security Department, 5;

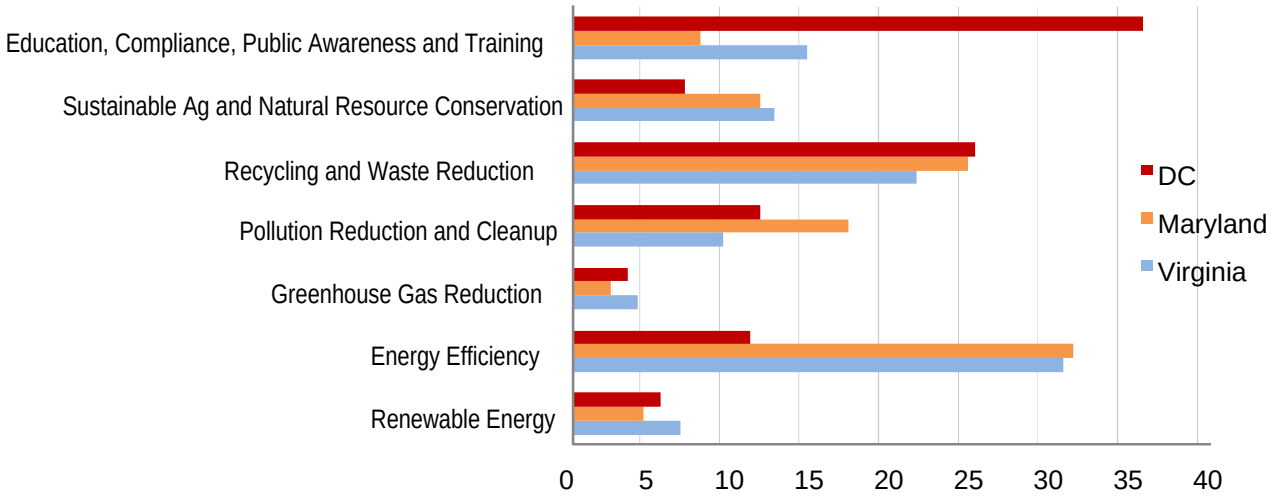
[23] State of California Employment Development Department, 17.

[24] Michigan Department of Energy, 13.

[25] Washington State Employment Security Department, 5

[26] Michigan Department of Energy, 13.

Figure 6. Percentage of Green Jobs by Core Area and Jurisdiction



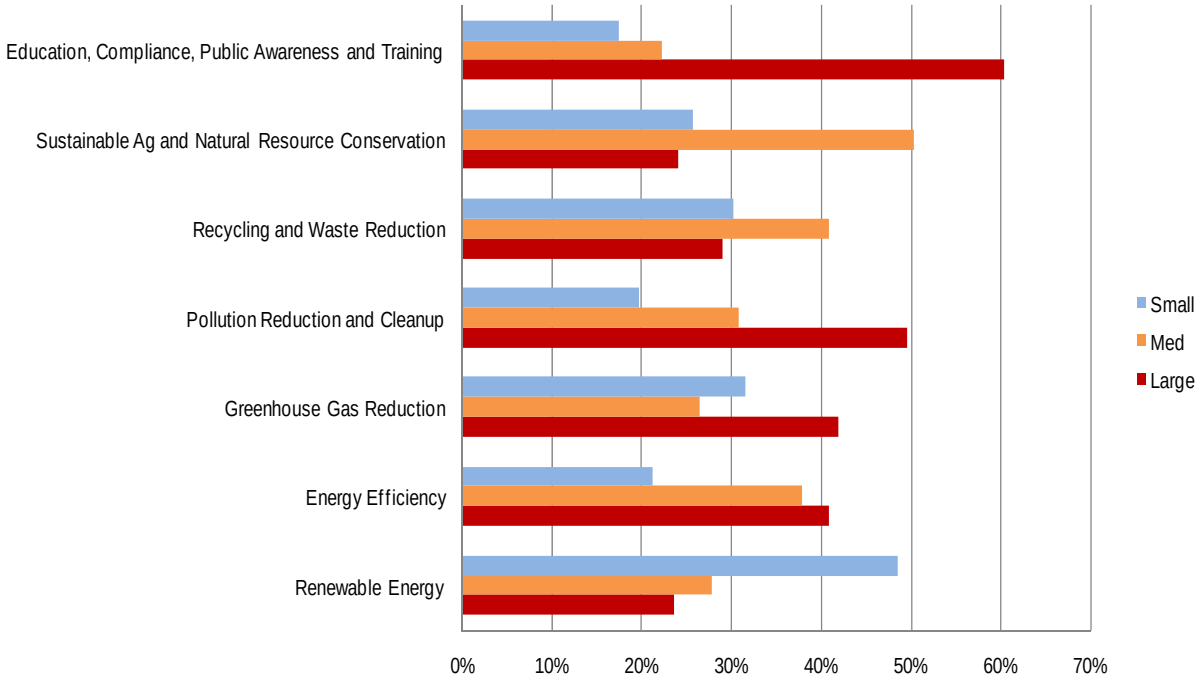
Source: ICF MARC Regional Employer Survey

There is significant variation across jurisdictions in terms of the dominant green category. In DC, for example, only 12 percent of green employment is in Energy Efficiency and Energy Conservation, while 36 percent of green employment is in Education, Compliance, Public Awareness and Training. Given the uniqueness of DC's economy, it is not surprising that its green job patterns are different than those in Maryland and Virginia. The federal government, education/health organizations, government contracting activities, as well as professional and business services represent a large portion of the local economy in DC, and are likely to provide green jobs that fall under the Education, Compliance, Public Awareness, and Training category.[27] The industry sectors of Education Services, Professional, Scientific and Technical Services and Religious, Grantmaking, Civic, Professional Organizations industry sectors make up a large portion of this green category, as well as the total DC economy. Maryland and Virginia each have 31 percent of employment in the Energy Efficiency and Energy Conservation category and less than 15 percent in the Education, Compliance, Public Awareness, and Training category. The Specialty Trade Contractor industry, and to a lesser extent, the Professional, Scientific, and Technical Services industry, provide many of the jobs in the Energy Efficiency and Energy Conservation category.

Figure 7 presents the distribution of large, medium, and small establishments by green category.

[27] DC Chamber of Commerce (2010). 2010 State of the Business: The District of Columbia in an Economic Context. Retrieved February 21, 2011 from http://www.dcchamber.org/clientuploads/2010%20State%20of%20Business%20Report.pdf

Figure 7. Percent of Employment in Large, Medium and Small Establishments by Green Core Area



Note: Small: 1-9 total employees (i.e., full-time plus part-time); Medium: 10-49 total employees; Large: 50 or more total employees

Source: ICF MARC Regional Employer Survey

Large establishments (50 or more employees) are more common in the Education, Compliance, Public Awareness, and Training and Pollution Reduction and Cleanup core green employment definition areas, while establishments in the Renewable Energy area tend to be small (9 or fewer employees). Recycling and Waste Reduction, Greenhouse Gas Reduction, and Energy Efficiency establishments vary significantly in terms of size, while Sustainable Agriculture and Natural Resource establishments tend to be mid-sized (10 to 49 employees).

The establishment size patterns for each green employment definition area are relatively consistent across jurisdictions with the exception of Renewable Energy. Establishments with Renewable Energy employees tend to be small or medium-sized in Maryland, medium or large in DC, and large in Virginia.

MARC Region at the WIA Level

Current green employment totals at the WIA level range from 1539 reported by employers in the Southwest Virginia WIA to 26558 in Hampton Roads, VA WIA. Current green employment was also examined as a percentage of total employment at the WIA level , employers reported levels ranging from 1.7 percent in DC to about 7.3 percent for the Lower Shore WIA in Maryland. On average, the Maryland WIAs have the highest proportions of green employees to all employees, particularly for the coastal WIAs. Figures 8 and 9 represent total employment and proportions of green employment respectively, at the WIA level for the MARC region.

Figure 8. Green Employment in the WIAs

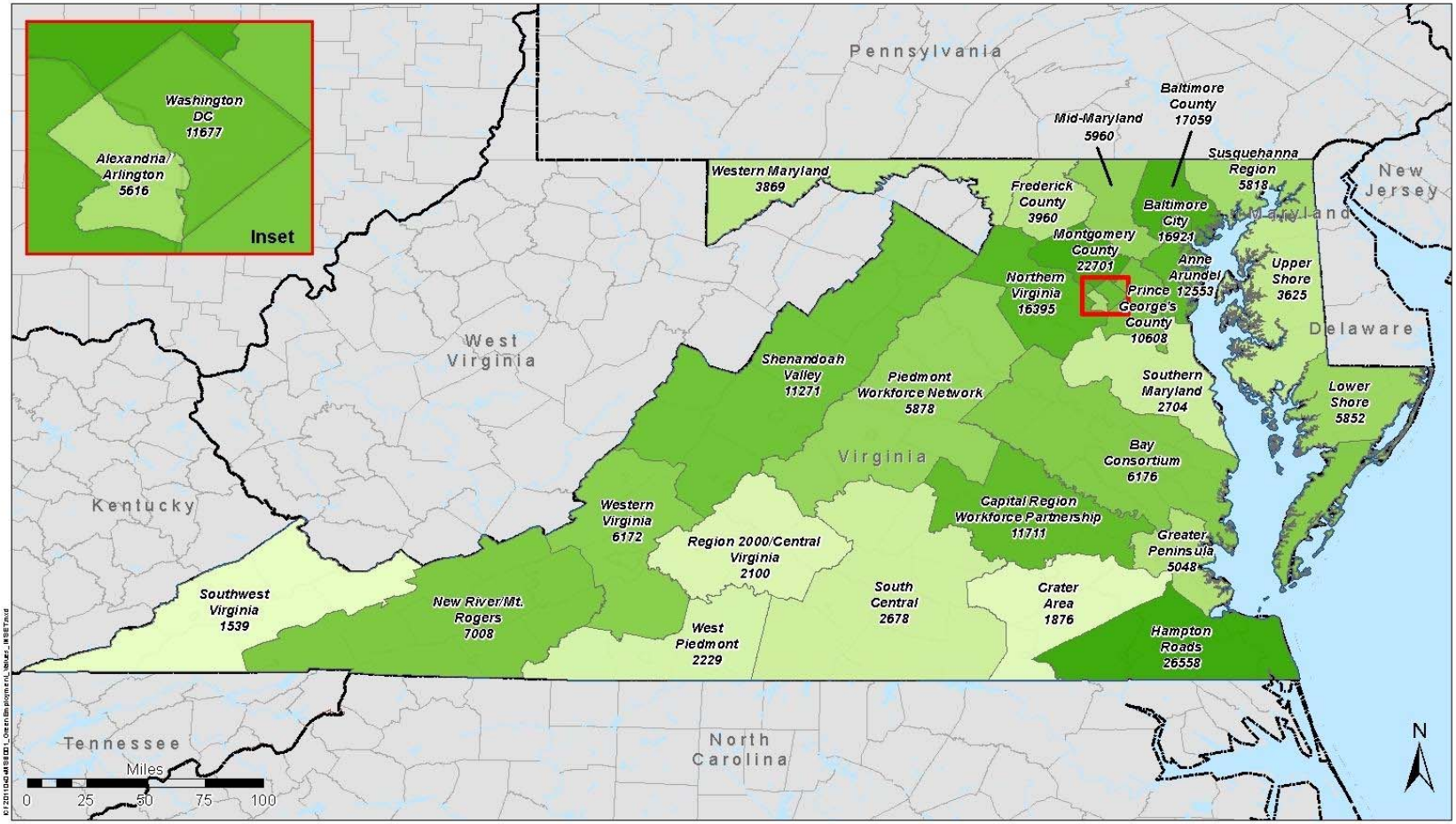
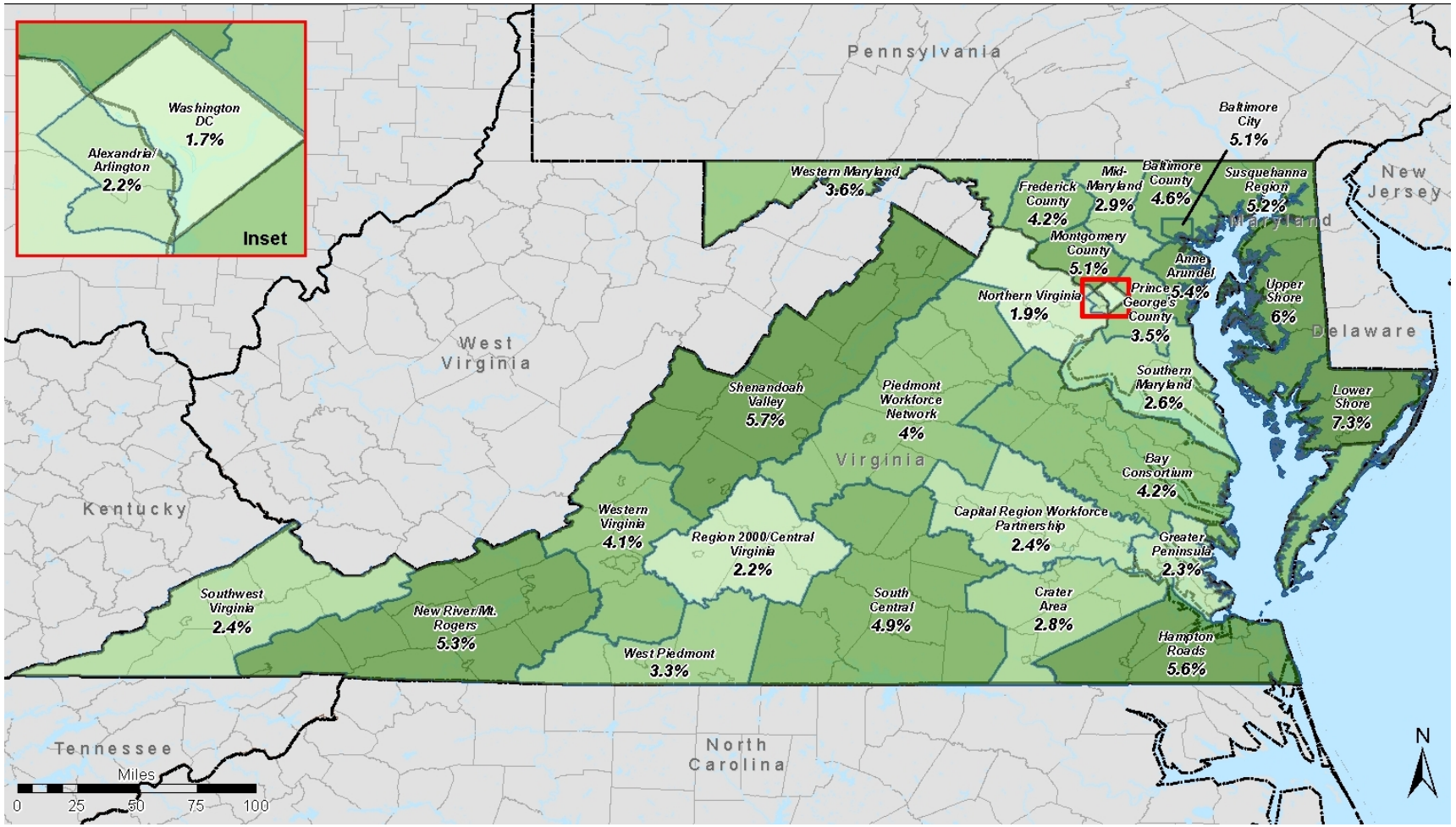


Figure 9. Expected Green Employment as a Percentage of Total Employment in the WIASs



Source: ICF MARC Regional Employer Survey

4.3. Green Employment by Industry

This section discusses the industries related to the green economy.

MARC Region

The MARC region has green employment in more than 300 industries. Regional green employment, however, is concentrated in a few key industries related to construction, education/policy, and production. Table 2 presents the distribution of green employment across the top 25 industries (as defined by 3-digit NAICS code classifications).

Table 2. Top 25 Industries, MARC Regional Green Employment

NAICS Code	NAICS Title	Renewable energy and alt. fuels	Energy efficiency and energy conservation	Greenhouse gas reduction	Pollution reduction and clean-up	Recycling and waste reduction	Sustainable agric. and natural resource conservation	Education, compliance, public awareness and training	Total
238	Specialty Trade Contractors	1,038	33,110	1,372	3,772	7,943	790	603	48,629
541	Professional, Scientific, and Technical Services	2,167	10,370	1,425	4,797	4,955	6,053	5,512	35,280
561	Administrative and Support Services	1,574	777	250	5,958	2,535	7,045	336	18,476
611	Educational Services	229	774	182	360	585	984	12,003	15,117
236	Construction of Buildings	1,143	6,576	151	715	1,237	142	516	10,479
811	Repair and Maintenance	369	1,635	354	1,646	3,724	52	255	8,035
423	Merchant Wholesalers, Durable Goods	242	2,002	122	427	5,119	-	26	7,938
813	Religious, Grant making, Civic, Professional, and Similar Organizations	145	1,029	115	307	1,978	620	3,356	7,550
326	Plastics and Rubber Products Manufacturing	70	3,993	9	218	751	-	339	5,381
562	Waste Management and Remediation Services	-	157	127	1,996	3,045	-	44	5,370
321	Wood Product Manufacturing	997	13	673	559	386	2,081	50	4,759
921	Executive, Legislative, and Other General Government Support	190	278	155	1,331	2,057	300	207	4,519
323	Printing and Related Support Activities	719	179	-	149	1,985	730	94	3,856
424	Merchant Wholesalers, Nondurable Goods	92	138	4	667	1,478	1,029	4	3,411
444	Building Material and Garden Equipment and Supplies Dealers	749	237	157	286	953	753	183	3,319
332	Fabricated Metal Product Manufacturing	201	1,815	267	172	736	-	8	3,199
111	Crop Production	-	-	596	-	-	2,571	-	3,166
923	Administration of Human Resource Programs	25	-	303	1,178	405	532	715	3,158
453	Miscellaneous Store Retailers	-	26	168	174	2,374	270	106	3,118
237	Heavy and Civil Engineering	366	279	-	191	1,703	238	322	3,098

NAICS Code	NAICS Title	Renewable energy and alt. fuels	Energy efficiency and energy conservation	Greenhouse gas reduction	Pollution reduction and clean-up	Recycling and waste reduction	Sustainable agric. and natural resource conservation	Education, compliance, public awareness and training	Total
	Construction								
621	Ambulatory Health Care Services	26	-	-	712	867	-	1,130	2,735
484	Truck Transportation	53	1,043	138	314	200	-	122	1,871
441	Motor Vehicle and Parts Dealers	10	444	97	215	700	-	216	1,682
926	Administration of Economic Programs	3	-	-	1,485	7	-	30	1,525
113	Forestry and Logging	688	-	-	20	91	549	-	1,348

Source: ICF MARC Regional Employer Survey

In the MARC Region, more than 50 percent of green employment is concentrated in five industries related to construction, technical services, and education/policy. Many industries and individual employers, however, have green jobs that can be classified under several of the green categories.

The two largest industry sectors – Specialty Trade Contractors and Professional, Scientific and Technical Services – are both construction-related and combine to account for approximately 36 percent of all regional green jobs.[28] Within these industries, plumbing, electrical services, engineering, and architectural professional services are the most common sub-sectors, comprising roughly 68,000 green jobs.

The Administrative and Support Services industry accounts for approximately 7.8 percent of green jobs in the region, including about 11,500 employees engaged in landscaping services. The Educational Services industry accounts for about 6.4 percent of green jobs in the region, primarily in the sub-sector of elementary and secondary schools, which includes more than 11,500 educators engaged in teaching and training related to green jobs as well as facilities coordinators responsible for institutional energy and recycling practices. Many production and maintenance industries include remediation services, engaging in product recycling or retooling, and recyclable material merchant wholesalers. In total, the top 25 industries account for nearly 88 percent of green employment in the region.

Table 3 displays the top 10 industries with the largest number of green employees in the region, sorted by the percentage of total regional employment in each industry that is attributable to green jobs.

[28] The professional, scientific, and technical services industry, as defined by the North American Industry Classification System, includes a wide variety of services, only some of which are construction-related. However, construction-related professional services accounted for a large portion of the green jobs reported in this industry.

Table 3. Green Jobs as a Percent of Industry Employment, Top 10 Industries

NAICS Code	NAICS Title	MARC Green Employment	Green Jobs as a Percent of Industry Employment
562	Waste Management and Remediation Services	5,370	28%
326	Plastics and Rubber Products Manufacturing	5,381	24%
238	Specialty Trade Contractors	48,629	21%
811	Repair and Maintenance	8,035	14%
236	Construction of Buildings	10,479	13%
423	Merchant Wholesalers, Durable Goods	7,938	8%
813	Religious, Grant making, Civic, Professional, and Similar Organizations	7,550	6%
541	Professional, Scientific, and Technical Services	35,280	5%
561	Administrative and Support Services	18,476	5%
611	Educational Services	15,117	2%

Source: QCEW, 2010; District of Columbia, Maryland, Virginia; ICF MARC Regional Employer Survey

The industries with the greatest number of green employees do not necessarily have the highest percentage of green employees. In fact, among these ten industries, the industries with the highest percentage of green employees are Waste Management and Remediation Services (28 percent) and Plastics and Rubber Products Manufacturing (24 percent), but they are the ninth and tenth largest industries by number of green employees, respectively. Green employment makes up roughly 15 to 20 percent of employment in several construction-related industries, including Specialty Trade Contractors, Repair and Maintenance, and Construction of Buildings. Green employment in the Professional, Scientific, and Technical Services industry, however, which includes a large number of green jobs in construction-related sub-sectors, makes up only 5 percent of employment in the industry. The wide variety of services included in this industry (e.g., consulting, legal, accounting, computer, photographic, and veterinary), many of which are not construction related, likely drives down the percentage of employment in the industry attributable to green jobs. Green jobs make up less than 10 percent of total employment in the other top green employment industries in the MARC Region.

District of Columbia

Table 4 presents the top ten industries in the District of Columbia, in terms of green employment.

Table 4. Top 10 Industries, District of Columbia Green Employment

NAICS Code	NAICS Title	Green Employment	Percent of Industry that is Green
541	Professional, Scientific, and Technical Services	3,256	3%
813	Religious, Grant making, Civic, Professional, and Similar Organizations	2,906	6%
621	Ambulatory Health Care Services	2,350	17%
611	Educational Services	556	1%
322	Paper Manufacturing	548	N/A
236	Construction of Buildings	428	12%
221	Utilities	323	13%
444	Building Material and Garden Equipment and Supplies Dealers	299	47%
561	Administrative and Support Services	278	1%
522	Credit Intermediation and Related Activities	249	3%

Source: QCEW, 2010 District of Columbia; ICF MARC Regional Employer Survey

DC's green employment is highly concentrated in a few industries. More than 73 percent of green employment in DC is represented by just three industries: Professional, Scientific, and Technical Services; Religious, Grantmaking, Civic, and Similar Organizations; and Ambulatory Health Care Services. The top 10 industries account for 96 percent of DC's green employment. The concentration of green jobs by industry is much greater in DC than in the MARC region as a whole. For comparison, the top 10 industries by green employment in the MARC region as a whole account for less than 70 percent of green employment in the region.

Within the Professional, Scientific, and Technical Services industry, sub-industries with large numbers of green jobs in DC include:

- Architectural Services,
- Public Relations Agencies,
- Offices of Lawyers, and
- Research and Development in the Social Sciences and Humanities.

The Environment, Conservation, and Wildlife Organizations sub-industry accounts for the bulk of green jobs in the Religious, Grant making, Civic, Professional, and Similar Organizations industry. Human Rights Organizations also provide a significant number of green jobs and fall under this industry.

Maryland

Table 5 displays the top 10 industries in Maryland in terms of green employment.

Table 5. Top 10 Industries, Maryland Green Employment

NAICS Code	NAICS Title	Green Employment	Percent of Industry that is Green
238	Specialty Trade Contractors	31,123	30%
541	Professional, Scientific, and Technical Services	14,761	6%
561	Administrative and Support Services	11,967	9%
811	Repair and Maintenance	4,172	18%
562	Waste Management and Remediation Services	3,663	44%
323	Printing and Related Support Activities	3,611	35%
236	Construction of Buildings	3,170	10%
813	Religious, Grant making, Civic, Professional, and Similar Organizations	3,057	12%
923	Administration of Human Resource Programs	2,959	5%
326	Plastics and Rubber Products Manufacturing	2,855	45%

Source: QCEW, 2010 Maryland; ICF MARC Regional Employer Survey

Green employment in Maryland is highly concentrated in a few industries but is less concentrated than green employment in DC. The top three industry sectors in Maryland – Specialty Trade Contractors (28 percent); Professional, Scientific, and Technical Services (13 percent); and Administrative and Support Services (11 percent) – account for approximately 52 percent of all green employment in the state. Similar to the regional pattern, Maryland's green employment is primarily in construction-related industries. No industry outside the top three industries accounts for more than 5 percent of the state's green employment.

The three sub-industries that have the highest green employment in Maryland within the Specialty Trade Contractors industry are listed below. All of these sub-industries are related to energy efficiency/weatherization (commercial and residential) work:

- Nonresidential Plumbing, Heating, and Air-Conditioning Contractors,
- Residential Electrical Contractors and Other Wiring Installation Contractors, and
- Nonresidential Electrical Contractors and Other Wiring Installation Contractors.

The Architectural Services and Environmental Consulting Services sub-industries account for the bulk of Maryland's green jobs in the Professional, Scientific, and Technical Services industry, while Landscaping Services is the top sub-industry for the Administrative and Support Services industry sector.

Virginia

As presented in Table 6, Virginia's green employment is the least concentrated by industry when compared with DC and Maryland.

Table 6. Top 10 Industries, Virginia Green Employment

NAICS Code	NAICS Title	Green Employment	Percent of Industry that is Green
238	Specialty Trade Contractors	17,506	14%
541	Professional, Scientific, and Technical Services	17,262	4%
611	Educational Services	12,341	4%
236	Construction of Buildings	6,881	17%
561	Administrative and Support Services	6,230	3%
423	Merchant Wholesalers, Durable Goods	5,086	9%
321	Wood Product Manufacturing	4,686	35%
811	Repair and Maintenance	3,778	11%
111	Crop Production	2,953	54%
332	Fabricated Metal Product Manufacturing	2,632	15%

Source: QCEW, 2010 Virginia; ICF MARC Regional Employer Survey

The largest three industry sectors - Specialty Trade Contractors; Professional, Scientific, and Technical Services; and Educational Services - still account for 42 percent of green employment in the Commonwealth, while the top ten industries account for 71 percent of total green employment. Similar to Maryland, construction-related industries are well represented among the top industries in terms of green employment.

The three sub-industries that have the highest green employment in Virginia within the Specialty Trade Contractors industry are listed below. Similar to the pattern in Maryland, these sub-industries are related to energy efficiency/weatherization (commercial and residential) work:

- Nonresidential Plumbing, Heating, and Air-Conditioning Contractors,
- Residential Electrical Contractors and Other Wiring Installation Contractors, and
- Residential Finish Carpentry Contractors.

The Engineering Services and Architectural Services sub-industries account for the bulk of Virginia's green jobs in the Professional, Scientific and Technical Services industry, while Elementary and Secondary Schools is the top sub-industry for the Education Services industry. Other key sub-industries include:

- Landscaping Services,
- Residential Remodelers,
- Nursery and Tree Production, and
- Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology).

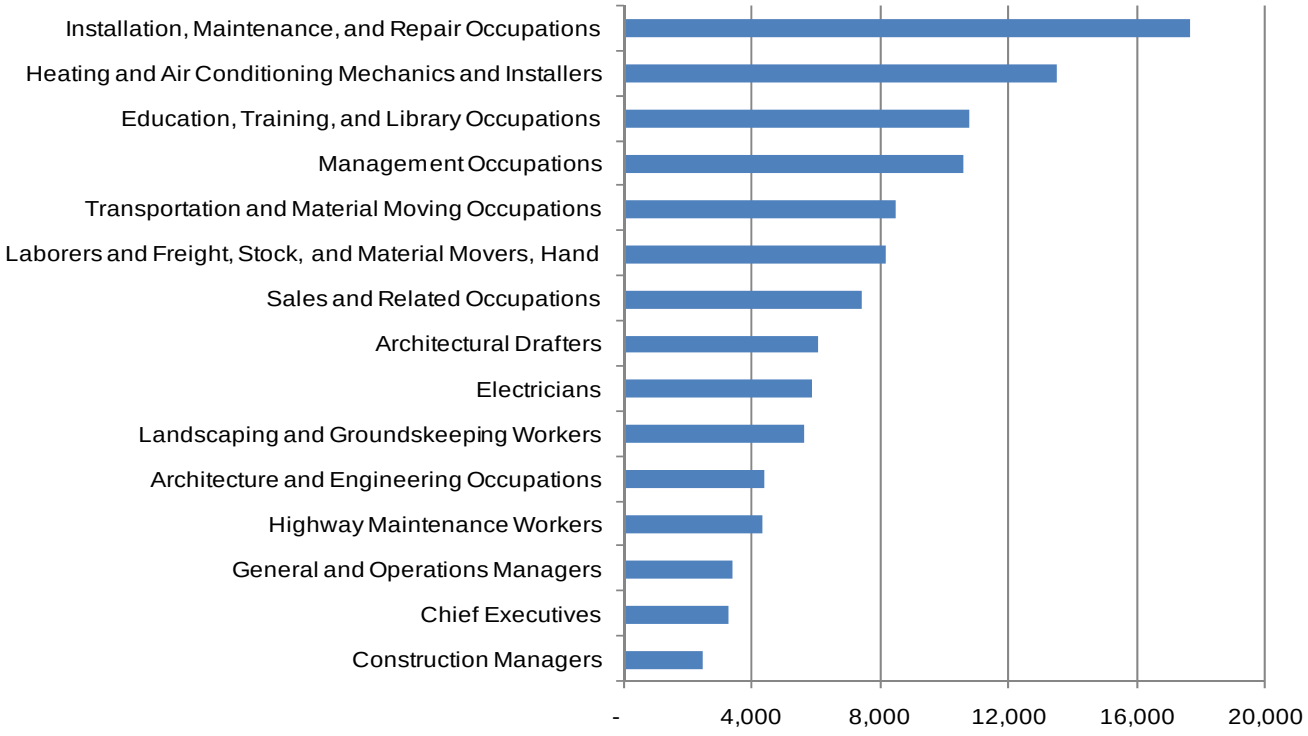
4.4. Green Employment by Occupation

This section discusses the occupations related to the green economy. Understanding the characteristics of green occupations is extremely important. An understanding of which occupations are considered green will assist workforce development practitioners and educators to understand the competency skills required to expand the region's green economy. Information on the characteristics of green-related occupations will also assist potential jobseekers in making informed decisions about selecting and training for green job openings. Occupational information will also be relevant to the economic development community because the attraction and retention of green businesses may depend on demonstrating the availability of a qualified regional labor pool for green jobs.

The MARC region has green employment in roughly 360 occupation codes, as defined by the SOC system. The region's green jobs are more dispersed by occupation than by industry but are still relatively concentrated. More than 50 percent of green employment in the region is concentrated in the top 20 occupations (compared to 50 percent of green employment in the top five industries).

Figure 10 presents the occupation groups with the largest number of green employees across the MARC region.

Figure 10. Top 15 Occupation Groups for Green Employment in MARC Region



Source: ICF MARC Regional Employer Survey

These 15 occupation groups account for 48 percent of green employment across the MARC region. Seven of the top 15 occupations are related to building/construction/design. This finding is not surprising due to the prevalence of establishments in construction-related industries among green employers.

The following five occupations account for 26 percent of the total green employment across the MARC region:

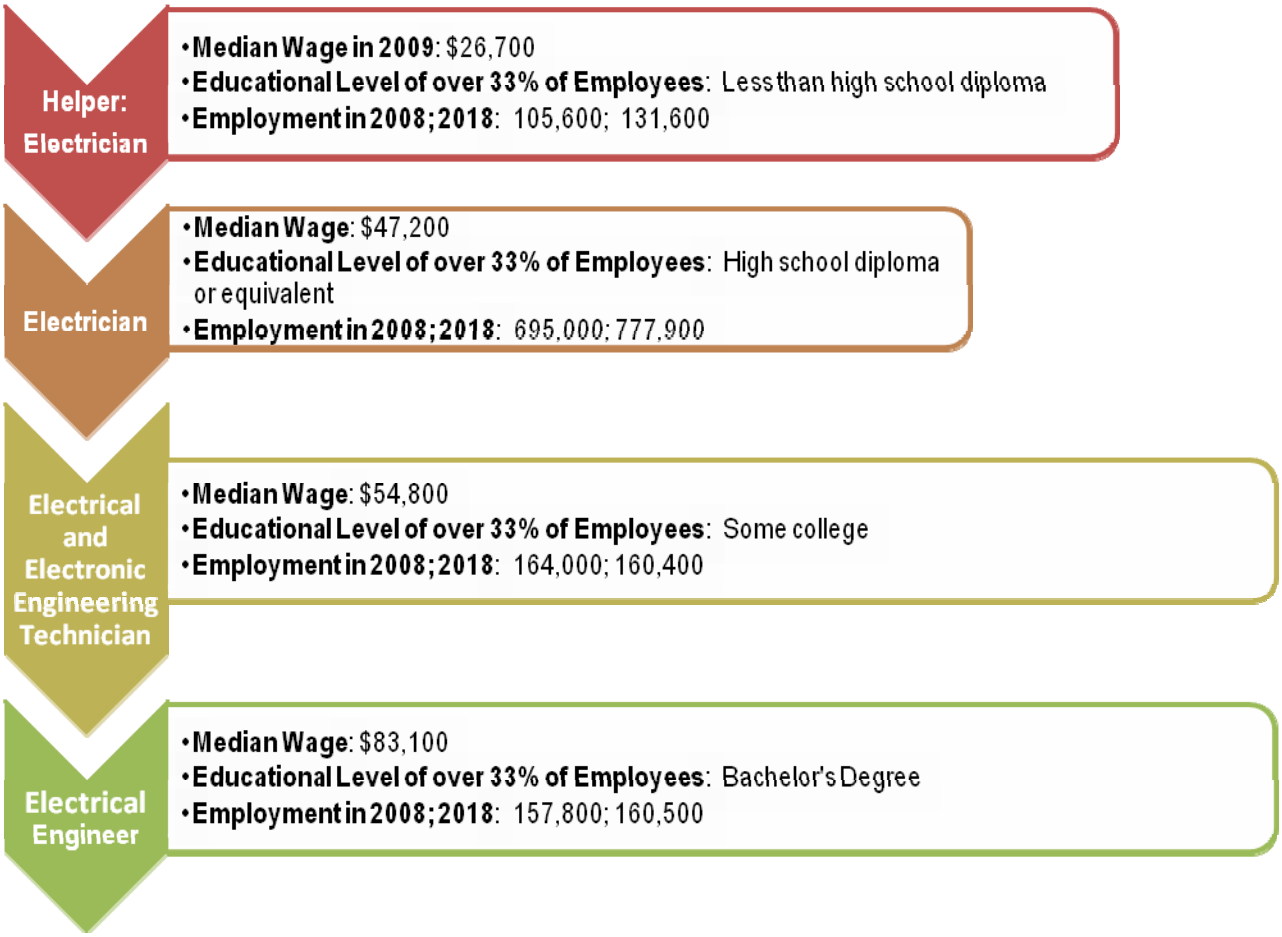
- Installation, Maintenance, and Repair Occupations,
- Heating and Air Conditioning Mechanics and Installers,
- Education, Training, and Library Occupations,
- Management Occupations, and
- Transportation and Material Moving Occupations.

The number of distinct occupations with green employment varies significantly across jurisdictions. In DC, green employment is concentrated entirely in 54 occupation codes, while green employment spans 227 occupation codes in Maryland and 271 occupation codes in Virginia.

In addition to looking at the breadth of green employment for the MARC region, we took a closer look at a career progression with regard to growth, wages, and required education and training for one of those occupations. Doing so provides additional detail about the prospects for attaining stackable credentials and increased earnings for an individual pursuing this particular pathway.

Figure 11 represents a sample career progression from a "helper" to an electrical engineer.

Figure 11. Sample Career Pathway



Source: CareerOneStop—Sponsored by the U. S. Department of Labor, Employment and Training Administration

District of Columbia

Table 7 presents the top 25 occupations in DC, in terms of green employment.

Table 7. Top 25 Occupations, DC Green Employment

SOC Code	SOC Description	Green Employment	Percent of Total Green Employment
11000000	Management Occupations	1,188	10%
53706100	Cleaners of Vehicles and Equipment	1,175	10%
17301101	Architectural Drafters	738	6%
27303100	Public Relations Specialists	604	5%
49904200	Maintenance and Repair Workers, General	593	5%
23101100	Lawyers	490	4%
11101100	Chief Executives	482	4%

SOC Code	SOC Description	Green Employment	Percent of Total Green Employment
41000000	Sales and Related Occupations	461	4%
41909100	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers	351	3%
19409900	Life, Physical, and Social Science Technicians, All Other	344	3%
11201101	Green Marketers	342	3%
11102100	General and Operations Managers	324	3%
35000000	Food Preparation and Serving Related Occupations	320	3%
11912100	Natural Sciences Managers	257	2%
17205100	Civil Engineers	241	2%
21101200	Educational, Vocational, and School Counselors	223	2%
13204100	Credit Analysts	214	2%
27309900	Media and Communication Workers, All Other	214	2%
45401100	Forest and Conservation Workers	207	2%
11919900	Managers, All Other	183	2%
17207100	Electrical Engineers	183	2%
43405100	Customer Service Representatives	183	2%
19309200	Geographers	178	2%
27102500	Interior Designers	128	1%
11911100	Medical and Health Services Managers	107	1%

Source: ICF MARC Regional Employer Survey

Green employment in DC is concentrated in a smaller number of occupations than in other jurisdictions in the MARC region. The top five occupations account for 37 percent of green employment in DC, while the top 25 occupations account for 83 percent. The two most common green occupations – Management and Cleaners of Vehicles and Equipment – account for approximately 20 percent of all green employment in DC.

Maryland

As shown in Table 8, green employment in Maryland is less concentrated by occupation than in DC.

Table 8. Top 25 Occupations, Maryland Green Employment

SOC Code	SOC Description	Green Employment	Percent of Total Green Employment
49000000	Installation, Maintenance, and Repair Occupations	12,071	11%
49902101	Heating and Air Conditioning Mechanics and Installers	8,736	8%
11000000	Management Occupations	4,452	4%
47405100	Highway Maintenance Workers	4,320	4%
37301100	Landscaping and Groundskeeping Workers	4,244	4%
53000000	Transportation and Material Moving Occupations	4,124	4%
17301101	Architectural Drafters	3,270	3%
47211100	Electricians	3,121	3%
41000000	Sales and Related Occupations	2,864	3%
53706200	Laborers and Freight, Stock, and Material Movers, Hand	2,781	3%

SOC Code	SOC Description	Green Employment	Percent of Total Green Employment
35000000	Food Preparation and Serving Related Occupations	2,149	2%
17000000	Architecture and Engineering Occupations	2,086	2%
47301300	Helpers—Electricians	1,944	2%
11102100	General and Operations Managers	1,920	2%
49302302	Automotive Specialty Technicians	1,768	2%
11101100	Chief Executives	1,708	2%
17302500	Environmental Engineering Technicians	1,613	2%
35301100	Bartenders	1,225	1%
37201100	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	1,002	1%
41203100	Retail Salespersons	919	1%
53708100	Refuse and Recyclable Material Collectors	883	1%
47203100	Carpenters	836	1%
19101300	Soil and Plant Scientists	822	1%
43507100	Shipping, Receiving, and Traffic Clerks	797	1%
11902100	Construction Managers	791	1%

Source: ICF MARC Regional Employer Survey

The five most common green occupational groups in Maryland account for approximately 31 percent of the state's green employment, and the top 25 occupational groups account for 66 percent. The two most common occupational groups (Installation, Maintenance, and Repair Occupations and Heating and Air Conditioning Mechanics and Installers) account for 19 percent of all green employment in the state.

Virginia

Table 9 presents the top 25 occupations in Virginia in terms of green employment.

Table 9. Top 25 Occupations, Virginia Green Employment

SOC Code	SOC Description	Green Employment	Percent of Total Green Employment
25000000	Education, Training, and Library Occupations	10,724	10%
49000000	Installation, Maintenance, and Repair Occupations	5,557	5%
53706200	Laborers and Freight, Stock, and Material Movers, Hand	5,370	5%
11000000	Management Occupations	4,945	4%
49902101	Heating and Air Conditioning Mechanics and Installers	4,770	4%
53000000	Transportation and Material Moving Occupations	4,357	4%
41000000	Sales and Related Occupations	4,101	4%
47211100	Electricians	2,788	2%
17000000	Architecture and Engineering Occupations	2,231	2%
17301101	Architectural Drafters	2,063	2%
43101100	First-Line Supervisors/Managers of Office and Administrative Support Workers	1,697	2%

SOC Code	SOC Description	Green Employment	Percent of Total Green Employment
17205100	Civil Engineers	1,692	2%
11902100	Construction Managers	1,687	2%
51204100	Structural Metal Fabricators and Fitters	1,647	1%
17302303	Electrical Engineering Technicians	1,563	1%
37301100	Landscaping and Groundskeeping Workers	1,368	1%
17301202	Electrical Drafters	1,270	1%
17207100	Electrical Engineers	1,246	1%
47404100	Hazardous Materials Removal Workers	1,240	1%
51919901	Recycling and Reclamation Workers	1,201	1%
11102100	General and Operations Managers	1,180	1%
49305200	Motorcycle Mechanics	1,131	1%
17205102	Water/Wastewater Engineers	1,123	1%
43906100	Office Clerks, General	1,098	1%
51919900	Production Workers, All Other	1,085	1%

Source: ICF MARC Regional Employer Survey

Green employment in Virginia is the least concentrated by occupation compared to green employment in the other MARC region jurisdictions, but only slightly less concentrated by occupation than green employment in Maryland.

The five most common green occupational groups in Virginia account for 28 percent of the Commonwealth's green employment, and the top 25 occupations account for 60 percent. The two most common occupational groups – Education, Training, and Library Occupations, and Installation, Maintenance, and Repair Occupations – account for 15 percent of all green employment in the Commonwealth.

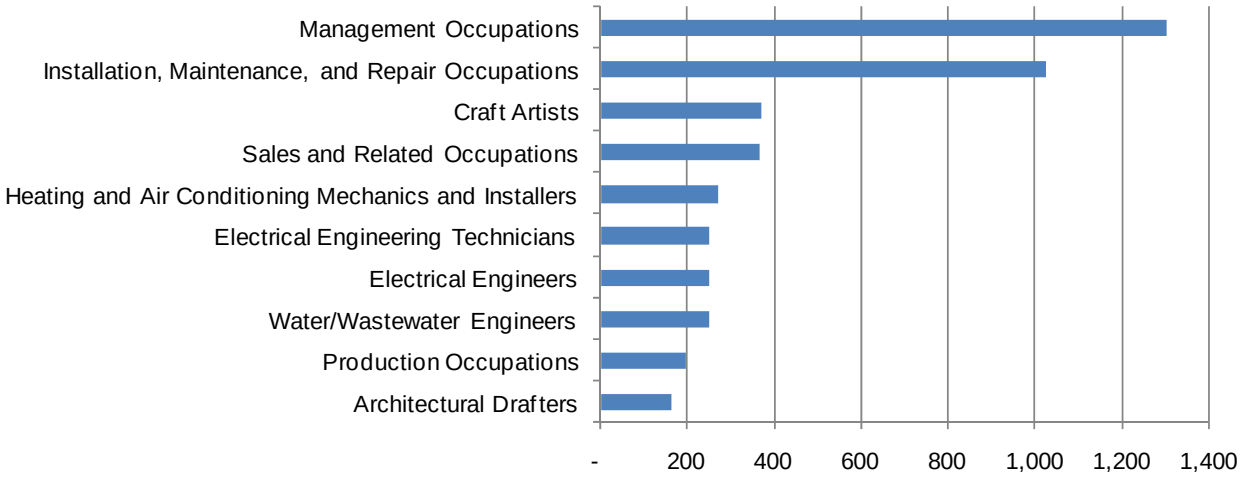
4.5. Green Job Vacancies

Employers indicated on the survey the green occupations in which they anticipate difficulty in filling future job vacancies.

MARC Region

Figure 12 presents the ten occupations with the greatest number of green job openings across the region.

Figure 12. Green Job Vacancies in the MARC Region



Source: ICF MARC Regional Employer Survey

The MARC region has almost 6,700 open green job positions across 68 occupation groups.[29] Almost 20 percent of the open positions are in Management occupations, and approximately 15 percent are in Installation, Maintenance, and Repair occupations. These two occupational groups were among the top five occupational categories for current green employment across the MARC region so it is not surprising that they currently have substantial jobs openings and are expected to grow.

Green job vacancies across the MARC region are concentrated -- almost fifty percent of all green job vacancies across the MARC region fall into five occupation groups. In addition to the two already mentioned, Craft Artists, Sales and Related Occupations, and Heating and Air Conditioning Mechanics and Installers have the most green job vacancies.

There are more than 4,600 green job vacancies in Virginia, which accounts for almost 70 percent of open positions in the MARC region. Twenty-five percent of the region's green job vacancies are in Maryland and approximately 5 percent are in DC, which amounts to roughly 1,700 green job vacancies in Maryland and 350 green job vacancies in DC. The District of Columbia represents 5 percent of the region's total green jobs, which is comparable to its share of green job vacancies. Virginia, however, represents just 48 percent of regional green jobs but 70 percent of open green opportunities. Maryland, on the other hand, represents 47 percent of regional green employment but just 25 percent of green job vacancies. These data suggest that, in the short term, Virginia's share of green jobs in the region may be increasing while Maryland's share is decreasing. The number of currently open green positions, however, is equal to just 2.8 percent of current green employment in the MARC region, and filling these positions would not drastically affect the relative levels of green employment across the region's jurisdictions. Furthermore, survey responses on

[29] Survey responses were collected in the summer/fall of 2010, a time of high unemployment. Therefore, these data may reflect fewer job openings than are available at the time of publication.

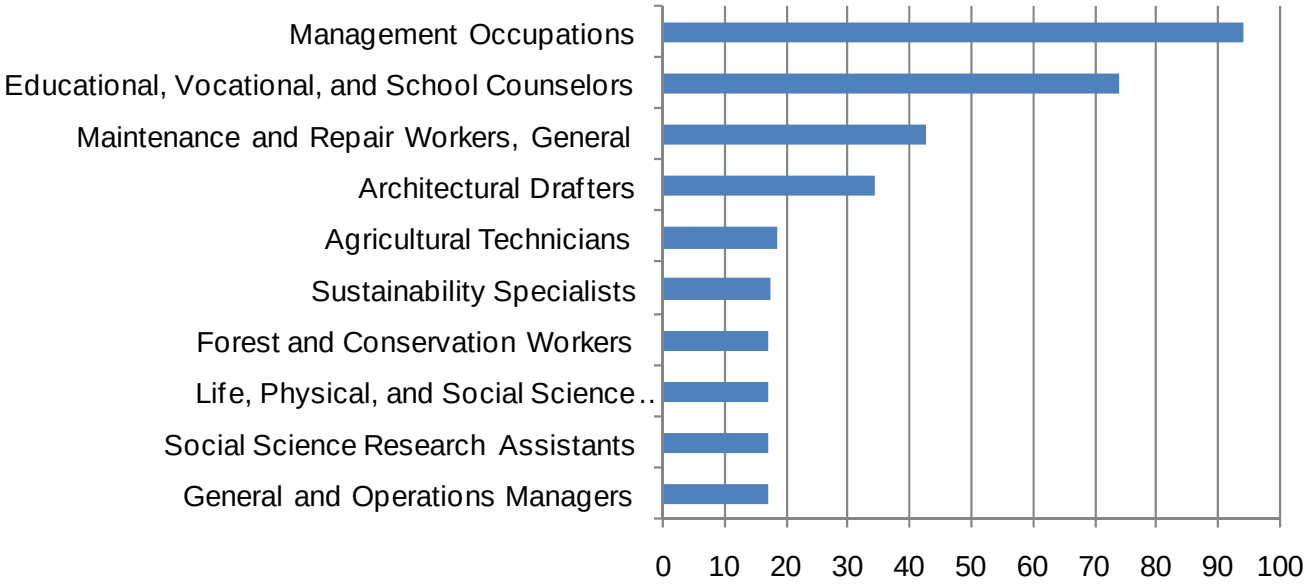
expected hiring (discussed in more detail later) suggest that over the next two years relative green job hiring rates in all three jurisdictions will be comparable to their current share of regional green employment.

While green job vacancies are highly concentrated for the MARC region as a whole, there is substantial variation across jurisdiction in terms of the type of green occupation that is experiencing vacancies.

District of Columbia

As shown in Figure 13, green job vacancies in DC span 10 occupations with 75 percent of open positions concentrated in the top five occupations.

Figure 13. Open Green Job Positions, DC



Source: ICF MARC Regional Employer Survey

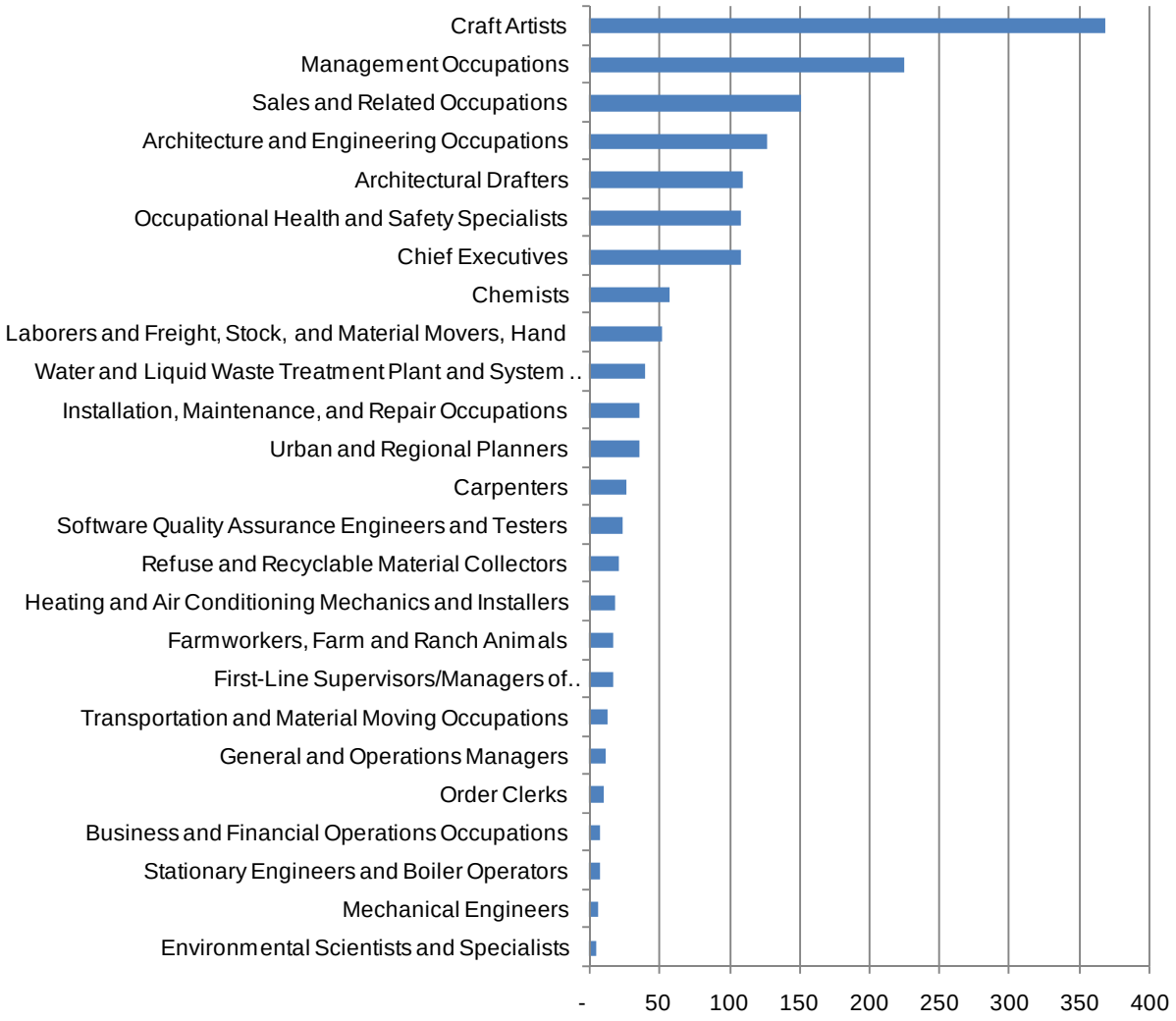
Management Occupations, which represent 27 percent of all open green positions in DC, include job titles (as specified by survey respondents) such as Global Warming Director, Program Manager for Green Buildings, Climate Displacement Program Manager, and Director of Technical Fuel Services and Standards. Open positions for Educational, Vocational, and School Counselors and Maintenance and Repair Workers represent 21 and 12 percent, respectively, of all open green positions in DC.

In DC, the average length of time positions are vacant varies significantly by occupation. For most occupations (e.g., Management, Architectural Drafters, Educational Counselors and Maintenance Workers), the average length of time a job remains open is one month. For more specialized positions, such as Sustainability Specialists, the hiring time increases up to six months. For Science Technicians, such as Horticulture Specialists, it can be as long as one year.

Maryland

As shown in Figure 14, green job vacancies in Maryland span 25 occupations.

Figure 14. Open Green Job Positions, Maryland



Source: ICF MARC Regional Employer Survey

In Maryland, vacancies are concentrated in the top 5 occupations, which combine to represent almost 58 percent of open green positions in the state. Key occupations include:

- Craft Artists, which represent more than 21 percent of all open green positions in the state, include specialty craftsmen engaged in sustainable products;
- Management Occupations, which represent 13 percent of all open green positions in the state, and include example job titles such as Environmental Manager, Director of Environmental Safety and Health, Facilities Managers, Director of Environmental Sustainability Energy manager, etc; and
- Sales and Related Occupations, which represent 9 percent of all open green positions in the state, and include job titles related to recycled auto-parts sales and insulation sales.

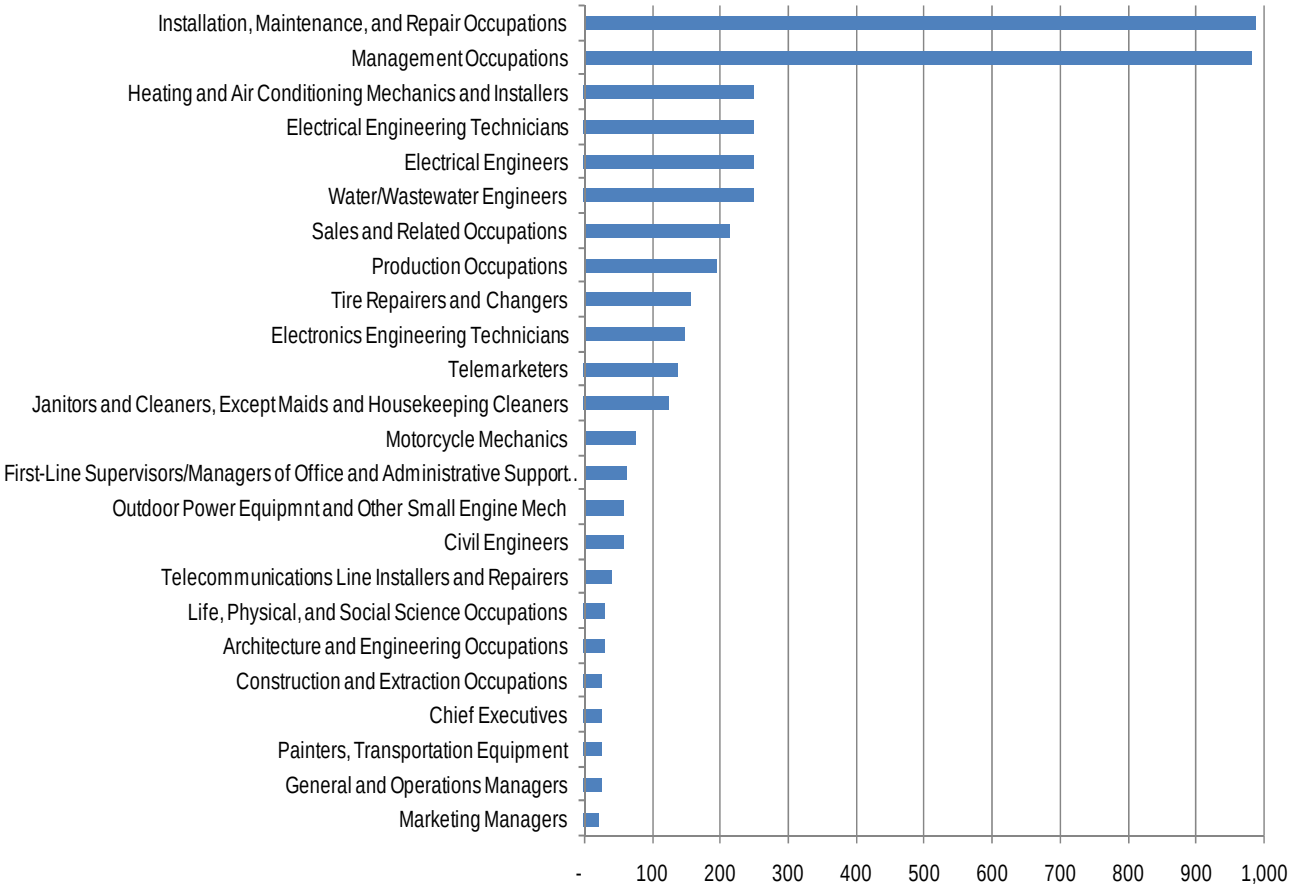
There is some overlap between the occupations with significant numbers of open green positions in DC and Maryland. Management occupations are near the top of the list in both jurisdictions, and Architectural Drafters are among the top five occupations for each jurisdiction.

In Maryland, job vacancies are open for four months on average, but the length of time varies significantly by occupation. Job vacancies for some occupations typically are vacant for a shorter period, including vacancies for general management positions, architects, and chemists. Job vacancies for other occupations are vacant for longer periods, such as vacancies for specialty sales-related and technical occupations.

Virginia

As presented in Figure 15, green job vacancies in Virginia span 44 occupations, but the top 5 occupations account for almost 60 percent of open positions in the Commonwealth.

Figure 15. Green Job Vacancies with More than 20 Open Positions, Virginia



Source: ICF MARC Regional Employer Survey

In terms of job vacancies in Virginia, key occupations include:

- Installation, Maintenance, and Repair Occupations, which represent more than 21 percent of all open green positions in the Commonwealth, include example job titles such as Installation Installers, Energy Efficient Window Installers, and Air Condition Mechanics;
- Management Occupations, which also represent more than 21 percent of all open green positions in the Commonwealth, include example job titles such as Director of Waste Services, Recycling Program Manager, CAD Manager, Greenery Manager, Energy Manager, and Director of Facilities and Engineering; and
- Heating and Air Conditioning Mechanics and Installers, which represent 5 percent of all open green positions in the Commonwealth, include example job titles related to HVAC installers, technicians and mechanics.

Some of the occupations with significant numbers of green open positions in Virginia overlap with those identified for DC and Maryland. Management occupations are near the top of the list in all three jurisdictions, and both Virginia and Maryland include Sales and Related Occupations among the top ten occupations with open green positions.

In Virginia, job vacancies are open for 2.5 months on average, but the length of time varies significantly by occupation. Vacancies in some occupations are open for less than two months, such as vacancies for engineers (waste-water, general electrical), general installers and repair occupations. Vacancies in other occupations are open for longer, such as vacancies for specialty sales and production occupations and HVAC mechanics and installers.

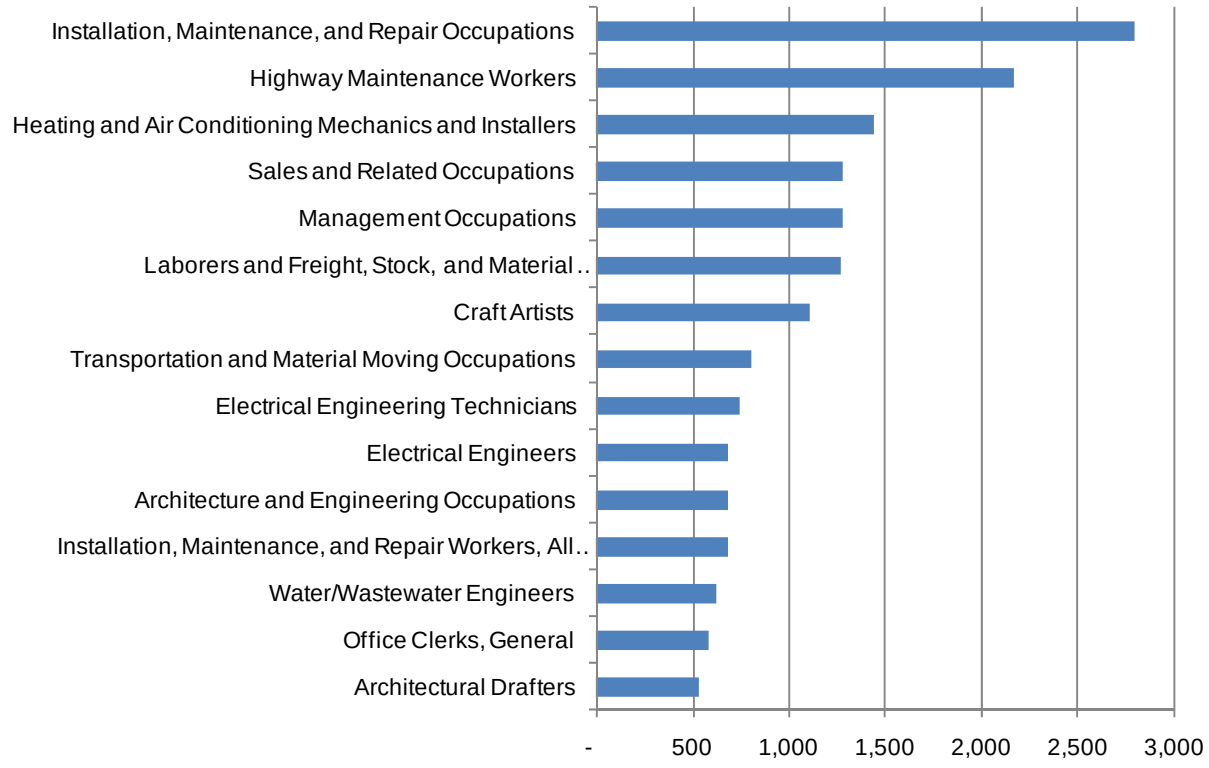
4.6. Green Job Hiring Plans

Expectations of employers regarding current and future green-related workforce needs are a critical element in further understanding green jobs. Accordingly, we asked employers in the survey questions regarding: (1) expected job gains in green occupations in the next two years; (2) expected difficulties in having enough qualified green candidates for the green jobs, and (3) expected difficulties in recruiting and hiring green workers. In this section, we discuss employers' green job hiring plans and green employee recruitment and retention challenges.

MARC Region

Employers in the MARC region are expecting to hire almost 28,000 green employees over the next two years (from a mid-2010 starting date). These new hires will span 150 green occupations. The number of expected new hires will equal about 12 percent of the region's current green employment. Approximately 10 percent of the expected new hires will be in Installation, Maintenance, and Repair Occupations. Other occupations in which employers expect to hire more than 1,000 employees in the next two years include: Highway Maintenance Workers; Heating and Air Conditioning Mechanics and Installers; Sales and Related Occupations; Management Occupations; Laborers and Freight, Stock and Material Movers; and Craft Artists. Almost 60 percent of the expected new green hires are concentrated in the top 15 occupations, as displayed in Figure 16.

Figure 16. MARC Region Green Hiring Expectations, Top 15 Occupations



Source: ICF MARC Regional Employer Survey

Approximately 35 percent of the expected growth will be in occupations in construction-related sectors, which often focus on energy efficiency activities. Given that energy efficiency positions already account for 30 percent of green employment in the MARC region and that several government policies have been enacted to encourage the reduction of residential and commercial energy use, it is not surprising that employers expect to hire a large number of new green employees in construction-related occupations over the next two years.[30]

Over the next two years, employers in DC expect to hire roughly 1,180 green employees, while Maryland and Virginia employers expect to hire more than 13,000 and 13,700 green employees, respectively. These projections are consistent with the current percentage breakdown of green jobs throughout the region, with 4 percent of the green employment growth expected in DC, 47 percent in Maryland, and 49 percent in

[30]One example is the Energy Start program. In 1992, the Environmental Protection Agency (EPA) introduced ENERGY STAR as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. ENERGY STAR has been a joint EPA-Department of Energy program since 1996. Today more than 1,400 manufacturers use the ENERGY STAR in over 40 product categories. EPA also offers the ENERGY STAR partnership to businesses and organizations of all types and sizes including schools, hospitals, hotels, small businesses and congregations and to key industries such as auto manufacturing, petroleum refining and pharmaceuticals. Retrieved February 24, 2011 from http://www.epa.gov/climatechange/policy/neartermghgreduction.html.

Virginia. There is significant variance across jurisdictions in terms of which occupations are expected to grow.

MARC Region at the WIA Level

As illustrated by Figure 16, the number of expected hires at the WIA level will range from none for the Southwest Virginia WIA to over 6900 for the Northern Virginia WIA. Hiring at the WIA level shows similar variations to those noted at the jurisdictional level. Comparing the number green-related hires to all hires yielded percentages ranging from 1.8 percent of total employment for the Frederick County, Maryland WIA whereas the green hiring projection for the neighboring Mid-Maryland WIA is expected to be at about 0.01 percent of the total employment. On the other hand, DC and Arlington County, which also share a border, have more closely matched figures with regard to green hiring as a percentage of total employment. These data were provided by employers who were asked to indicate their total hires, as well as the number of green-related hires for the next two years. Figures 17 and 18 presents additional WIA-level hiring projections. These figures provide a level of granularity that is helpful for green workers, trainers, and other workforce stakeholders.

Figure 17 presents hiring projections at the WIA-level for the MARC region. Figure 18 presents hiring projections for the MARC region as a percentage of total employment.

Figure 17. Number of Expected Green Hirings in the WIAs

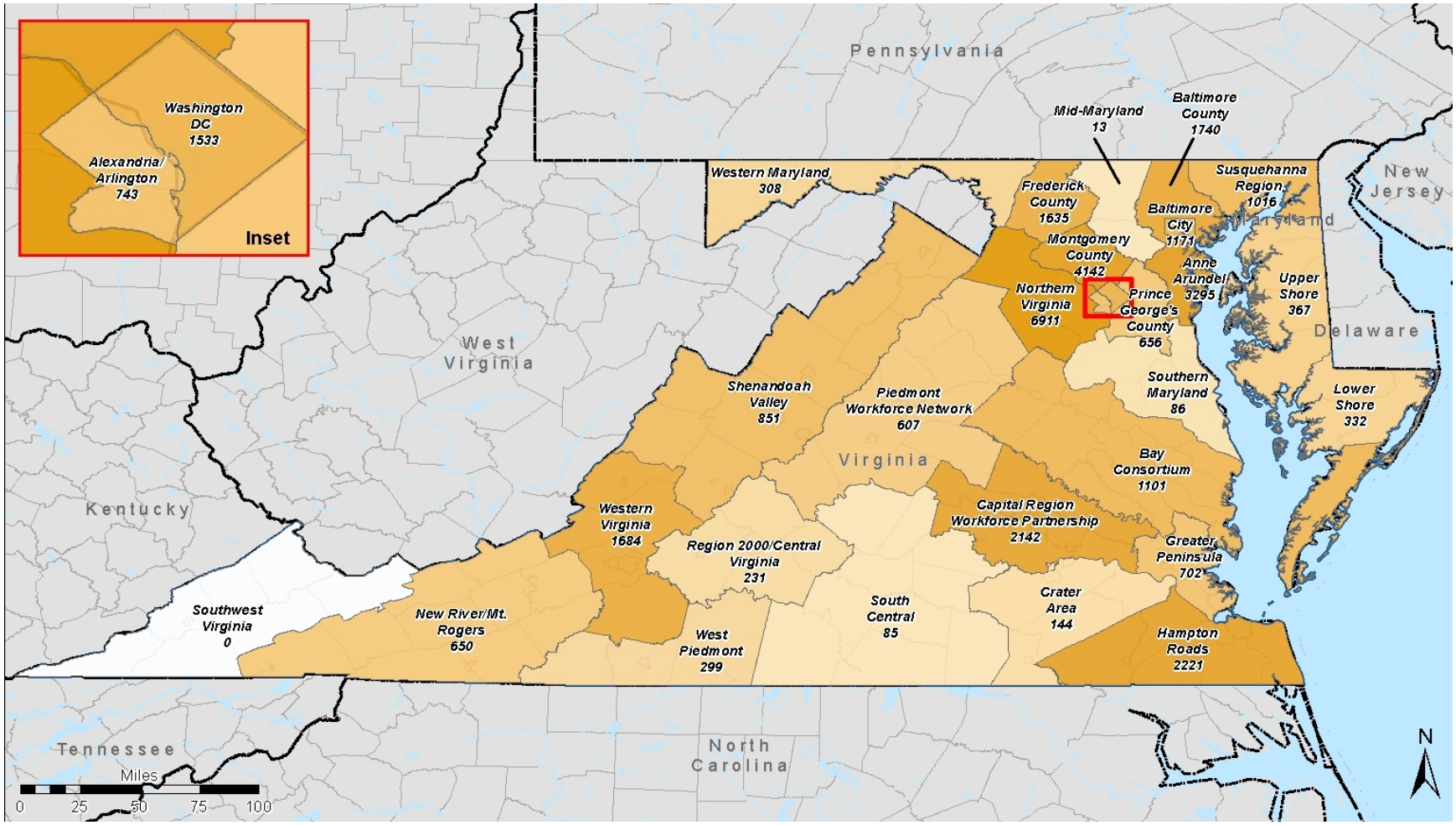
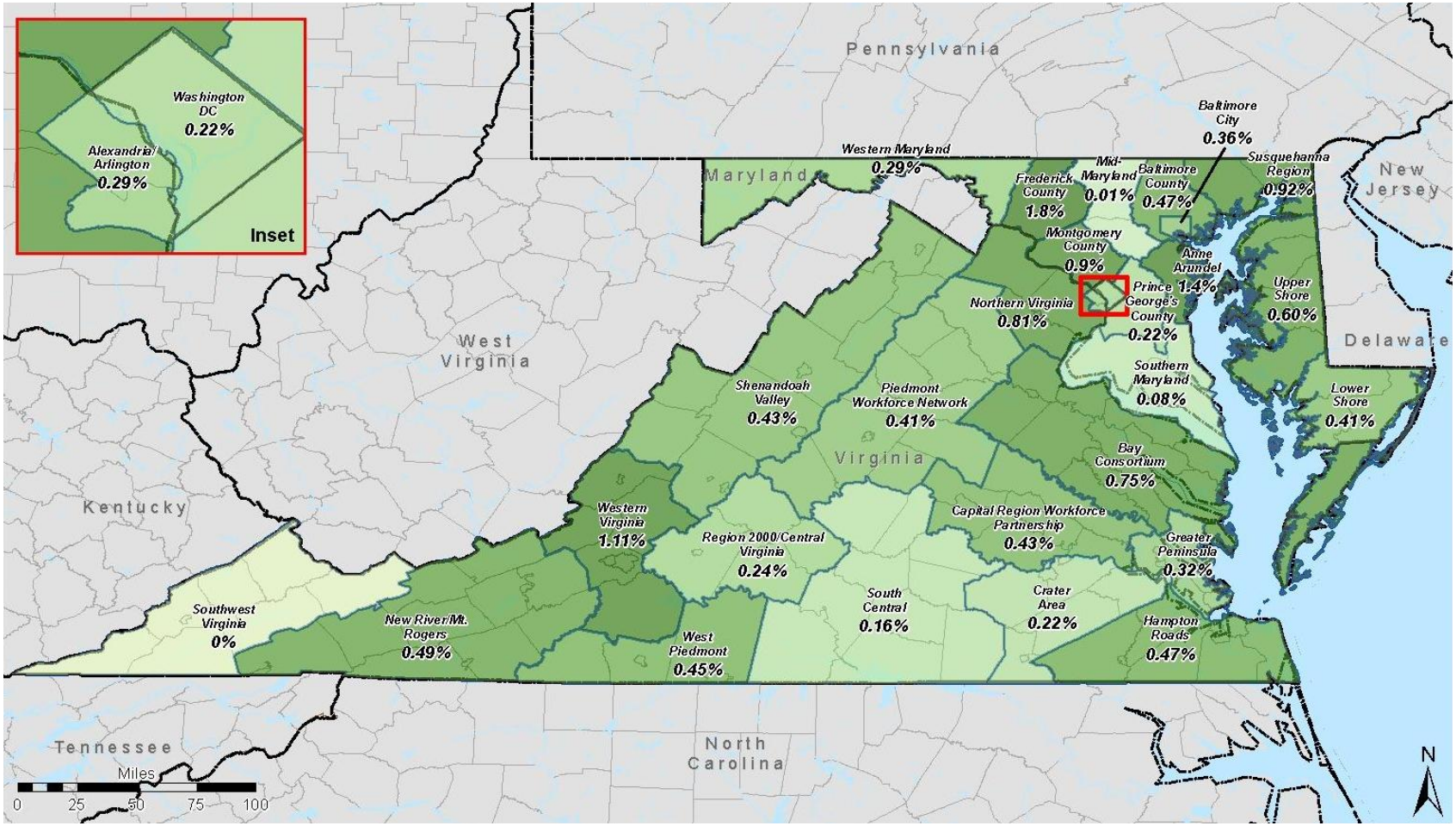


Figure 18. Expected Green Hiring as a Percentage of Total Employment in the WIAs

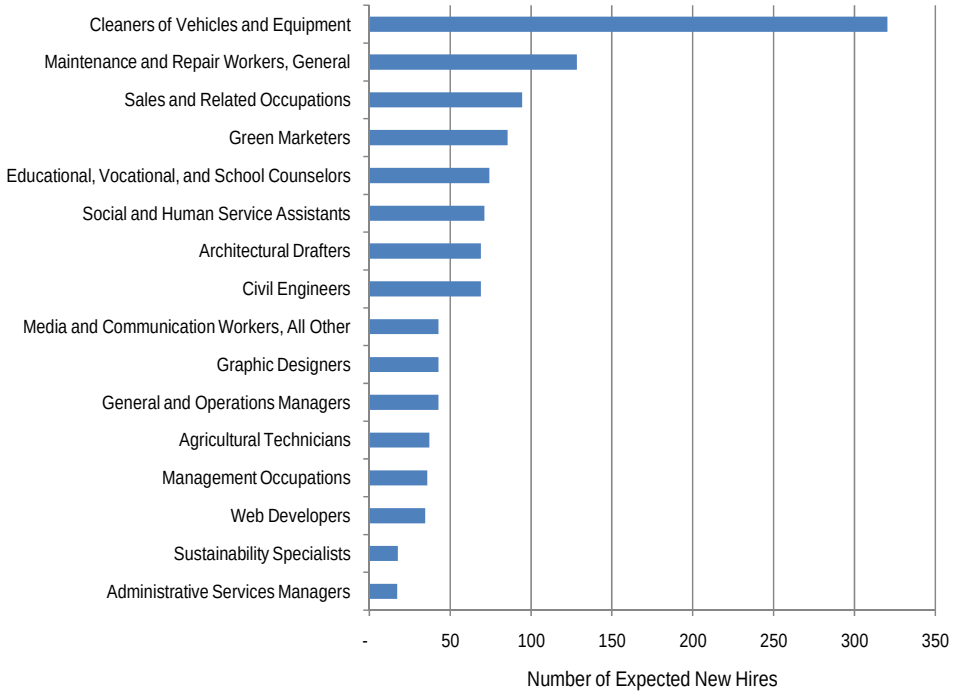


Source: ICF MARC Regional Employer Survey

District of Columbia

Figure 19 illustrates the green occupations for which employers expect to hire additional employees by 2012 in DC.

Figure 19. Green Hiring Expectations, DC



Source: ICF MARC Regional Employer Survey

Over the next two years, employers in DC expect to hire roughly 1,180 green employees. The expected green hires in DC are highly concentrated – 27 percent of expected green hires are for *Cleaners of Vehicles and Equipment* and nearly 60 percent fall into the top five occupations.

Survey respondents listed job titles such as Architects, Structural Engineers, Facilities Directors, and Green Renovation Development Directors as the occupations for which they expect to hire.

Maryland

Table 10 presents the Top 20 green occupations for which employers expect to hire additional employees by 2012 in Maryland.

Table 10. Top 20 Occupations that Are Expected to Grow by 2012, Maryland

SOC Code	SOC Description	New Hires Expected by 2012	Percent of Total Green New Hires
47405100	Highway Maintenance Workers	2,160	17%
27101200	Craft Artists	1,105	8%
49902101	Heating and Air Conditioning Mechanics and Installers	1,051	8%
49000000	Installation, Maintenance, and Repair Occupations	914	7%
53706200	Laborers and Freight, Stock, and Material Movers, Hand	723	6%
49909900	Installation, Maintenance, and Repair Workers, All Other	681	5%
53000000	Transportation and Material Moving Occupations	572	4%
11000000	Management Occupations	526	4%
35301100	Bartenders	493	4%
17301101	Architectural Drafters	335	3%
45209201	Nursery Workers	316	2%
47218100	Roofers	311	2%
37301100	Landscaping and Groundskeeping Workers	226	2%
17203100	Biomedical Engineers	189	1%
13106100	Emergency Management Specialists	188	1%
41000000	Sales and Related Occupations	182	1%
17000000	Architecture and Engineering Occupations	139	1%
45209300	Farmworkers, Farm and Ranch Animals	137	1%
19101300	Soil and Plant Scientists	131	1%
41101100	First-Line Supervisors/Managers of Retail Sales Workers	130	1%

Source: ICF MARC Regional Employer Survey

By 2012, employers in Maryland expect to hire more than 13,000 new green employees. The expected hires in Maryland are less concentrated by occupation than in DC. The occupation with most expected hires is Highway Maintenance Workers, which accounts for 17 percent of expected green hires in the state. The top 5 occupations account for 46 percent of expected green hires.

Similar to the trend across the MARC region, roughly 40 percent of the expected green job growth in Maryland is expected in the construction-related sectors, which often pertain to energy efficiency activities. Highway workers, as well as other transportation-related occupations, were also identified as occupations for which employers expect to hire a substantial number of additional employees by 2012.

Virginia

Table 11 lists the Top 20 green occupations for which employers expect to hire additional employees by 2012 in Virginia.

Table 11. Top 20 Occupations that Are Expected to Grow by 2012, Virginia

SOC Code	SOC Description	New Hires by 2012	Percent of Total Green New Hires
49000000	Installation, Maintenance, and Repair Occupations	1,876	14%
41000000	Sales and Related Occupations	1,006	7%
17302303	Electrical Engineering Technicians	745	5%

SOC Code	SOC Description	New Hires by 2012	Percent of Total Green New Hires
11000000	Management Occupations	720	5%
17207100	Electrical Engineers	685	5%
17205102	Water/Wastewater Engineers	624	5%
43906100	Office Clerks, General	584	4%
17000000	Architecture and Engineering Occupations	543	4%
53706200	Laborers and Freight, Stock, and Material Movers, Hand	541	4%
49902101	Heating and Air Conditioning Mechanics and Installers	390	3%
51000000	Production Occupations	316	2%
49309300	Tire Repairers and Changers	304	2%
51919901	Recycling and Reclamation Workers	278	2%
17205100	Civil Engineers	255	2%
47215202	Plumbers	250	2%
53000000	Transportation and Material Moving Occupations	236	2%
17302301	Electronics Engineering Technicians	233	2%
17219903	Energy Engineers	202	1%
49305200	Motorcycle Mechanics	188	1%
17301202	Electrical Drafters	182	1%

Source: ICF MARC Regional Employer Survey

Virginia employers are expected to hire more than 13,700 new green employees by 2012. Compared to DC and Maryland, the expected new hires in Virginia are the least concentrated by occupation. The occupation with most expected hires is Installation, Maintenance, and Repair, which accounts for just 14 percent of expected green hires in the Commonwealth, and the top five occupations account for only 37 percent. That said, the top five occupations (listed below) relate to the energy-efficiency core segment, and almost 50 percent of expected hires pertain to energy efficiency activities.

- Installation, Maintenance, and Repair Occupations (e.g. Insulation Mechanic)
- Sales and Related Occupations (e.g. Green Product Sales Representative)
- Electrical Engineering Technicians (e.g. Environmental Engineer)
- Management Occupations (e.g. Energy Manager)
- Electrical Engineers (e.g. Environmental Engineer)

4.7. Green Employee Recruitment and Retention

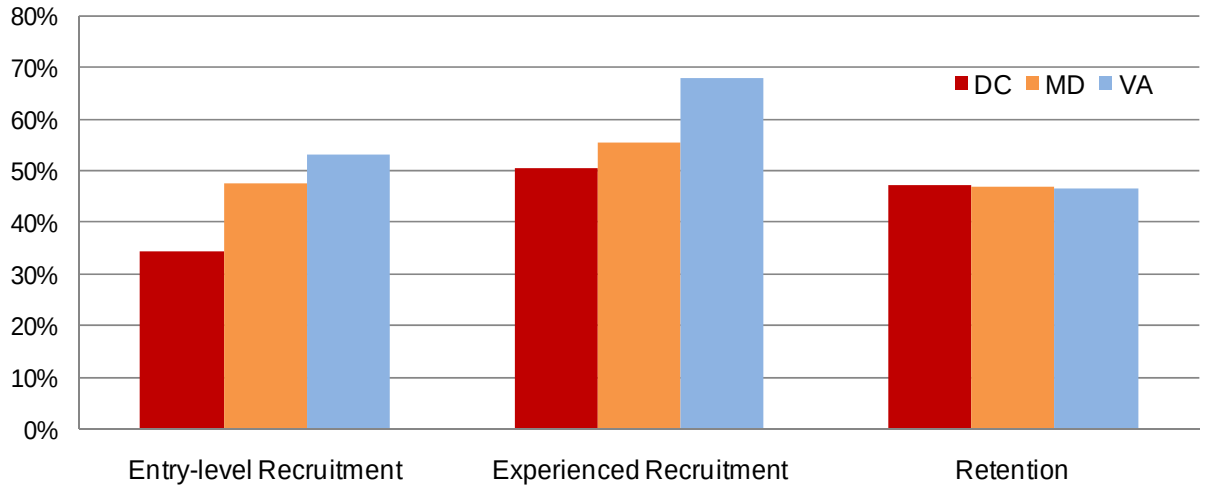
MARC Region

Finding Green Workers with Experience is Hardest in Maryland followed by Virginia and DC

Figure 20 illustrates trends in recruiting and retention across the three jurisdictions.

Figure 20. Green Establishment Recruiting and Retention Trends

Green establishments citing "very or somewhat difficult" to recruit or retain green workers



Source: ICF MARC Regional Employer Survey

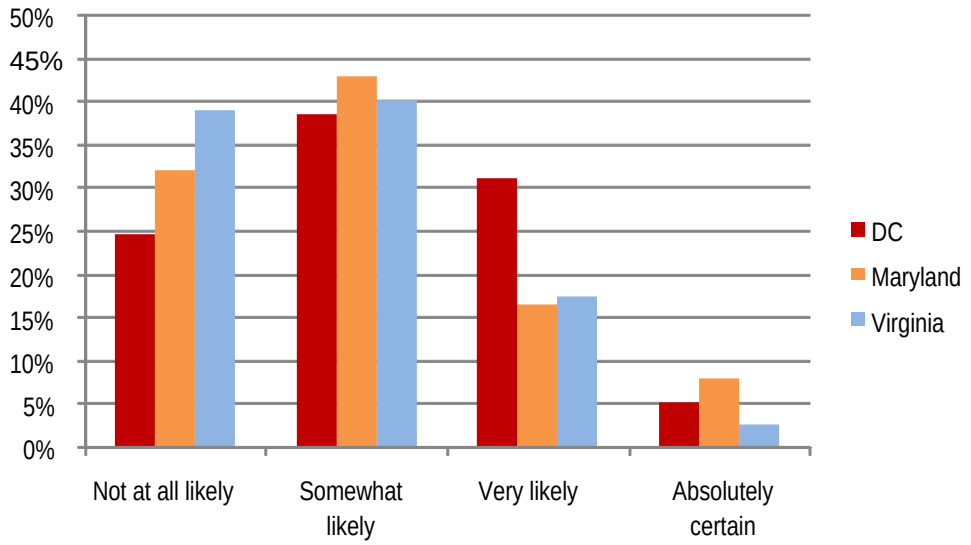
Across the MARC region, employers indicated that it is harder to find experienced green workers than it is to find entry-level green employees. More than 50 percent of employer respondents indicated that experienced workers were either "somewhat difficult" or "very difficult" to recruit. Finding both experienced and entry-level green employees is the most difficult in Virginia and the least difficult in DC.

Employee retention is stable across each jurisdiction. Retention is considered "somewhat difficult" by 39 percent of employers and "very difficult" by 8 percent of employers.

4.8 Willingness to Hire Green Employees with Federal Subsidy

This section summarizes survey responses to a question about employers' reaction to hiring long-term unemployed candidates for green employment, including providing on-the-job training to retrain them for new careers, if the Federal Government subsidized at least 50 percent of the candidate's salary for the first six months. Figure 21 presents data on the hiring likelihood of candidates for green employment with salary subsidization.

Figure 21. Likelihood of Hiring Long-Term Unemployed Workers if 50%+ of their Salaries were Subsidized



Source: ICF MARC Regional Employer Survey

Throughout the region, 64 percent of respondents indicated that they would be somewhat likely, very likely, or absolutely certain to hire long-term unemployed workers if reimbursed for at least 50 percent of their salary by the Federal Government. In most cases, the respondents indicated that they were somewhat likely or very likely to do so. Less than ten percent of respondents in each jurisdiction stated that they were absolutely certain to hire long-term unemployed workers under such a program. Green employers in DC are slightly more likely to take advantage of a salary subsidization program than their Maryland and Virginia counterparts.

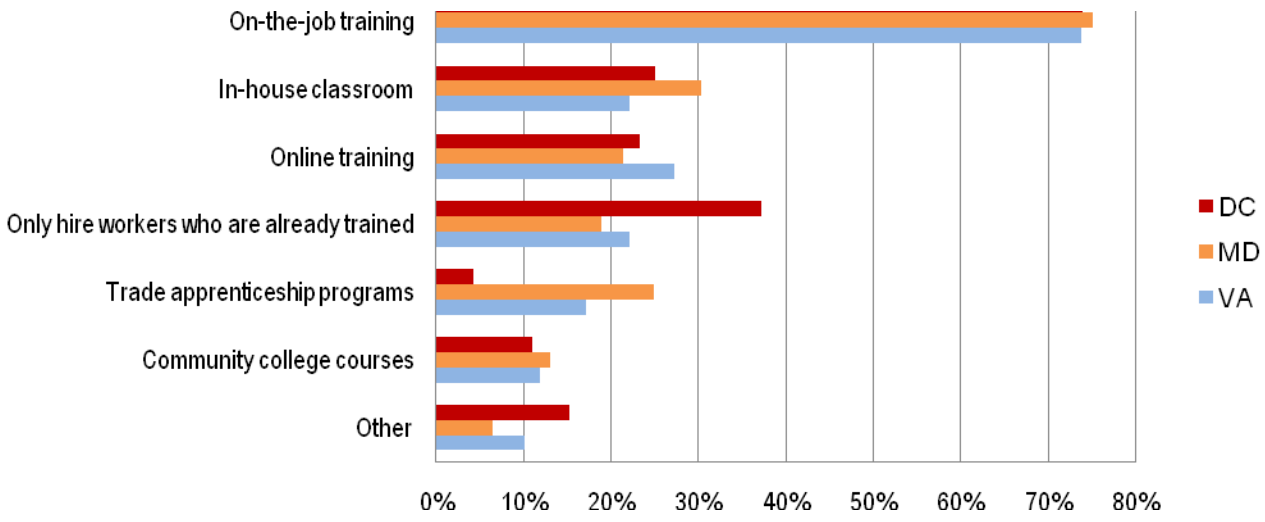
4.9. Education and Training

In an attempt to measure the education and training needs of employers, the survey asked employers about their use of various methods to prepare current workers to produce green products or services, including in-house classroom, on-the-job training, online training, apprenticeship programs, and community college courses.

Existing Education and Training

Figure 22 presents data on training employed by employers to prepare their green workers to produce green products or services.

Figure 22. Training Used by Employers to Prepare their Green Workers



Source: ICF MARC Regional Employer Survey

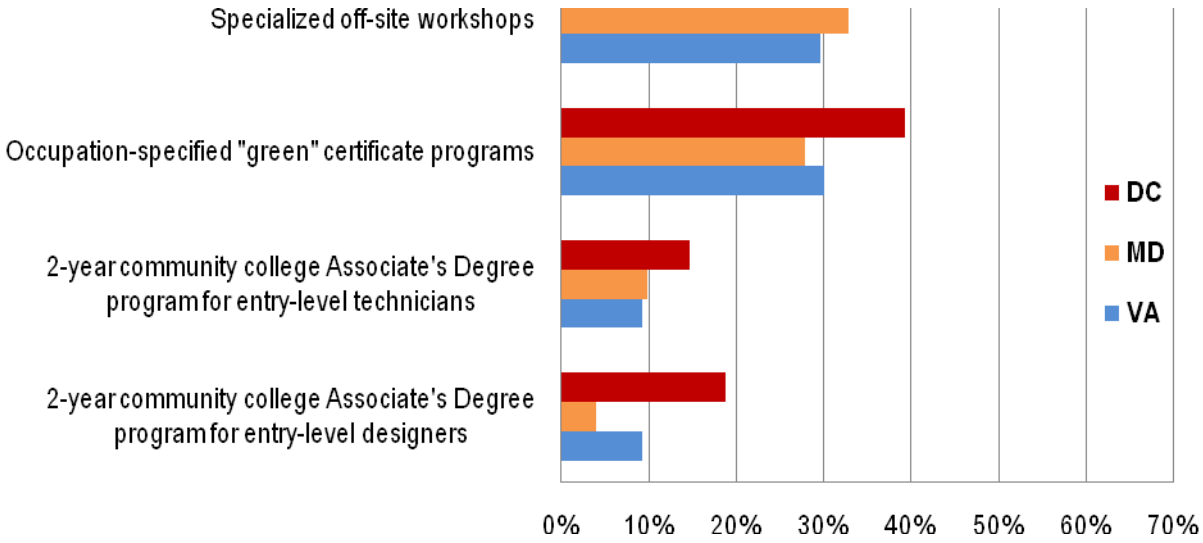
The overwhelming majority (75 percent) of regional green establishments responded that they use on-the-job training to prepare their workers to produce green products and services. This percentage equals roughly 20,000 employers throughout the MARC region. Twenty-five percent or less of employers reported using the other types of training cited. Community college courses are the least popular form of training among green employers – just over ten percent of employers in each jurisdiction offer community college training to their green employees.

DC green employers are almost twice as likely as their Maryland and Virginia counterparts to hire only trained green workers. There is substantial variation across the three jurisdictions in the use of trade apprenticeship programs – about 25 percent of green employers in Maryland use this method of training, while less than 20 percent of green employers in Virginia and less than 5 percent of green employers in DC use such programs. Maryland-based green employers are more likely than employers in other jurisdictions to offer in-house classroom training. Virginia-based green employers are more likely than employers in the other jurisdictions to offer online training. Roughly 10 percent of Virginia-based green employers indicated that they offered "other" training, which consists of programs such as U.S. Green Building Council (USGBC) Certification, LEED accreditation, and various specialty manufacturing technical trainings.

Employer Support for Employee Training

Figure 23 presents respondents' willingness to pay for part of the cost to have green employees enroll in specialized training, stratified by jurisdiction. When surveyed about their interest in subsidizing additional worker training, 33 percent of green establishments in the MARC region indicated they would pay for specialized off-site training and 30 percent indicated they would pay for occupation-specific green certification programs.

Figure 23. Percent of Establishments Willing to Provide Financial Support for Green Worker Training



Source: ICF MARC Regional Employer Survey

Consistent with the current training trends discussed above, fewer regional employers were willing to support community college courses. Only 8 to 10 percent of regional green establishments indicate they would pay for community college associates programs.

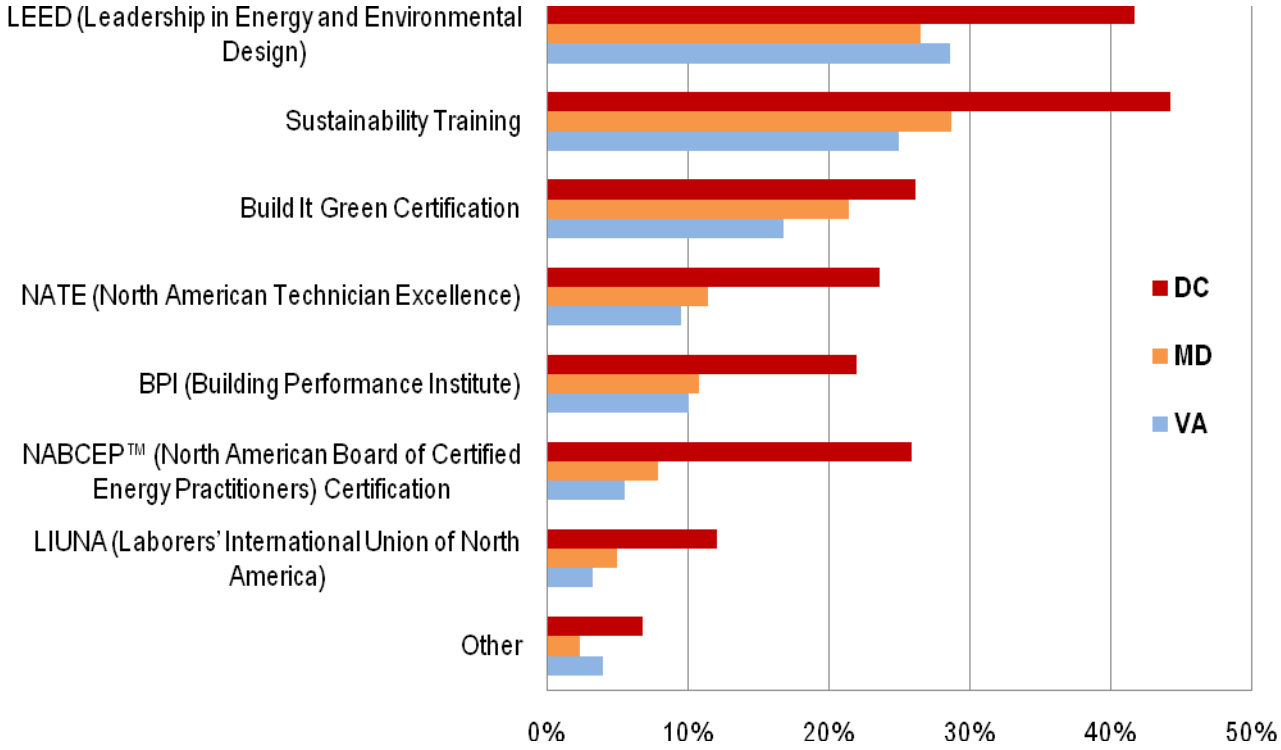
Across all training programs, DC-based green employers are more willing to pay for training. In fact, they are twice as likely to support specialized off-site workshops as are employers in other jurisdictions.

4.10. Green Credentials

When surveyed about the importance of credentials in their hiring decisions, 29 percent of green establishments indicated that the Leadership in Energy and Environmental Design (LEED) certification would improve the likelihood that they would hire a job applicant. Since there is no industry standard certification for sustainability training, the survey asked respondents broadly about their interest in sustainability training credentials, and 28 percent indicated that such credentials would increase the likelihood that they would hire a job applicant who had previously participated in sustainability training.

Figure 24 presents respondents' opinions on whether possessing one of the following credentials/training would improve the likelihood that they would hire a green job candidate in the next two years.

Figure 24. Importance of Credential in Hiring Decisions Cited by Establishments



Source: ICF MARC Regional Employer Survey

Across all credential types, DC-based green employers place greater emphasis on credentials in their hiring of green workers than employers in Maryland and Virginia. DC respondents indicate that "other" training such as the Home Energy Rating System Rater (HERS Rater) certification, traditional architecture training and the Association of Energy Engineer's Certified Carbon & GHG Reduction Manager (CRM) training were also important. Other than LEED certification, Maryland-based green employers place greater emphasis on the importance of credentials than their Virginia counter-parts do. Virginia respondents cited "other" training programs such as Tradesman License, HERS Rater and Sustainable Forestry Initiative (SFI) Certifications as additional important credentials.

It is important to keep in mind when viewing these results that LEED is the most widely-known credential, while only about 50 percent of green establishment respondents are familiar with the Laborers' International Union of North America (LIUNA), North American Technician Excellence (NATE), and North American

Board of Certified Energy Practitioners (NABCEP) credentials. In general, DC-based green employers are more familiar with the various credentials than employers based in Virginia and Maryland.

5. Conclusion

Data-based decision making with regard to the green "collar" economy in Maryland, DC, and Virginia will likely be enhanced significantly by the survey

Our findings provide a current snapshot of the green economy in the MARC region as well as suggest opportunities for growth—jobs in this region are expected to grow by 12 percent in the next two years. In particular, jobs in the Energy Efficiency and Conservation core area seem to hold the most promise in terms of current and future growth. When looking at the data at a more granular level, hiring projections indicate that green activities in Construction, Professional, Scientific, and Technical Services, Support and Waste Management Services are expected to grow in the next two years. These data are an important baseline for entrants and current workers in green-collar occupations since decisions about job prospects, training and credentialing opportunities, and long term growth may be impacted by these findings. In addition, the information in this report, combined with the real-time regional labor market information available through the labor exchange portal at www.MARCGreenWorks.com, will facilitate job searches, access to training providers and the use of other critical workforce tools. Job seekers, employers, policymakers, workforce development practitioners, and other stakeholders in the MARC region are now able to make evidence-based decisions about green employment opportunities and trends in DC, Maryland, and Virginia.

5.1. Future Research

ICF, along with partners from three premier research institutions: The Jacob France Institute of the Merrick School of Business at the University of Baltimore, The College of William and Mary, and Georgetown University's Center on Education and the Workforce have teamed (ICF Team) to conduct related research that examines important labor and supply information about green employment trends in the MARC region. This information is designed to supplement information that has been obtained through the MARC LMI survey and labor portal exchange projects. This effort will include evaluating existing green employment, industries, and educational infrastructure to provide a picture of skill and competency requirements in the region's green labor market, labor supply and demand and the gaps therein, summaries of regional education infrastructure, and projected growth for green jobs, training, education, and wages. The ICF Team represents each of the three jurisdictions and offers a unique combination of expertise in labor market research and deep knowledge of the MARC region's labor market.

As part of this project, the ICF Team is using three economic modeling systems including IMPLAN, WIN Strategic Compass, and Economic Modeling Specialists, Incorporated (EMSI) [31],[32],[33]. The combination of

[31] A complete economic assessment software package.

[32] A web-based tool for assessing and aligning workforce indicators with state and regional economic trends by providing one-stop access to economic trend data, education and workforce data and gap analyses between workforce supply and demand.

[33] EMSI provides the in-depth and current local employment data. The data are updated four times per year and are available for any county or individual ZIP code in the U.S. EMSI is composed of comprehensive information on industries, occupations, demographics — as well as things like occupational skills, education, training, and even the names and size of companies in the region of interest broken down by industry.

these three tools allows us to provide comprehensive labor market diagnostics. Specifically, we will use IMPLAN to conduct economic impact analysis. We are using WIN Strategic Compass to harness its detailed labor supply and demand analytics, including data on participants in apprenticeship programs and the skills and competencies of the workforce. Finally, the Geographic Information System (GIS) module of the EMSI tool is helping to build maps of labor market data at the county and jurisdiction levels. An advantage of using these tools is that they already contain a variety of data collected from federal, state, and private proprietary databases; combined, these tools will allow us to achieve efficiency, present information for the three jurisdictions in a consistent format, and ensure high quality, comprehensive analysis. The key activities and objectives of the related research project are as follows:

- Evaluate existing green employment, industries, and educational infrastructure;
- Develop and post on-line catalogue of green education and training providers;
- Describe labor supply and demand;
- Conduct workforce gap analysis;
- Identify skill and competency requirements in region's green labor market;
- Provide projected growth for green jobs, training, education, and wages;
- Integrate data collection for development of online expansion; and,
- Conduct outreach on findings.

The related research findings, as well as the catalogue of green education and training providers will be available on the labor exchange portal (www.MARCGreenWorks.com) in April 2011.

Appendix A: Green Jobs Survey Forms

District of Columbia Jobs Survey

PLEASE REPORT ONLY FOR YOUR SITES IN WASHINGTON, D.C.

13. In the next two years, do you anticipate that the following credentials would improve a candidate's chances of being hired for a '**green**' job at your sites **in Washington, D.C.**?

	Yes	No	Not familiar
NABCEP™ (North American Board of Certified Energy Practitioners) Certification	☐	☐	☐
BPI (Building Performance Institute)	☐	☐	☐
LIUNA (Laborers' International Union of North America)	☐	☐	☐
NATE (North American Technician Excellence)	☐	☐	☐
LEED (Leadership in Energy and Environmental Design)	☐	☐	☐
Build It Green Certification	☐	☐	☐
Sustainability Training	☐	☐	☐
Other (please specify):	☐	☐	☐

14. Would your organization pay part of the cost to have '**green**' employees at your sites **in D.C.** enroll in specialized training offered for the following?

	Yes	No
Occupation-specific '**green**' certificate programs	☐	☐
Specialized off-site workshops	☐	☐
2-year community college Associate's Degree program for entry-level designers	☐	☐
2-year community college Associate's Degree program for entry-level technicians	☐	☐
Other (please specify):	☐	☐

15. Next, we have a question concerning all job openings. The Federal government has a fund to help employers hire long-term unemployed workers for on-the-job training to retrain them for new careers. This fund covers a portion of their first six months salary (from 50% to 90% of their salary).

How likely would your organization be to hire long-term unemployed workers in Washington, D.C. if your organization was reimbursed for at least 50% of their salaries for the first six months they are funded?

☐ Not at all likely ☐ Somewhat likely ☐ Very likely ☐ Absolutely Certain

☐ Not Applicable – Federal Organization

About You

Finally, we have some questions about you. These questions are not mandatory, but if we have follow-up questions, we might like to contact you. Your name and contact information will be kept strictly confidential. In addition, if you provide your email address, we can email a copy of the study report to you.

16. What is your name? _____

17. What is your position/title (e.g. Human Resources Manager)? _____

18. What is your telephone number? _____

19. What is your email address? _____

20. Would you like to receive a copy of the final study report by email? Yes ☐ No ☐

21. In what Ward is your establishment located? _____

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon, VA 20172-9900.

DISTRICT OF COLUMBIA JOBS SURVEY

1. Regardless of other possible locations, is the organization still functioning at any site in Washington, D.C.?

☐ Yes → **PLEASE CONTINUE.**
☐ No → **PLEASE RETURN THIS SURVEY IN THE ENVELOPE PROVIDED.**

Your Organization or Agency

2. **For your entire organization or agency**, what was its total gross revenue (or budget, if a public or non-profit organization) for the most recent 12-month period? Your best guess would be fine.

☐ Less than $100,000 ☐ $100,000 – $500,000 ☐ $500,000 – $1 million ☐ $1 million – $5 million ☐ $5 million – $10 million ☐ $10 million – $50 million ☐ $50 million – $500 million ☐ $500 million or more

3. What would you estimate that the sale or provision of '**green**' products or services was as a percent of your revenue (or budget) **for your entire organization/agency**?

Please estimate the percentage: _____ %

4. In total, about how many employees work at your **entire organization/agency**?

Total **full-time** (work 35 hours or more per week) employees: _____
Total **part-time** (work less than 35 hours per week) employees: _____

Current Employment in Washington, D.C.

5. How many different locations does your organization have **in Washington, D.C.**? _____

6. In total, about how many employees are currently based at your sites **in D.C.**?

Total **full-time** (work 35 hours or more per week) employees: _____
Total **part-time** (work less than 35 hours per week) employees: _____

7. Of the employees at your sites **in D.C.**, about how many have worked to produce **ANY** '**green**' products or supply any '**green**' services (in one or more of the seven categories of green jobs)?

Number of **full-time** (work 35 hours or more per week) employees doing any '**green**' work: _____
Number of **part-time** (work less than 35 hours per week) employees doing any '**green**' work: _____

Future Employment in Washington, D.C.

8. What is your estimate of the total number of employees who will be hired in the next 2 years to work **at any of your sites in D.C.**?

Full-time (work 35 hours or more per week) employees to be hired: _____
Part-time (work less than 35 hours per week) employees to be hired: _____

9. For the new employees at any of your sites **in D.C.**, what is your estimate of how many will work to produce **ANY** '**green**' products or provide any '**green**' services?

Full-time (work 35 hours or more per week) employees doing any '**green**' work to be hired: _____
Part-time (work less than 35 hours per week) employees doing any '**green**' work to be hired: _____

→ **IF THERE ARE NO EMPLOYEES WHO CURRENTLY DO ANY 'GREEN' WORK AT ANY OF YOUR SITES IN D.C., PLEASE RETURN THIS SURVEY IN THE ENVELOPE PROVIDED, YOU ARE DONE.**

→ **IF THERE ARE EMPLOYEES AT ANY OF YOUR SITES IN D.C. WHO DO ANY 'GREEN' WORK, PLEASE CONTINUE.**

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon, VA 20172-9900.

PLEASE REPORT ONLY FOR YOUR SITES IN WASHINGTON, D.C.

10. Next, we would like you to report on the jobs in which employees spend **ANY** of their time on one or more of the following '**green**' activities for your sites **in Washington, D.C**. For employees responsible for doing work in more than one '**green**' job category, choose the one that accounts for the most time on the job. Do not include information for locations outside of D.C.

	Green Job Categories											
	Renewable energy and alternative fuels	Energy efficiency and energy conservation	Greenhouse gas reduction	Pollution reduction and cleanup	Recycling and waste reduction	Sustainable agriculture and natural resources conservation	Education, compliance, public awareness, and training directly related to green jobs					
List Job Titles Related to Green Job Categories	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	How many positions are currently open?	How long have these positions been open? (in months)	How many more NEW employees will you need for this position in the next 2 years?	Over the next 2 years, do you anticipate any difficulties having enough qualified 'green' candidates for this job title?	
Example: Civil Engineer											Yes	No
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐

If you have more job titles to report, please see the instructions in the box to the right.

Have more green jobs to report? We want to hear about all of your green jobs!

Please contact the Job Survey Team for another copy or make a photocopy of this page.

11. Does your organization use the following methods at your sites **in D.C.** to prepare current workers to produce '**green**' products or services?

	Yes	No
In-house classroom	☐	☐
On-the-job training	☐	☐
Online training	☐	☐
Trade apprenticeship programs	☐	☐
Community college courses	☐	☐
We hire only workers who are already trained	☐	☐
Other (please specify):	☐	☐

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon VA 20172-9900.

12. Over the next two years, how difficult do you anticipate the following will be for the '**green**' jobs and openings at your sites **in D.C.**?

	Not at all difficult	Somewhat difficult	Very difficult
Recruiting entry-level '**green**' employees with appropriate training and education	☐	☐	☐
Recruiting experienced '**green**' employees with adequate skills	☐	☐	☐
Retaining valuable '**green**' employees who could be hired by competitors	☐	☐	☐
Providing '**green**' training opportunities for advancement of current employees	☐	☐	☐
Other recruiting/retaining activities (please specify):	☐	☐	☐
Other training activities (please specify):	☐	☐	☐

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon VA 20172-9900.

District of Columbia Follow-up Survey for Non-Response Bias Study



District of Columbia Jobs Survey Follow-up Questionnaire

Thank you for your participation – your responses are essential for the success of this effort.

Do you want better-prepared employees? The District of Columbia needs your help to identify training and workforce needs in the area. Recently you were invited to participate in a survey sent in the mail concerning jobs at your business/organization. However, we did not receive a returned form. Please complete the questions below to help us understand a little bit about your organization. Please return the completed survey by email (jobsurvey@icfi.com) or by fax (703-225-2357).

Q1. Regardless of other possible locations, is the organization still functioning at any site in City/County?

1. Yes
2. No (Go To Q7)

Q2. How many different locations does your organization have in City/County?

Number of locations: _____

Q3a. About how many full-time employees are based at your sites in City/County?

(Full-time employees work 35 hours or more per week): _____

Q3b. And, how many part-time employees are there?

(Part-time employees work 35 hours or more per week): _____

Next, we have just a couple of questions about green jobs. Categories of green jobs include renewable energy and alternative fuels, energy efficiency and energy conservation, greenhouse gas reduction, pollution reduction and cleanup, recycling and waste reduction, sustainable agriculture and natural resources conservation, and education, compliance, public awareness and training directly related to green jobs.

Q4a. Of the employees at your sites in City/County, about how **full-time** employees produce ANY 'green' products or supply any 'green' services in any of these categories?

(Full-time employees work 35 hours or more per week): _____

Q4b. And, how many **part-time** employees do any green work?

(Part-time employees work 35 hours or more per week): _____

Q5. For your entire organization or agency, what was its total gross revenue (or budget, if a public or non-profit organization) for the most recent 12-month period? Was it…

1. Less than $100,000
2. $100,000 to $500,000
3. $500,000 to $1 million
4. $1 million to $5 million
5. $5 million to $10 million
6. $10 million to $50 million
7. $50 million to $500 million
8. $500 million or more

Q6. What percent of your revenue (or budget) for your **entire organization/agency** would you estimate that selling 'green' products or providing 'green' services was?

Estimate of the percentage: _____

Q7. Do you recall receiving a **District of Columbia Jobs Survey** in the mail recently?

1. Yes, received it (GO TO Q8)
2. No, didn't receive it (GO TO Q9)
3. Don't recall whether or not they received it (GO TO Q9)

If Yes, Received it:

Q8. Finally, we'd like to find out some reasons why your organization/business did not complete the **District of Columbia Job Survey**. What might have the reasons been for your organization/business?

_____

_____

_____

_____

If Didn't Receive it or Don't Recall whether or not Received it:

Q9. We directed the survey to the **Human Resources Manager or Operations Manager** and asked that it be forwarded to someone familiar with the types of jobs and openings in your organization. Who would have been the right person in your organization?

_____

_____

_____

_____

Thank you very much for your time!

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Please return the survey by **email** (jobsurvey@icfi.com) or by **fax** (703-225-2357).

State of Maryland Jobs Survey

PLEASE REPORT ONLY FOR YOUR SITES IN THE SPECIFIED MARYLAND COUNTY/CITY

13. In the next two years, do you anticipate that the following credentials would improve a candidate's chances of being hired for a '**green**' job at your sites **in the specified county/city**?

	Yes	No	Not familiar
NABCEP™ (North American Board of Certified Energy Practitioners) Certification	☐	☐	☐
BPI (Building Performance Institute)	☐	☐	☐
LIUNA (Laborers' International Union of North America)	☐	☐	☐
NATE (North American Technician Excellence)	☐	☐	☐
LEED (Leadership in Energy and Environmental Design)	☐	☐	☐
Build It Green Certification	☐	☐	☐
Sustainability Training	☐	☐	☐
Other (please specify):	☐	☐	☐

14. Would your organization pay part of the cost to have '**green**' employees at your sites **in the specified county/city** enroll in specialized training offered for the following?

	Yes	No
Occupation-specific '**green**' certificate programs	☐	☐
Specialized off-site workshops	☐	☐
2-year community college Associate's Degree program for entry-level designers	☐	☐
2-year community college Associate's Degree program for entry-level technicians	☐	☐
Other (please specify):	☐	☐

15. Next, we have a question concerning all job openings. The Federal government has a fund to help employers hire long-term unemployed workers for on-the-job training to retrain them for new careers. This fund covers a portion of their first six months salary (from 50% to 90% of their salary).

How likely would your organization be to hire long-term unemployed workers in the specified county/city if your organization was reimbursed for at least 50% of their salaries for the first six months they are funded?

☐ Not at all likely ☐ Somewhat likely ☐ Very likely ☐ Absolutely Certain ☐ Not Applicable – Federal Organization

About You

Finally, we have some questions about you. These questions are not mandatory, but if we have follow-up questions, we might like to contact you. Your name and contact information will be kept strictly confidential. In addition, if you provide your email address, we can email a copy of the study report to you.

16. What is your name? _____

17. What is your position/title (e.g. Human Resources Manager)? _____

18. What is your telephone number? _____

19. What is your email address? _____

20. Would you like to receive a copy of the final study report by email? Yes ☐ No ☐

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon, VA 20172-9900.

STATE OF MARYLAND JOBS SURVEY

1. Regardless of other possible locations, is the organization still functioning at any site in the county/city specified to the right?

☐ **Yes → PLEASE CONTINUE.**
☐ **No → PLEASE RETURN THIS SURVEY IN THE ENVELOPE PROVIDED.**

Your Organization or Agency

2. For your entire organization or agency, what was its total gross revenue (or budget, if a public or non-profit organization) for the most recent 12-month period? Your best guess would be fine.

☐ Less than $100,000 ☐ $100,000 – $500,000 ☐ $500,000 – $1 million ☐ $1 million – $5 million ☐ $5 million – $10 million ☐ $10 million – $50 million ☐ $50 million – $500 million ☐ $500 million or more

3. What would you estimate that the sale or provision of '**green**' products or services was as a percent of your revenue (or budget) **for your entire organization/agency**?

Please estimate the percentage: ____ %

4. In total, about how many employees work at your **entire organization/agency**?

Total **full-time** (work 35 hours or more per week) employees: ____

Total **part-time** (work less than 35 hours per week) employees: ____

Current Employment in the Specified County/City

5. How many different locations does your organization have **in the specified county/city?** ____

6. In total, about how many employees are currently based at your sites **in the specified county/city**?

Total **full-time** (work 35 hours or more per week) employees: ____

Total **part-time** (work less than 35 hours per week) employees: ____

7. Of the employees at your sites **in the specified county/city**, about how many have worked to produce **ANY** '**green**' products or supply any '**green**' services (in one or more of the seven categories of green jobs)?

Number of **full-time** (work 35 hours or more per week) employees doing any '**green**' work: ____

Number of **part-time** (work less than 35 hours per week) employees doing any '**green**' work: ____

Future Employment in the Specified County/City

8. What is your estimate of the total number of employees who will be hired in the next 2 years to work **at any of your sites in the specified county/city**?

Full-time (work 35 hours or more per week) employees to be hired: ____

Part-time (work less than 35 hours per week) employees to be hired: ____

9. For the new employees at any of your sites **in the specified county/city**, what is your estimate of how many will work to produce **ANY** '**green**' products or provide any '**green**' services?

Full-time (work 35 hours or more per week) employees doing any '**green**' work to be hired: ____

Part-time (work less than 35 hours per week) employees doing any '**green**' work to be hired: ____

→ IF THERE ARE NO EMPLOYEES WHO CURRENTLY DO ANY 'GREEN' WORK AT ANY OF YOUR SITES IN THE SPECIFIED COUNTY/CITY, PLEASE RETURN THIS SURVEY IN THE ENVELOPE PROVIDED, YOU ARE DONE.

→ IF THERE ARE EMPLOYEES AT ANY OF YOUR SITES IN THE SPECIFIED COUNTY/CITY WHO DO ANY 'GREEN' WORK, PLEASE CONTINUE.

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon, VA 20172-9900.

PLEASE REPORT ONLY FOR YOUR SITES IN THE SPECIFIED MARYLAND COUNTY/CITY

10. Next, we would like you to report on the jobs in which employees spend **ANY** of their time on one or more of the following '**green**' activities for your sites **in the specified**. For employees responsible for doing work in more than one '**green**' job category, choose the one that accounts for the most time on the job. Do not include information for locations outside of the specified county/city.

Green Job Categories

	Renewable energy and alternative fuels	Energy efficiency and energy conservation	Greenhouse gas reduction	Pollution reduction and cleanup	Recycling and waste reduction	Sustainable agriculture and natural resources conservation	Education, compliance, public awareness, and training directly related to green jobs					
List Job Titles Related to Green Job Categories	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	How many positions are currently open?	How long have these positions been open? (in months)	How many more NEW employees will you need for this position in the next 2 years?	Over the next 2 years, do you anticipate any difficulties having enough qualified 'green' candidates for this job title?	
Example: Civil Engineer											Yes	No
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐

If you have more job titles to report, please see the instructions in the box to the right.

Have more green jobs to report? We want to hear about all of your green jobs!

Please contact the Job Survey Team for another copy or make a photocopy of this page.

11. Does your organization use the following methods at your sites **in the specified county/city** to prepare current workers to produce '**green**' products or services?

	Yes	No
In-house classroom	☐	☐
On-the-job training	☐	☐
Online training	☐	☐
Trade apprenticeship programs	☐	☐
Community college courses	☐	☐
We hire only workers who are already trained	☐	☐
Other (please specify):	☐	☐

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon VA 20172-9900.

12. Over the next two years, how difficult do you anticipate the following will be for the '**green**' jobs and openings at your sites **in the specified county/city**?

	Not at all difficult	Somewhat difficult	Very difficult
Recruiting entry-level '**green**' employees with appropriate training and education	☐	☐	☐
Recruiting experienced '**green**' employees with adequate skills	☐	☐	☐
Retaining valuable '**green**' employees who could be hired by competitors	☐	☐	☐
Providing '**green**' training opportunities for advancement of current employees	☐	☐	☐
Other recruiting/retaining activities (please specify):	☐	☐	☐
Other training activities (please specify):	☐	☐	☐

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon VA 20172-9900.

State of Maryland Follow-up Survey for Non-Response Bias Study

STATE OF MARYLAND DLLR
DEPARTMENT OF LABOR, LICENSING AND REGULATION

State of Maryland Jobs Survey Follow-up Questionnaire

Thank you for your participation – your responses are essential for the success of this effort.

Do you want better-prepared employees? The State of Maryland needs your help to identify training and workforce needs in the area. Recently you were invited to participate in a survey sent in the mail concerning jobs at your business/organization. However, we did not receive a returned form. Please complete the questions below to help us understand a little bit about your organization. Please return the completed survey by email (jobsurvey@icfi.com) or by fax (703-225-2357).

Q1. Regardless of other possible locations, is the organization still functioning at any site in City/County?

3. Yes
4. No (Go To Q7)

Q2. How many different locations does your organization have in City/County?

Number of locations: _____

Q3a. About how many full-time employees are based at your sites in City/County?

(Full-time employees work 35 hours or more per week): _____

Q3b. And, how many part-time employees are there?

(Part-time employees work 35 hours or more per week): _____

Next, we have just a couple of questions about green jobs. Categories of green jobs include renewable energy and alternative fuels, energy efficiency and energy conservation, greenhouse gas reduction, pollution reduction and cleanup, recycling and waste reduction, sustainable agriculture and natural resources conservation, and education, compliance, public awareness and training directly related to green jobs.

Q4a. Of the employees at your sites in City/County, about how **full-time** employees produce ANY 'green' products or supply any 'green' services in any of these categories?

(Full-time employees work 35 hours or more per week): _____

Q4b. And, how many **part-time** employees do any green work?

(Part-time employees work 35 hours or more per week): _____

Q5. For your entire organization or agency, what was its total gross revenue (or budget, if a public or non-profit organization) for the most recent 12-month period? Was it…

9. Less than $100,000
10. $100,000 to $500,000
11. $500,000 to $1 million
12. $1 million to $5 million
13. $5 million to $10 million
14. $10 million to $50 million
15. $50 million to $500 million
16. $500 million or more

Q6. What percent of your revenue (or budget) for your **entire organization/agency** would you estimate that selling 'green' products or providing 'green' services was?

Estimate of the percentage: _____

Q7. Do you recall receiving a **State of Maryland Jobs Survey** in the mail recently?

4. Yes, received it (GO TO Q8)
5. No, didn't receive it (GO TO Q9)
6. Don't recall whether or not they received it (GO TO Q9)

If Yes, Received it:

Q8. Finally, we'd like to find out some reasons why your organization/business did not complete the **State of Maryland Job Survey**. What might have the reasons been for your organization/business?

_____

_____

_____

_____

If Didn't Receive it or Don't Recall whether or not Received it:

Q9. We directed the survey to the **Human Resources Manager or Operations Manager** and asked that it be forwarded to someone familiar with the types of jobs and openings in your organization. Who would have been the right person in your organization?

_____

_____

_____

_____

Thank you very much for your time!

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Please return the survey by **email** (jobsurvey@icfi.com) or by **fax** (703-225-2357).

Commonwealth of Virginia Jobs Survey

PLEASE REPORT ONLY FOR YOUR SITES IN THE SPECIFIED VIRGINIA COUNTY/CITY

13. In the next two years, do you anticipate that the following credentials would improve a candidate's chances of being hired for a '**green**' job at your sites **in the specified county/city**?

	Yes	No	Not familiar
NABCEP™ (North American Board of Certified Energy Practitioners) Certification	☐	☐	☐
BPI (Building Performance Institute)	☐	☐	☐
LIUNA (Laborers' International Union of North America)	☐	☐	☐
NATE (North American Technician Excellence)	☐	☐	☐
LEED (Leadership in Energy and Environmental Design)	☐	☐	☐
Build It Green Certification	☐	☐	☐
Sustainability Training	☐	☐	☐
Other (please specify):	☐	☐	☐

14. Would your organization pay part of the cost to have '**green**' employees at your sites **in the specified county/city** enroll in specialized training offered for the following?

	Yes	No
Occupation-specific '**green**' certificate programs	☐	☐
Specialized off-site workshops	☐	☐
2-year community college Associate's Degree program for entry-level designers	☐	☐
2-year community college Associate's Degree program for entry-level technicians	☐	☐
Other (please specify):	☐	☐

15. Next, we have a question concerning all job openings. The Federal government has a fund to help employers hire long-term unemployed workers for on-the-job training to retrain them for new careers. This fund covers a portion of their first six months salary (from 50% to 90% of their salary).

How likely would your organization be to hire long-term unemployed workers in the specified county/city if your organization was reimbursed for at least 50% of their salaries for the first six months they are funded?

☐ Not at all likely ☐ Somewhat likely ☐ Very likely ☐ Absolutely Certain ☐ Not Applicable – Federal Organization

About You

Finally, we have some questions about you. These questions are not mandatory, but if we have follow-up questions, we might like to contact you. Your name and contact information will be kept strictly confidential. In addition, if you provide your email address, we can email a copy of the study report to you.

16. What is your name? _____

17. What is your position/title (e.g. Human Resources Manager)? _____

18. What is your telephone number? _____

19. What is your email address? _____

20. Would you like to receive a copy of the final study report by email? Yes ☐ No ☐

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon, VA 20172-9900.

COMMONWEALTH OF VIRGINIA JOBS SURVEY

1. Regardless of other possible locations, is the organization still functioning at any site in the county/city specified to the right?

☐ Yes → **PLEASE CONTINUE.**
☐ No → **PLEASE RETURN THIS SURVEY IN THE ENVELOPE PROVIDED.**

Your Organization or Agency

2. **For your entire organization or agency**, what was its total gross revenue (or budget, if a public or non-profit organization) for the most recent 12-month period? Your best guess would be fine.

☐ Less than $100,000 ☐ $100,000 – $500,000 ☐ $500,000 – $1 million ☐ $1 million – $5 million ☐ $5 million – $10 million ☐ $10 million – $50 million ☐ $50 million – $500 million ☐ $500 million or more

3. What would you estimate that the sale or provision of '**green**' products or services was as a percent of your revenue (or budget) **for your entire organization/agency**?

Please estimate the percentage: _____ %

4. In total, about how many employees work at your **entire organization/agency**?

Total **full-time** (work 35 hours or more per week) employees: _____
Total **part-time** (work less than 35 hours per week) employees: _____

Current Employment in the Specified County/City

5. How many different locations does your organization have **in the specified county/city?** _____

6. In total, about how many employees are currently based at your sites **in the specified county/city**?

Total **full-time** (work 35 hours or more per week) employees: _____
Total **part-time** (work less than 35 hours per week) employees: _____

7. Of the employees at your sites **in the specified county/city**, about how many have worked to produce **ANY** '**green**' products or supply any '**green**' services (in one or more of the seven categories of green jobs)?

Number of **full-time** (work 35 hours or more per week) employees doing any '**green**' work: _____
Number of **part-time** (work less than 35 hours per week) employees doing any '**green**' work: _____

Future Employment in the Specified County/City

8. What is your estimate of the total number of employees who will be hired in the next 2 years to work **at any of your sites in the specified county/city**?

Full-time (work 35 hours or more per week) employees to be hired: _____
Part-time (work less than 35 hours per week) employees to be hired: _____

9. For the new employees at any of your sites **in the specified county/city**, what is your estimate of how many will work to produce **ANY** '**green**' products or provide any '**green**' services?

Full-time (work 35 hours or more per week) employees doing any '**green**' work to be hired: _____
Part-time (work less than 35 hours per week) employees doing any '**green**' work to be hired: _____

→ **IF THERE ARE NO EMPLOYEES WHO CURRENTLY DO ANY 'GREEN' WORK AT ANY OF YOUR SITES IN THE SPECIFIED COUNTY/CITY, PLEASE RETURN THIS SURVEY IN THE ENVELOPE PROVIDED, YOU ARE DONE.**

→ **IF THERE ARE EMPLOYEES AT ANY OF YOUR SITES IN THE SPECIFIED COUNTY/CITY WHO DO ANY 'GREEN' WORK, PLEASE CONTINUE.**

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon, VA 20172-9900.

PLEASE REPORT ONLY FOR YOUR SITES IN THE SPECIFIED VIRGINIA COUNTY/CITY

10. Next, we would like you to report on the jobs in which employees spend **ANY** of their time on one or more of the following '**green**' activities for your sites **in the specified county/city**. For employees responsible for doing work in more than one '**green**' job category, choose the one that accounts for the most time on the job. Do not include information for locations outside of the specified county/city.

Green Job Categories

	Renewable energy and alternative fuels	Energy efficiency and energy conservation	Greenhouse gas reduction	Pollution reduction and cleanup	Recycling and waste reduction	Sustainable agriculture and natural resources conservation	Education, compliance, public awareness, and training directly related to green jobs					
List Job Titles Related to Green Job Categories	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	Number of employees in this core area	How many positions are currently open?	How long have these positions been open? (in months)	How many more NEW employees will you need for this position in the next 2 years?	Over the next 2 years, do you anticipate any difficulties having enough qualified 'green' candidates for this job title?	
Example: Civil Engineer											Yes	No
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐

If you have more job titles to report, please see the instructions in the box to the right.

Have more green jobs to report? We want to hear about all of your green jobs!

Please contact the Job Survey Team for another copy or make a photocopy of this page.

11. Does your organization use the following methods at your sites **in the specified county/city** to prepare current workers to produce '**green**' products or services?

	Yes	No
In-house classroom	☐	☐
On-the-job training	☐	☐
Online training	☐	☐
Trade apprenticeship programs	☐	☐
Community college courses	☐	☐
We hire only workers who are already trained	☐	☐
Other (please specify):	☐	☐

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon VA 20172-9900.

12. Over the next two years, how difficult do you anticipate the following will be for the '**green**' jobs and openings at your sites **in the specified county/city**?

	Not at all difficult	Somewhat difficult	Very difficult
Recruiting entry-level '**green**' employees with appropriate training and education	☐	☐	☐
Recruiting experienced '**green**' employees with adequate skills	☐	☐	☐
Retaining valuable '**green**' employees who could be hired by competitors	☐	☐	☐
Providing '**green**' training opportunities for advancement of current employees	☐	☐	☐
Other recruiting/retaining activities (please specify):	☐	☐	☐
Other training activities (please specify):	☐	☐	☐

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Thank you for responding. Please return the survey to ICF International at P.O. Box 789, Herndon VA 20172-9900.

Commonwealth of Virginia Follow-up Survey for Non-Response Bias Study

Commonwealth of Virginia Jobs Survey
Follow-up Questionnaire

Thank you for your participation – your responses are essential for the success of this effort.

Do you want better-prepared employees? The Commonwealth of Virginia needs your help to identify training and workforce needs in the area. Recently you were invited to participate in a survey sent in the mail concerning jobs at your business/organization. However, we did not receive a returned form. Please complete the questions below to help us understand a little bit about your organization. Please return the completed survey by email (jobsurvey@icfi.com) or by fax (703-225-2357).

Q1. Regardless of other possible locations, is the organization still functioning at any site in County/City?

5. Yes
6. No (Go To Q7)

Q2. How many different locations does your organization have in City/County?

Number of locations: _____

Q3a. About how many full-time employees are based at your sites in City/County?

(Full-time employees work 35 hours or more per week): _____

Q3b. And, how many part-time employees are there?

(Part-time employees work 35 hours or more per week): _____

Next, we have just a couple of questions about green jobs. Categories of green jobs include renewable energy and alternative fuels, energy efficiency and energy conservation, greenhouse gas reduction, pollution reduction and cleanup, recycling and waste reduction, sustainable agriculture and natural resources conservation, and education, compliance, public awareness and training directly related to green jobs.

Q4a. Of the employees at your sites in City/County, about how **full-time** employees produce ANY 'green' products or supply any 'green' services in any of these categories?

(Full-time employees work 35 hours or more per week): _____

Q4b. And, how many **part-time** employees do any green work?

(Part-time employees work 35 hours or more per week): _____

Q5. For your entire organization or agency, what was its total gross revenue (or budget, if a public or non-profit organization) for the most recent 12-month period? Was it…

17. Less than $100,000
18. $100,000 to $500,000
19. $500,000 to $1 million
20. $1 million to $5 million
21. $5 million to $10 million
22. $10 million to $50 million
23. $50 million to $500 million
24. $500 million or more

Q6. What percent of your revenue (or budget) for your **entire organization/agency** would you estimate that selling 'green' products or providing 'green' services was?

Estimate of the percentage: _____

Q7. Do you recall receiving a **Commonwealth of Virginia Jobs Survey** in the mail recently?

7. Yes, received it (GO TO Q8)
8. No, didn't receive it (GO TO Q9)
9. Don't recall whether or not they received it (GO TO Q9)

If Yes, Received it:

Q8. Finally, we'd like to find out some reasons why your organization/business did not complete the **Commonwealth of Virginia Job Survey**. What might have the reasons been for your organization/business?

_____

_____

_____

_____

If Didn't Receive it or Don't Recall whether or not Received it:

Q9. We directed the survey to the **Human Resources Manager or Operations Manager** and asked that it be forwarded to someone familiar with the types of jobs and openings in your organization. Who would have been the right person in your organization?

_____

_____

_____

_____

Thank you very much for your time!

Need help? Contact the Job Survey Team at: 1-877-386-8282 or jobsurvey@icfi.com.

Please return the survey by **email** (jobsurvey@icfi.com) or by **fax** (703-225-2357).

Appendix B: Detailed Survey Methodology

Sampling Plan

The Quarterly Census of Employment and Wages (QCEW) databases from Maryland, the District of Columbia, and Virginia were used to obtain establishment contact information for developing the sampling frame and implementing the survey. The QCEW database represents a "quarterly count of employment and wages reported by employers covering 98 percent of U.S. jobs, available at the county, Metropolitan Statistical Area (MSA), state and national levels by industry[34]." As illustrated by Exhibit 1, the final sampling universe included 326,946 establishments across the three states of interest for the MARC survey.

Exhibit 1: QCEW Cases from Maryland, the District of Columbia, and Virginia

State	Number of Establishments
District of Columbia	24,914
Maryland	128,439
Virginia	173,593
Total	326,946

Upon receipt of data from the three jurisdictions and completion of Non-Disclosure Agreements, MARC-SAT began intensive review and cleaning of the data, which involved steps to facilitate sampling and mailing, e.g. correcting name and address fields through both manual and automated processes, assigning records to appropriate work investment areas (WIAs), etc. The specific stages for preparing the sample are outlined in the following sections.

Stage 0: Defining the Strata

The sample was stratified by employer size, location (WIA) and green/non-green NAICS codes. The distribution of green/non-green NAICS codes across the entire population—DC, Maryland, Virginia—was approximately 72 percent green and 28 percent non-green. To have greater precision in estimates for employers with green jobs, we designed the sample such that 90 percent of sampled employers were from the group of previously identified "green" NAICS codes and 10 percent were from the group identified as "Not likely to have green jobs". Employee size was important in stratifying the sample since MARC-SAT anticipated that larger employers would be less likely to complete the survey given the increased complexity of responding to the survey for a large company. As such, the recoded Federal Information Processing Standards codes (FIPS) [35] code, number of employees and NAICS code variables were used to define the strata. Below is more detail about the elements of the strata:

[34] United States Department of Labor, Bureau of Labor Statistics (2010). Quarterly Census of Employment and Wages. Retrieved 9/28/10 from http://www.bls.gov/cew/

[35] Federal information processing standards codes (FIPS codes) are a standardized set of numeric or alphabetic codes issued by the National Institute of Standards and Technology (NIST) to ensure uniform identification of geographic entities through all federal government agencies. The entities covered include: states and statistically equivalent entities, counties and statistically equivalent entities, named populated and related location entities (such as, places and county subdivisions), and American Indian and Alaska Native areas. Retrieved on February 24, 2011 from http://quickfacts.census.gov/qfd/meta/long_fips.htm

1. FIPS codes which were included in the QCEW data were recoded into WIAs. In other words, each FIPS code was classified by its corresponding WIA. For example, the Montgomery County WIA in Maryland included the FIPS code 031. There were 12 WIAs in Maryland and 15 in Virginia. The District of Columbia was not subdivided.
2. Number of Employees, a continuous variable, was recoded into categories as follows: 1-20 employees, 21-100 employees, 101-250 employees and more than 250 employees. Records that had 0 employees were removed from the files.
3. NAICs codes were classified as either green or non-green. The green NAICS codes were identified as NAICS codes that were likely to have green employers or employees while the non-green were not likely to have green employment or activities. Seven hundred and thirty-two 6-digit (NAICS) codes were used in the MARC LMI survey. The list of 732 was compiled using information and green-related NAICS codes as defined by the BLS and numerous regional and state green employment surveys conducted in the past five years.

Stage 1: Merging the Data

Having prepared each of the three QCEW data files separately as a preliminary step, MARC-SAT combined all three data sets (Maryland, DC, Virginia) into one working data file. After merging all three data files, we conducted an initial round of "deduplication" or removing duplicate records from the working data file; duplicates were defined as cases in which the organization had the same legal name and same address across the three jurisdictions. In some instances, establishments with the same legal name and same address were in different states or counties. In order to determine the record that would remain in the data set, we assigned random numbers to each record using a random number generator and selected the record that was randomly assigned the lowest number. This process only removed duplicates in which the name and address were exact matches. However, many establishments had the same name and address but were off by a few characters (e.g. St versus Street in the address field), as such, there were still some duplicates even after employing the exact match process.

There were also distinctions between the jurisdictions' data fields that we noted as we looked at the combined data file; therefore, we had to make decisions about the ways we would address those distinctions in order to ensure consistency. In particular, we noted differences in the number and types of address fields included across the jurisdiction; the Virginia QCEW file only included one address field, while Maryland and the District of Columbia had three separate address fields. Specifically, the Maryland data file included *tax address, mailing address, and physical address* fields for each employer record while the District of Columbia included *tax address, mailing address and other address* fields for its listed employers. After reviewing each of the address fields in the data file, it was clear that there was close similarity between the *tax address* fields in Maryland and DC and the Virginia *address* field. However, the *tax address* field had the most duplicate and out-of-state records as it frequently listed the address of an organization's headquarters. Therefore, we used the *mailing address* fields for the Maryland and DC employers as these fields more closely represented the record of interest—the unique establishment level. We used the singular *address field* included for the Virginia employers, despite the higher number of duplicates as compared to the Maryland and DC files, since it was the only available option for corresponding with the Virginia employers included in the survey sample. MARC-SAT was able to address other such variations in the data set by employing a standardized, stepwise, and documented process that was quality-assured at various stages to ensure replicability and rigor.

Stage 2: Selecting Optimal Numbers per WIA based on Green/Non-Green and Size

In addition to making decisions about distinctions across the jurisdictions, we had to make decisions about drawing the sample per the defined strata, as well as in the context of precision and other critical factors. One of our primary concerns was representativeness across the jurisdictions, WIAs, green/non-green, and employer size based on number of employees. Therefore, we selected larger employers with certainty because we anticipated larger employers would be less likely to respond to the survey. As described by the United States Census Bureau (n.d.), "sampling units expected to have a large effect on the precision of the estimates are selected with certainty. This means they are sure to be selected and will represent only themselves (i.e., have a selection probability of 1 and a sampling weight of 1).[36]" Consequently, we selected a larger number of records from the five largest WIAs in Maryland and in Virginia in order to ensure sufficient representation in these WIAs, as well as to accurately represent each State. Of the 27 WIAs in Maryland and Virginia, 17 were designated as small WIAs and ten were designated as large WIAs (five in each state). From the smaller WIAs, we selected with certainty all employers with 101 or more employees and from the larger WIAs we selected with certainty all employers with 251 or more employees. The District of Columbia was treated like a large WIA; therefore, we selected all District of Columbia establishments with 251 or more employees with certainty.

For estimation of proportions, our goal for our sample size of 270 per WIA was to have a precision of 5 percent at the 90 percent confidence level. With regard to margins of error, there were variations across the WIAs ranging from 1.28 percent to 14.33 percent; the margin of error for the entire survey was 1.84 percent. For the estimation of totals (e.g., the total number of green jobs), the estimated total was within 10 percent of the true total with 90 percent confidence. Note that, for estimation of totals, the error rate of 10 percent is a relative error rate. The size of the absolute error is proportional to the true population total. For example, if one stratum has 1,000 green jobs, our estimate may be off by as much as 100 with a sample size of 270 per WIA.

As previously mentioned, we also wanted to ensure that the survey sample would reflect the correct distribution of green/non-green NAICS codes. The distribution of green/non-green NAICS codes across the entire population was approximately 72 percent Green and 28 percent non-green. We designed the sample to oversample from the NAICS codes that had been determined to likely include green employers and employees to allow for greater precision of estimates within this group; only 10 percent of the sample was to come from those NAICS codes that were less likely to have non-green employers or employees. Therefore, the percentage of green vs. non-green that was selected was determined by achieving a 90 percent/10 percent split while maintaining the approximate proportions across the categories of employee size. Based on marginal proportions for the strata for green/non-green and employer size, we determined ratios to select optimal numbers based on WIA size. This allowed us to maintain relative proportions of employer size groups within green/non-green NAICS codes, similar to the margins overall before sampling for green/non-green strata.

- For the 17 small WIAs, we selected records as follows:
    - For green NAICS codes, we randomly selected 35 percent of those with 1-20 employees and 92 percent of those with 21-100 employees.

[36] United States Census Bureau. (n.d.). Monthly Wholesale Trade Survey Stratification. Retrieved November 11/19/10 from http://www.census.gov/wholesale/pdf/mwts/methods/MWTS_Stratification.pdf

- For non-green NAICS codes, we randomly selected 10 percent of those with 1-20 employees and 28 percent of those with 21-100 employees.
- We selected with certainty those who have 101+ employees regardless of the green/non-green NAICS code split.

- For the 10 large WIAs, we selected records as follows:
  - For green NAICS codes, we randomly selected 35 percent of those with 1-20 employees and 92 percent of those with 21-250 employees.
  - For non-green NAICS codes, we randomly selected 10 percent of those with 1-20 employees and 28 percent of those with 21-250 employees.
  - We selected with certainty those who have 251+ employees regardless of the green/non-green NAICS code split.

- We treated the District of Columbia as a large WIA, selecting the records as follows:
  - For green NAICS codes, we randomly selected 35 percent of those with 1-20 employees and 92 percent of those with 21-250 employees.
  - For non-green NAICS codes, we randomly selected 10 percent of those with 1-20 employees and 28 percent of those 21-250 with employees.
  - We selected with certainty those with 251+ employees regardless of the green/non-green NAICS code split.

Stage 3: Oversampling by WIA due to Duplication

Because we knew that there were still a large number of duplicate records in the data, we first selected a larger number of records rather than selecting the final desired sample size for each WIA.

- For the 17 small WIAs, we randomly deselected down to approximately 1300 per WIA, keeping all employers with 101 or more employees

- For the nine larger WIAs, not including Northern Virginia, we randomly deselected down to approximately 2000 per WIA, keeping all employers with 251 or more employees

- Because Northern Virginia had many more employers than other WIAs (over 10,000) and many more large employers than most other WIAs, we determined that the Northern Virginia WIA should have a larger sample size. For Northern Virginia, we randomly deselected down to approximately 2300 records, keeping all employers with 251 or more employees

- For the District of Columbia, we randomly deselected down to approximately 6200 records, keeping all employers with 251 or more employees

Stage 4: Manual Deduplication by Name and Address

Next, we reviewed the data and deleted duplicate records in which the business name and mailing address were the same. We first sorted the data file by name of business and then by address; in addition, employee size was sorted randomly. To do this, we used a random number generator to assign random

numbers, and sorted by the random number within name and address. After sorting the data, we scanned the records, deleting records with the same trade name and same address. We deleted duplicate records such that there would only be one record for a given organization at a given address. Our aim was to ensure that only one questionnaire was delivered to a particular address. This mostly affected records in which there was more than one location but the address in the data set reflected the company headquarters. Preference was given to keep larger employers in smaller counties and those with green-likely NAICS codes.

Stage 5: Second Round of Manual Deduplication

Next, we sorted by name and address to check again for duplicates using the automated deduplication command in Statistical Package for the Social Sciences 18.0 (SPSS/PASW). We discovered that there were still duplicate records. Specifically, we found 18 duplications remaining in the data, which we deleted based on size of the organization, deleting the duplicate records with a smaller employer size.

Stage 6: Final Sample Selection

After completing the manual deduplication of the data, we randomly selected the final sample for each WIA.

- For the 17 small WIAs, we randomly deselected to approximately 1000 per WIA, keeping all employers with 101 or more employees
- For the nine larger WIAs, not including Northern Virginia, we selected approximately 1300 records for the two largest WIAs in Maryland and Virginia and 1200 records in the 5 remaining larger WIAs, keeping all employers with 251 or more employees
- For Northern Virginia, we randomly deselected to approximately 1600 records, keeping all employers with 251 or more employees
- For the District of Columbia, we randomly deselected to approximately 4800 records, keeping all employers with 251 or more employees

Our final sample size by jurisdiction was as follows:

Exhibit 2: Final Sample

State	Number of Establishments
Virginia	16,572
Maryland	13,364
District of Columbia	5,037
Total	34,973

Data Collection

Approximately 35,000 public and private employers were sent surveys by mail in early June 2010, with a Web-based response option offered approximately two weeks later. The survey websites were State-specific and therefore were tailored to unique variables such as county versus ward distinctions in Maryland

and Virginia as compared to DC. In addition to the Web-based response option, MARC-SAT provided survey support via a dedicated toll-free telephone line, as well as by email. At the close of the survey on October 1, 2010, MARC-SAT had received a total of 9,892 paper- and web-based survey responses from the three jurisdictions combined; in some instances we received more than one submission from employers and in those cases we kept the one that was more complete or the one submitted first if they were equally complete. At the jurisdictional levels, we received 633 surveys from DC, 3512 responses from Maryland, and 5747 from the Commonwealth of Virginia. Exhibit 3 illustrates the jurisdictional response rates.

Exhibit 3: Final Sample

State	Number of Responses
Virginia	5,747
Maryland	3,512
District of Columbia	633
Total	9,892

Survey Instruments

Research: Lessons Learned and Promising Practices

MARC-SAT researched lessons-learned and promising practices from other jurisdictions in drafting survey questions. Specifically, we reviewed data collection items, green jobs definitions, survey findings, and best practices from previously administered green jobs / labor market studies in California, Michigan, Missouri, New York, Oregon, Washington State, and other jurisdictions in drafting the survey questions. The team also evaluated information issued by the BLS and participated in the BLS webinar discussing green jobs definitions, data collection and survey practices, and accounting methodology. The survey development team also evaluated the State of Florida's survey when it was issued in mid-June, after the MARC survey was near completion. In addition, MARC-SAT conducted pretests with Human Resources and Operations Managers in Virginia and the District of Columbia. Feedback from the pretests was used to revise and refine the questionnaire. In addition, feedback was obtained from the MARC Project Partners and representatives of the three State Workforce Agencies on the MARC LMI Steering Committee, including District of Columbia Department of Employment Services, Maryland Department of Labor, Licensing, and Regulation, and the Virginia Employment Commission.

Survey Finalization

In addition to researching promising practices from other jurisdictions, MARC-SAT took pains to make determinations about such matters as which logos to include on the cover letters of the survey, the appropriate introductory language and even the title of the survey. Tailoring and carefully crafting these survey communications was important to the MARC-SAT Team because well designed survey invitations and reminders help improve survey response rates. We determined that we would customize the cover letters for each jurisdiction by using relevant language, as well as different State Workforce Agency logos for each jurisdiction; and that we would title the survey as a "Jobs Survey" so that it would not preclude those who do not think of their businesses as green from responding. These decisions were particularly

important since one of the primary goals of the survey was to adequately represent all jobs (green and non-green) in the region, within each State and within each WIA.

Paper-Based Survey

There were three versions of the paper-based survey distributed to respondents: State of Maryland Jobs Survey; Commonwealth of Virginia Jobs Survey; and the District of Columbia Jobs Survey. All three surveys asked respondents the same questions; however, there were distinctions between each in that there were specific references to cities/counties within each state. In addition, there was a Ward-level question included for the DC Survey since this manner of characterizing neighborhoods is unique to DC; this question was important to the process of analyzing the data since we initially intended to report data at the Ward level. Overall, there were 20 questions on the Virginia and DC survey and 21 on the DC survey (including the Ward-level question). Although there was an additional Ward-level question for DC establishments, not all establishments were able to provide a response to question; this, coupled with lower response rates for DC establishments made it difficult to provide robust Ward-level analysis. Please refer to Appendix A to view each version of the surveys.

Web-Based Survey

Similar to the paper-based survey, there were three versions of the web-based survey, each with a unique Uniform Resource Locator (URL) (www.dcjobsurvey.com, www.mdjobsurvey.com, and www.vajobsurvey.com). While the general information portion of these sites could be accessed by the general public, the survey portion of the sites will required a unique identifier for access, ensuring that any survey completed on one of the following three sites was completed by a respondent selected from the sample population. When the first survey package was mailed to respondents, the individual URLs were active but provided only general information about the MARC LMI survey. The web-based surveys were launched when we sent the first reminder postcard to respondents. The timing of the launching was based on peer-reviewed research that advocates a "sequential used of modes[37]" in order to increase, and not suppress, the likelihood of response. Previous research has found that providing survey respondents the option of several modes of survey completion at the outset will generally reduce response rate when compared to offering only a single initial mode completion. Therefore, respondents did not receive notice of the additional survey response mode until approximately three weeks after their receipt of the paper-pencil survey. In addition to the web-based surveys for the sample population, three additional web surveys were launched for general public use. Those websites were also customized for each jurisdiction and were accessible via the following URLs: www.dcgreenjobsurvey.com; www.mdgreenjobsurvey.com; and, www.vagreenjobsurvey.com. The public websites did not require a unique identifier for access.

Sample Weights

Sampling weights were applied to the sample in order to ensure that the responses could be extrapolated to the population, including adjusting for unit and item non-response. In particular, survey responses were weighted at the WIA- and Employer Size- levels to account for any underrepresentation.

[37] Dillman, D.A., Phelps, G., Tortora, R., Swift, K., Korhell, J., & Berck, J. (1999). Response Rate and Measurement Differences in Mixed Mode Surveys Using Telephone, Interactive Voice Response and Internet. Retrieved 10/28/10 from http://www.sesrc.wsu.edu/dillman/papers/Mixed%20Mode%20ppr%20_with%20Gallup_%20POQ.pdf

Response Rate Protocol

In line with Dillman's *Tailored Design Method* (TDM), survey participants were sent a pre-notification postcard, two copies of the survey, as well as four reminders—totaling seven paper survey communications—in order to increase the likelihood of response. The specific data collection methodology was as follows[38]:

(1) All members of the sample were sent a pre-notification postcard. The postcard alerted employers in the sample that they had been selected to participate in the survey, provided a brief description of the survey, and included information about the funding agency as well as State Workforce Agency logos to establish the legitimacy of the survey. All subsequent correspondence included State Workforce Agency logos as well.

(2) Approximately one week after the pre-notification postcard was mailed, all members of the sample received a survey package that included a cover letter with instructions and information regarding the dedicated toll-free line and other contact information, definitions and examples for each of the seven green jobs categories, the questionnaire, and a postage-paid enveloped with which to return the questionnaire.

(3) Approximately one week after the questionnaire was mailed, a follow-up postcard was sent to all members of the sample. The postcard included language that thanked employers that had responded and requested a response from those who had not yet responded.

(4) Another follow-up or reminder postcard was sent to all members of the sample about a week after the first postcard. Similar to the first postcard, this postcard included language that thanked employers that had already responded to the survey, as well as requested a response from non-responding employers.

(5) Two weeks after the second "reminder postcard" was mailed, non-responding members of the sample received another survey package that included a cover letter with instructions and information regarding the dedicated toll-free line and other contact information, definitions and examples for each of the seven green jobs categories, the questionnaire, and a postage-paid envelope with which to return the questionnaires.

(6) As a follow-up to the reissued survey package, a postcard was sent to non-responding members of the sample within a week. The postcard reminded non-respondents to complete the survey, as well as included language that thanked employers that had already responded. Although a majority of the respondent employers were removed from the sample for this correspondence, we kept the language that thanked employers that had already responded because there may have some overlap between the time span in which we removed respondents from the sample and the delivery of completed surveys by mail.

(7) A final reminder postcard was sent to all sampled employers a week after the sixth mailed correspondence; the postcard alerted non-responders to the survey administration closing and thanked the employers that had already responded.

[38] Adapted from a study conducted by the State Bar of Texas Legal Services to the Poor in Criminal Matters Committee at The University of Texas at Arlington. Retrieved 9/28/10 from http://www.uta.edu/pols/moore/indigent/tdm.htm

In addition to mailing the survey to employers, a web survey—via three state-specific websites (www.dcjobsurvey.com, www.mdjobsurvey.com, and www.vajobsurvey.com) was made available to respondents in the second postcard reminder. Telephone and email support was available from the beginning of the survey administration. Selected employers who did not respond to the survey mailing were contacted by telephone to collect survey responses. Data collection was conducted over a six week time period.

Telephone Follow-up

At the close of the survey administration period, MARC-SAT conducted two telephone follow-up activities in order to increase employers' response rates, as well as to determine why certain establishments had particularly lower response rates. The first activity was a "Survey Completion Follow-up" and the second was a "Non-Response Bias Study;" the intent of the former was to complete the full survey with a randomly-selected sample of non-respondents whereas the intent of the latter was to ascertain why the sampled employers did not respond to the survey. There were two different samples established for each study—both from the lowest responding establishments of the study sample. Lastly, all members of MARC-SAT that conducted telephone follow-up used a script in order to standardize the approach and to decrease the likelihood of bias resulting from diverse approaches.

Survey Completion Follow-up

As previously indicated, we randomly selected a subset of non-responding establishments in order to complete the full survey by telephone. The members of the sample that had the lowest response rates (ranging from 7-12 percent) were: a) large businesses – we sampled 2,678 large businesses and as of the start of the follow-up activity 9.1 percent had responded; b) District of Columbia – we sampled 5,037 businesses in DC, as of the start of the follow-up activity 7 percent had responded; and, c) two WIAs in Maryland (103 and 108) that had a low response rate (12 percent) as of the start of the follow-up activity. Therefore, the final follow-up sample was randomly drawn from these subsets of the sample population.

The establishments were randomly selected for the purposes of representativeness, as well as to lessen the likelihood of systematic bias; a total of 317 records were selected for follow-up and divided into replicates of smaller sets of employers. Once the employers for follow-up were determined, MARC-SAT called the establishments according to how they were ordered by the initial selection process rather than choosing the order in which establishments would be contacted; this approach further decreased the likelihood of bias. Members of MARC-SAT exhausted each set of records (including call backs) before moving on to another set of records.

Non-Response Bias Study

In order to determine why certain employers did not respond to the survey, and to assess the possibility of bias as a result of survey non-response, MARC-SAT completed a Non-Response Bias Study. The study was completed by telephone and involved the use of an abbreviated version of the survey, titled the "Follow-up Questionnaire," which included nine key survey questions. Although we called the study a non-response study internally, we were more generic in our correspondences with sampled employers in order to decrease the stigma attached with being non-respondents and to increase the likelihood of response. The Follow-up Questionnaire, like the full green jobs survey, was customized for each jurisdiction so that we asked information specific to the jurisdiction, city/county and establishment that we contacted.

Similar to the "Survey Completion Follow-up" activity, non-responding establishments were randomly selected for the purposes of representativeness, as well as to lessen the likelihood of systematic bias; a total of 120 records were selected for follow-up with the goal of completing 100 surveys by phone. The Non-Response Bias Study involved a more intensive outreach approach compared to the telephone follow-up approach because the goal was not only to ensure that each employer was reached but also that employers either completed the survey by phone or explicitly declined to participate. Also, some representatives asked that we fax or email copies of the survey forms to them for completion and were still non-responsive despite additional follow-up. The study was conducted for approximately 19 days and resulted in the completion of 32 surveys by phone. Eleven establishments declined participation and the remainders either never responded to several messages or were never reached. Please see Appendix A for a copy of the Follow-up Questionnaire.

Appendix C: List of Green Industries

NAICS	NAICS Title
111110	Soybean Farming
111120	Oilseed (except Soybean) Farming
111130	Dry Pea and Bean Farming
111140	Wheat Farming
111150	Corn Farming
111160	Rice Farming
111191	Oilseed and Grain Combination Farming
111199	All Other Grain Farming
111211	Potato Farming
111219	Other Vegetable (except Potato) and Melon Farming
111310	Orange Groves
111320	Citrus (except Orange) Groves
111331	Apple Orchards
111332	Grape Vineyards
111333	Strawberry Farming
111334	Berry (except Strawberry) Farming
111335	Tree Nut Farming
111336	Fruit and Tree Nut Combination Farming
111339	Other Noncitrus Fruit Farming
111411	Mushroom Production
111419	Other Food Crops Grown Under Cover
111421	Nursery and Tree Production

NAICS	NAICS Title
111422	Floriculture Production
111910	Tobacco Farming
111920	Cotton Farming
111930	Sugarcane Farming
111940	Hay Farming
111991	Sugar Beet Farming
111992	Peanut Farming
111998	All Other Miscellaneous Crop Farming
112111	Beef Cattle Ranching and Farming
112112	Cattle Feedlots
112120	Dairy Cattle and Milk Production
112210	Hog and Pig Farming
112310	Chicken Egg Production
112320	Broilers and Other Meat Type Chicken Production
112330	Turkey Production
112340	Poultry Hatcheries
112390	Other Poultry Production
112410	Sheep Farming
112420	Goat Farming
112511	Finfish Farming and Fish Hatcheries
112512	Shellfish Farming
112519	Other Aquaculture
112910	Apiculture
112930	Fur-Bearing Animal and Rabbit Production

NAICS	NAICS Title
112990	All Other Animal Production
113110	Timber Tract Operations
113210	Forest Nurseries and Gathering of Forest Products
113310	Logging
115111	Cotton Ginning
115112	Soil Preparation, Planting, and Cultivating
115113	Crop Harvesting, Primarily by Machine
115114	Postharvest Crop Activities (except Cotton Ginning)
115116	Farm Management Services
115210	Support Activities for Animal Production
115310	Support Activities for Forestry
212313	Crushed and Broken Granite Mining and Quarrying
212319	Other Crushed and Broken Stone Mining and Quarrying
212321	Construction Sand and Gravel Mining
213111	Drilling Oil and Gas Wells
221111	Hydroelectric Power Generation
221112	Fossil Fuel Electric Power Generation
221113	Nuclear Electric Power Generation
221119	Other Electric Power Generation
221121	Electric Bulk Power Transmission and Control
221122	Electric Power Distribution
221210	Natural Gas Distribution
221310	Water Supply and Irrigation Systems
221320	Sewage Treatment Facilities

NAICS	NAICS Title
221330	Steam and Air-Conditioning Supply
236115	New Single-Family Housing Construction (except Operative Builders)
236116	New Multifamily Housing Construction (except Operative Builders)
236117	New Housing Operative Builders
236118	Residential Remodelers
236210	Industrial Building Construction
236220	Commercial and Institutional Building Construction
237110	Water and Sewer Line and Related Structures Construction
237120	Oil and Gas Pipeline and Related Structures Construction
237130	Power and Communication Line and Related Structures Construction
237210	Land Subdivision
237310	Highway, Street, and Bridge Construction
237990	Other Heavy and Civil Engineering Construction
238110	Poured Concrete Foundation and Structure Contractors
238120	Structural Steel and Precast Concrete Contractors
238130	Framing Contractors
238140	Masonry Contractors
238160	Roofing Contractors
238170	Siding Contractors
238210	Electrical Contractors and Other Wiring Installation Contractors
238220	Plumbing, Heating, and Air-Conditioning Contractors
238290	Other Building Equipment Contractors
238310	Drywall and Insulation Contractors
238320	Painting and Wall Covering Contractors

NAICS	NAICS Title
238350	Finish Carpentry Contractors
238390	Other Building Finishing Contractors
238910	Site Preparation Contractors
238990	All Other Specialty Trade Contractors
311111	Dog and Cat Food Manufacturing
311119	Other Animal Food Manufacturing
311211	Flour Milling
311212	Rice Milling
311213	Malt Manufacturing
311221	Wet Corn Milling
311222	Soybean Processing
311223	Other Oilseed Processing
311225	Fats and Oils Refining and Blending
311230	Breakfast Cereal Manufacturing
311311	Sugarcane Mills
311312	Cane Sugar Refining
311313	Beet Sugar Manufacturing
311320	Chocolate and Confectionery Manufacturing from Cacao Beans
311330	Confectionery Manufacturing from Purchased Chocolate
311340	Nonchocolate Confectionery Manufacturing
311411	Frozen Fruit, Juice, and Vegetable Manufacturing
311412	Frozen Specialty Food Manufacturing
311421	Fruit and Vegetable Canning
311422	Specialty Canning

NAICS	NAICS Title
311423	Dried and Dehydrated Food Manufacturing
311511	Fluid Milk Manufacturing
311512	Creamery Butter Manufacturing
311513	Cheese Manufacturing
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing
311520	Ice Cream and Frozen Dessert Manufacturing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311615	Poultry Processing
311711	Seafood Canning
311712	Fresh and Frozen Seafood Processing
311811	Retail Bakeries
311812	Commercial Bakeries
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing
311821	Cookie and Cracker Manufacturing
311822	Flour Mixes and Dough Manufacturing from Purchased Flour
311823	Dry Pasta Manufacturing
311830	Tortilla Manufacturing
311911	Roasted Nuts and Peanut Butter Manufacturing
311919	Other Snack Food Manufacturing
311920	Coffee and Tea Manufacturing
311930	Flavoring Syrup and Concentrate Manufacturing
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing

NAICS	NAICS Title
311942	Spice and Extract Manufacturing
311991	Perishable Prepared Food Manufacturing
311999	All Other Miscellaneous Food Manufacturing
312111	Soft Drink Manufacturing
312120	Breweries
312130	Wineries
312140	Distilleries
312210	Tobacco Stemming and Redrying
312221	Cigarette Manufacturing
312229	Other Tobacco Product Manufacturing
313111	Yarn Spinning Mills
313112	Yarn Texturizing, Throwing, and Twisting Mills
313113	Thread Mills
313210	Broadwoven Fabric Mills
313221	Narrow Fabric Mills
313230	Nonwoven Fabric Mills
313241	Weft Knit Fabric Mills
313249	Other Knit Fabric and Lace Mills
313311	Broadwoven Fabric Finishing Mills
314110	Carpet and Rug Mills
314121	Curtain and Drapery Mills
314999	All Other Miscellaneous Textile Product Mills
315212	Women's, Girls', and Infants' Cut and Sew Apparel Contractors
315239	Women's and Girls' Cut and Sew Other Outerwear Manufacturing

NAICS	NAICS Title
321113	Sawmills
321114	Wood Preservation
321211	Hardwood Veneer and Plywood Manufacturing
321212	Softwood Veneer and Plywood Manufacturing
321213	Engineered Wood Member (except Truss) Manufacturing
321214	Truss Manufacturing
321219	Reconstituted Wood Product Manufacturing
321911	Wood Window and Door Manufacturing
321918	Other Millwork (including Flooring)
321920	Wood Container and Pallet Manufacturing
321991	Manufactured Home (Mobile Home) Manufacturing
321992	Prefabricated Wood Building Manufacturing
321999	All Other Miscellaneous Wood Product Manufacturing
322110	Pulp Mills
322121	Paper (except Newsprint) Mills
322122	Newsprint Mills
322130	Paperboard Mills
322211	Corrugated and Solid Fiber Box Manufacturing
322214	Fiber Can, Tube, Drum, and Similar Products Manufacturing
322299	All Other Converted Paper Product Manufacturing
323110	Commercial Lithographic Printing
323112	Commercial Flexographic Printing
323113	Commercial Screen Printing
323114	Quick Printing

NAICS	NAICS Title
323122	Prepress Services
324110	Petroleum Refineries
324121	Asphalt Paving Mixture and Block Manufacturing
324122	Asphalt Shingle and Coating Materials Manufacturing
324199	All Other Petroleum and Coal Products Manufacturing
325193	Ethyl Alcohol Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325211	Plastics Material and Resin Manufacturing
325212	Synthetic Rubber Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325312	Phosphatic Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325510	Paint and Coating Manufacturing
325520	Adhesive Manufacturing
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325620	Toilet Preparation Manufacturing
325910	Printing Ink Manufacturing
325991	Custom Compounding of Purchased Resins
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing

NAICS	NAICS Title
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326160	Plastics Bottle Manufacturing
326191	Plastics Plumbing Fixture Manufacturing
326192	Resilient Floor Covering Manufacturing
326199	All Other Plastics Product Manufacturing
326212	Tire Retreading
326299	All Other Rubber Product Manufacturing
327111	Vitreous China Plumbing Fixture and China and Earthenware Bathroom Accessories Manufacturing
327112	Vitreous China, Fine Earthenware, and Other Pottery Product Manufacturing
327121	Brick and Structural Clay Tile Manufacturing
327122	Ceramic Wall and Floor Tile Manufacturing
327123	Other Structural Clay Product Manufacturing
327124	Clay Refractory Manufacturing
327125	Nonclay Refractory Manufacturing
327211	Flat Glass Manufacturing

NAICS	NAICS Title
327212	Other Pressed and Blown Glass and Glassware Manufacturing
327213	Glass Container Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
327310	Cement Manufacturing
327320	Ready-Mix Concrete Manufacturing
327331	Concrete Block and Brick Manufacturing
327332	Concrete Pipe Manufacturing
327390	Other Concrete Product Manufacturing
327410	Lime Manufacturing
327420	Gypsum Product Manufacturing
327991	Cut Stone and Stone Product Manufacturing
327993	Mineral Wool Manufacturing
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
331111	Iron and Steel Mills
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
331221	Rolled Steel Shape Manufacturing
331222	Steel Wire Drawing
331311	Alumina Refining
331312	Primary Aluminum Production
331314	Secondary Smelting and Alloying of Aluminum
331315	Aluminum Sheet, Plate, and Foil Manufacturing
331316	Aluminum Extruded Product Manufacturing
331319	Other Aluminum Rolling and Drawing
331421	Copper Rolling, Drawing, and Extruding

NAICS	NAICS Title
331422	Copper Wire (except Mechanical) Drawing
331423	Secondary Smelting, Refining, and Alloying of Copper
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)
331511	Iron Foundries
331512	Steel Investment Foundries
331513	Steel Foundries (except Investment)
331521	Aluminum Die-Casting Foundries
331522	Nonferrous (except Aluminum) Die-Casting Foundries
331524	Aluminum Foundries (except Die-Casting)
331525	Copper Foundries (except Die-Casting)
331528	Other Nonferrous Foundries (except Die-Casting)
332111	Iron and Steel Forging
332112	Nonferrous Forging
332311	Prefabricated Metal Building and Component Manufacturing
332312	Fabricated Structural Metal Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332431	Metal Can Manufacturing
332710	Machine Shops
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers

NAICS	NAICS Title
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring
332911	Industrial Valve Manufacturing
332913	Plumbing Fixture Fitting and Trim Manufacturing
332919	Other Metal Valve and Pipe Fitting Manufacturing
332992	Small Arms Ammunition Manufacturing
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
333132	Oil and Gas Field Machinery and Equipment Manufacturing
333220	Plastics and Rubber Industry Machinery Manufacturing
333298	All Other Industrial Machinery Manufacturing
333311	Automatic Vending Machine Manufacturing
333312	Commercial Laundry, Drycleaning, and Pressing Machine Manufacturing
333315	Photographic and Photocopying Equipment Manufacturing
333319	Other Commercial and Service Industry Machinery Manufacturing
333411	Air Purification Equipment Manufacturing
333412	Industrial and Commercial Fan and Blower Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333511	Industrial Mold Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing

NAICS	NAICS Title
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
333911	Pump and Pumping Equipment Manufacturing
333994	Industrial Process Furnace and Oven Manufacturing
333996	Fluid Power Pump and Motor Manufacturing
334111	Electronic Computer Manufacturing
334113	Computer Terminal Manufacturing
334119	Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334413	Semiconductor and Related Device Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334516	Analytical Laboratory Instrument Manufacturing

NAICS	NAICS Title
334519	Other Measuring and Controlling Device Manufacturing
335110	Electric Lamp Bulb and Part Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335129	Other Lighting Equipment Manufacturing
335211	Electric Housewares and Household Fan Manufacturing
335221	Household Cooking Appliance Manufacturing
335222	Household Refrigerator and Home Freezer Manufacturing
335224	Household Laundry Equipment Manufacturing
335228	Other Major Household Appliance Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335312	Motor and Generator Manufacturing
335313	Switchgear and Switchboard Apparatus Manufacturing
335314	Relay and Industrial Control Manufacturing
335911	Storage Battery Manufacturing
335912	Primary Battery Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
336111	Automobile Manufacturing
336112	Light Truck and Utility Vehicle Manufacturing
336120	Heavy Duty Truck Manufacturing
336213	Motor Home Manufacturing
336214	Travel Trailer and Camper Manufacturing
336311	Carburetor, Piston, Piston Ring, and Valve Manufacturing

NAICS	NAICS Title
336312	Gasoline Engine and Engine Parts Manufacturing
336322	Other Motor Vehicle Electrical and Electronic Equipment Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336370	Motor Vehicle Metal Stamping
336391	Motor Vehicle Air-Conditioning Manufacturing
336399	All Other Motor Vehicle Parts Manufacturing
336411	Aircraft Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing
336510	Railroad Rolling Stock Manufacturing
336611	Ship Building and Repairing
336612	Boat Building
336991	Motorcycle, Bicycle, and Parts Manufacturing
337110	Wood Kitchen Cabinet and Countertop Manufacturing
337121	Upholstered Household Furniture Manufacturing
337122	Nonupholstered Wood Household Furniture Manufacturing
337212	Custom Architectural Woodwork and Millwork Manufacturing
337214	Office Furniture (except Wood) Manufacturing
337920	Blind and Shade Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339116	Dental Laboratories

NAICS	NAICS Title
339920	Sporting and Athletic Goods Manufacturing
339931	Doll and Stuffed Toy Manufacturing
339932	Game, Toy, and Children's Vehicle Manufacturing
339950	Sign Manufacturing
339992	Musical Instrument Manufacturing
339999	All Other Miscellaneous Manufacturing
423110	Automobile and Other Motor Vehicle Merchant Wholesalers
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers
423130	Tire and Tube Merchant Wholesalers
423140	Motor Vehicle Parts (Used) Merchant Wholesalers
423210	Furniture Merchant Wholesalers
423220	Home Furnishing Merchant Wholesalers
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers
423390	Other Construction Material Merchant Wholesalers
423420	Office Equipment Merchant Wholesalers
423430	Computer and Computer Peripheral Equipment and Software Merchant Wholesalers
423440	Other Commercial Equipment Merchant Wholesalers
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
423460	Ophthalmic Goods Merchant Wholesalers
423490	Other Professional Equipment and Supplies Merchant Wholesalers
423510	Metal Service Centers and Other Metal Merchant Wholesalers
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant

NAICS	NAICS Title
	Wholesalers
423620	Electrical and Electronic Appliance, Television, and Radio Set Merchant Wholesalers
423690	Other Electronic Parts and Equipment Merchant Wholesalers
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers
423740	Refrigeration Equipment and Supplies Merchant Wholesalers
423810	Construction and Mining (except Oil Well) Machinery and Equipment Merchant Wholesalers
423820	Farm and Garden Machinery and Equipment Merchant Wholesalers
423830	Industrial Machinery and Equipment Merchant Wholesalers
423840	Industrial Supplies Merchant Wholesalers
423850	Service Establishment Equipment and Supplies Merchant Wholesalers
423860	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers
423920	Toy and Hobby Goods and Supplies Merchant Wholesalers
423930	Recyclable Material Merchant Wholesalers
423990	Other Miscellaneous Durable Goods Merchant Wholesalers
424110	Printing and Writing Paper Merchant Wholesalers
424120	Stationery and Office Supplies Merchant Wholesalers
424130	Industrial and Personal Service Paper Merchant Wholesalers
424210	Drugs and Druggists' Sundries Merchant Wholesalers
424310	Piece Goods, Notions, and Other Dry Goods Merchant Wholesalers
424330	Women's, Children's, and Infants' Clothing and Accessories Merchant Wholesalers
424410	General Line Grocery Merchant Wholesalers
424420	Packaged Frozen Food Merchant Wholesalers

NAICS	NAICS Title
424430	Dairy Product (except Dried or Canned) Merchant Wholesalers
424440	Poultry and Poultry Product Merchant Wholesalers
424450	Confectionery Merchant Wholesalers
424460	Fish and Seafood Merchant Wholesalers
424470	Meat and Meat Product Merchant Wholesalers
424480	Fresh Fruit and Vegetable Merchant Wholesalers
424490	Other Grocery and Related Products Merchant Wholesalers
424510	Grain and Field Bean Merchant Wholesalers
424520	Livestock Merchant Wholesalers
424590	Other Farm Product Raw Material Merchant Wholesalers
424610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers
424690	Other Chemical and Allied Products Merchant Wholesalers
424710	Petroleum Bulk Stations and Terminals
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
424810	Beer and Ale Merchant Wholesalers
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers
424910	Farm Supplies Merchant Wholesalers
424920	Book, Periodical, and Newspaper Merchant Wholesalers
424930	Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers
424940	Tobacco and Tobacco Product Merchant Wholesalers
424950	Paint, Varnish, and Supplies Merchant Wholesalers
424990	Other Miscellaneous Nondurable Goods Merchant Wholesalers
425110	Business to Business Electronic Markets

NAICS	NAICS Title
425120	Wholesale Trade Agents and Brokers
441110	New Car Dealers
441120	Used Car Dealers
441210	Recreational Vehicle Dealers
441310	Automotive Parts and Accessories Stores
441320	Tire Dealers
442110	Furniture Stores
442210	Floor Covering Stores
442291	Window Treatment Stores
443111	Household Appliance Stores
443112	Radio, Television, and Other Electronics Stores
443120	Computer and Software Stores
444110	Home Centers
444120	Paint and Wallpaper Stores
444130	Hardware Stores
444190	Other Building Material Dealers
444210	Outdoor Power Equipment Stores
444220	Nursery, Garden Center, and Farm Supply Stores
445110	Supermarkets and Other Grocery (except Convenience) Stores
445120	Convenience Stores
445210	Meat Markets
445220	Fish and Seafood Markets
445230	Fruit and Vegetable Markets
445291	Baked Goods Stores

NAICS	NAICS Title
445292	Confectionery and Nut Stores
445299	All Other Specialty Food Stores
445310	Beer, Wine, and Liquor Stores
446110	Pharmacies and Drug Stores
446120	Cosmetics, Beauty Supplies, and Perfume Stores
446191	Food (Health) Supplement Stores
446199	All Other Health and Personal Care Stores
447110	Gasoline Stations with Convenience Stores
447190	Other Gasoline Stations
451110	Sporting Goods Stores
451120	Hobby, Toy, and Game Stores
451130	Sewing, Needlework, and Piece Goods Stores
451211	Book Stores
451212	News Dealers and Newsstands
451220	Prerecorded Tape, Compact Disc, and Record Stores
452111	Department Stores (except Discount Department Stores)
452112	Discount Department Stores
452910	Warehouse Clubs and Supercenters
452990	All Other General Merchandise Stores
453110	Florists
453210	Office Supplies and Stationery Stores
453310	Used Merchandise Stores
453910	Pet and Pet Supplies Stores
453930	Manufactured (Mobile) Home Dealers

NAICS	NAICS Title
453991	Tobacco Stores
453998	All Other Miscellaneous Store Retailers (except Tobacco Stores)
454111	Electronic Shopping
454112	Electronic Auctions
454113	Mail-Order Houses
454210	Vending Machine Operators
454311	Heating Oil Dealers
454319	Other Fuel Dealers
454390	Other Direct Selling Establishments
482111	Line-Haul Railroads
483114	Coastal and Great Lakes Passenger Transportation
483212	Inland Water Passenger Transportation
484110	General Freight Trucking, Local
484121	General Freight Trucking, Long-Distance, Truckload
484122	General Freight Trucking, Long-Distance, Less Than Truckload
484210	Used Household and Office Goods Moving
484220	Specialized Freight (except Used Goods) Trucking, Local
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance
485111	Mixed Mode Transit Systems
485112	Commuter Rail Systems
485113	Bus and Other Motor Vehicle Transit Systems
485119	Other Urban Transit Systems
485210	Interurban and Rural Bus Transportation
485310	Taxi Service

NAICS	NAICS Title
485320	Limousine Service
485410	School and Employee Bus Transportation
485510	Charter Bus Industry
485991	Special Needs Transportation
485999	All Other Transit and Ground Passenger Transportation
486210	Pipeline Transportation of Natural Gas
487110	Scenic and Sightseeing Transportation, Land
487210	Scenic and Sightseeing Transportation, Water
488119	Other Airport Operations
488190	Other Support Activities for Air Transportation
488330	Navigational Services to Shipping
488410	Motor Vehicle Towing
488510	Freight Transportation Arrangement
491110	Postal Service
492110	Couriers and Express Delivery Services
492210	Local Messengers and Local Delivery
493110	General Warehousing and Storage
493120	Refrigerated Warehousing and Storage
493130	Farm Product Warehousing and Storage
493190	Other Warehousing and Storage
511110	Newspaper Publishers
511120	Periodical Publishers
511130	Book Publishers
511140	Directory and Mailing List Publishers

NAICS	NAICS Title
511199	All Other Publishers
511210	Software Publishers
512110	Motion Picture and Video Production
512120	Motion Picture and Video Distribution
515111	Radio Networks
515112	Radio Stations
515120	Television Broadcasting
515210	Cable and Other Subscription Programming
518210	Data Processing, Hosting, and Related Services
519110	News Syndicates
519120	Libraries and Archives
519130	Internet Publishing and Broadcasting and Web Search Portals
522110	Commercial Banking
522120	Savings Institutions
522130	Credit Unions
522190	Other Depository Credit Intermediation
522220	Sales Financing
523130	Commodity Contracts Dealing
523140	Commodity Contracts Brokerage
523210	Securities and Commodity Exchanges
523910	Miscellaneous Intermediation
523920	Portfolio Management
523930	Investment Advice
531110	Lessors of Residential Buildings and Dwellings

NAICS	NAICS Title
531120	Lessors of Nonresidential Buildings (except Miniwarehouses)
531130	Lessors of Miniwarehouses and Self-Storage Units
531210	Offices of Real Estate Agents and Brokers
531312	Nonresidential Property Managers
532111	Passenger Car Rental
532112	Passenger Car Leasing
532210	Consumer Electronics and Appliances Rental
532292	Recreational Goods Rental
532411	Commercial Air, Rail, and Water Transportation Equipment Rental and Leasing
532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing
532420	Office Machinery and Equipment Rental and Leasing
533110	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
541110	Offices of Lawyers
541199	All Other Legal Services
541211	Offices of Certified Public Accountants
541214	Payroll Services
541219	Other Accounting Services
541310	Architectural Services
541320	Landscape Architectural Services
541330	Engineering Services
541350	Building Inspection Services
541360	Geophysical Surveying and Mapping Services
541370	Surveying and Mapping (except Geophysical) Services
541380	Testing Laboratories

NAICS	NAICS Title
541410	Interior Design Services
541420	Industrial Design Services
541430	Graphic Design Services
541490	Other Specialized Design Services
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541513	Computer Facilities Management Services
541519	Other Computer Related Services
541611	Administrative Management and General Management Consulting Services
541612	Human Resources Consulting Services
541613	Marketing Consulting Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541618	Other Management Consulting Services
541620	Environmental Consulting Services
541690	Other Scientific and Technical Consulting Services
541711	Research and Development in Biotechnology
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)
541720	Research and Development in the Social Sciences and Humanities
541810	Advertising Agencies
541820	Public Relations Agencies
541850	Display Advertising
541922	Commercial Photography
541940	Veterinary Services

NAICS	NAICS Title
541990	All Other Professional, Scientific, and Technical Services
551112	Offices of Other Holding Companies
551114	Corporate, Subsidiary, and Regional Managing Offices
561110	Office Administrative Services
561210	Facilities Support Services
561311	Employment Placement Agencies
561320	Temporary Help Services
561330	Professional Employer Organizations
561439	Other Business Service Centers (including Copy Shops)
561499	All Other Business Support Services
561510	Travel Agencies
561520	Tour Operators
561612	Security Guards and Patrol Services
561710	Exterminating and Pest Control Services
561720	Janitorial Services
561730	Landscaping Services
561910	Packaging and Labeling Services
561920	Convention and Trade Show Organizers
562111	Solid Waste Collection
562112	Hazardous Waste Collection
562119	Other Waste Collection
562211	Hazardous Waste Treatment and Disposal
562212	Solid Waste Landfill
562213	Solid Waste Combustors and Incinerators

NAICS	NAICS Title
562219	Other Nonhazardous Waste Treatment and Disposal
562910	Remediation Services
562920	Materials Recovery Facilities
562991	Septic Tank and Related Services
562998	All Other Miscellaneous Waste Management Services
611110	Elementary and Secondary Schools
611210	Junior Colleges
611310	Colleges, Universities, and Professional Schools
611430	Professional and Management Development Training
611513	Apprenticeship Training
611519	Other Technical and Trade Schools
621111	Offices of Physicians (except Mental Health Specialists)
621210	Offices of Dentists
621340	Offices of Physical, Occupational and Speech Therapists, and Audiologists
621399	Offices of All Other Miscellaneous Health Practitioners
621492	Kidney Dialysis Centers
621511	Medical Laboratories
622110	General Medical and Surgical Hospitals
622310	Specialty (except Psychiatric and Substance Abuse) Hospitals
623110	Nursing Care Facilities
623312	Homes for the Elderly
624120	Services for the Elderly and Persons with Disabilities
624210	Community Food Services
624229	Other Community Housing Services

NAICS	NAICS Title
624310	Vocational Rehabilitation Services
711211	Sports Teams and Clubs
711212	Racetracks
711310	Promoters of Performing Arts, Sports, and Similar Events with Facilities
711510	Independent Artists, Writers, and Performers
712110	Museums
712130	Zoos and Botanical Gardens
712190	Nature Parks and Other Similar Institutions
713110	Amusement and Theme Parks
713210	Casinos (except Casino Hotels)
713920	Skiing Facilities
713940	Fitness and Recreational Sports Centers
713990	All Other Amusement and Recreation Industries
721110	Hotels (except Casino Hotels) and Motels
721214	Recreational and Vacation Camps (except Campgrounds)
722110	Full-Service Restaurants
722211	Limited-Service Restaurants
722212	Cafeterias, Grill Buffets, and Buffets
722213	Snack and Nonalcoholic Beverage Bars
722310	Food Service Contractors
722320	Caterers
722330	Mobile Food Services
722410	Drinking Places (Alcoholic Beverages)
811111	General Automotive Repair

NAICS	NAICS Title
811112	Automotive Exhaust System Repair
811113	Automotive Transmission Repair
811118	Other Automotive Mechanical and Electrical Repair and Maintenance
811121	Automotive Body, Paint, and Interior Repair and Maintenance
811191	Automotive Oil Change and Lubrication Shops
811192	Car Washes
811198	All Other Automotive Repair and Maintenance
811211	Consumer Electronics Repair and Maintenance
811212	Computer and Office Machine Repair and Maintenance
811213	Communication Equipment Repair and Maintenance
811219	Other Electronic and Precision Equipment Repair and Maintenance
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance
811412	Appliance Repair and Maintenance
811490	Other Personal and Household Goods Repair and Maintenance
812112	Beauty Salons
812220	Cemeteries and Crematories
812320	Drycleaning and Laundry Services (except Coin-Operated)
812331	Linen Supply
812930	Parking Lots and Garages
813110	Religious Organizations
813211	Grantmaking Foundations
813219	Other Grantmaking and Giving Services
813311	Human Rights Organizations

NAICS	NAICS Title
813312	Environment, Conservation and Wildlife Organizations
813319	Other Social Advocacy Organizations
813410	Civic and Social Organizations
813910	Business Associations
813920	Professional Organizations
813940	Political Organizations
813990	Other Similar Organizations (except Business, Professional, Labor, and Political Organizations)
921120	Legislative Bodies
921140	Executive and Legislative Offices, Combined
921190	Other General Government Support
922140	Correctional Institutions
922190	Other Justice, Public Order, and Safety Activities
923110	Administration of Education Programs
923130	Administration of Human Resource Programs (except Education, Public Health, and Veterans' Affairs Programs)
924110	Administration of Air and Water Resource and Solid Waste Management Programs
924120	Administration of Conservation Programs
925110	Administration of Housing Programs
925120	Administration of Urban Planning and Community and Rural Development
926110	Administration of General Economic Programs
926120	Regulation and Administration of Transportation Programs
926130	Regulation and Administration of Communications, Electric, Gas, and Other Utilities
926140	Regulation of Agricultural Marketing and Commodities
926150	Regulation, Licensing, and Inspection of Miscellaneous Commercial Sectors

NAICS	NAICS Title
928110	National Security

Appendix D: List of Green Occupations

SOC Code	SOC Description
11000000	Management Occupations
11101100	Chief Executives
11101103	Chief Sustainability Officers
11102100	General and Operations Managers
11201100	Advertising and Promotions Managers
11201101	Green Marketers
11202100	Marketing Managers
11202200	Sales Managers
11203100	Public Relations Managers
11301100	Administrative Services Managers
11302100	Computer and Information Systems Managers
11303101	Treasurers and Controllers
11303102	Financial Managers, Branch or Department
11304000	Human Resources Managers
11304200	Training and Development Managers
11305100	Industrial Production Managers
11305101	Quality Control Systems Managers
11305105	Methane/Landfill Gas Collection System Operators
11306100	Purchasing Managers
11307101	Transportation Managers
11307102	Storage and Distribution Managers
11901101	Nursery and Greenhouse Managers
11901200	Farmers and Ranchers

SOC Code	SOC Description
11902100	Construction Managers
11903100	Education Administrators, Preschool and Child Care Center/Program
11903200	Education Administrators, Elementary and Secondary School
11903300	Education Administrators, Postsecondary
11903900	Education Administrators, All Other
11904100	Engineering Managers
11907100	Gaming Managers
11911100	Medical and Health Services Managers
11912100	Natural Sciences Managers
11912102	Water Resource Specialists
11914100	Property, Real Estate, and Community Association Managers
11915100	Social and Community Service Managers
11919900	Managers, All Other
11919901	Regulatory Affairs Managers
11919902	Compliance Managers
13000000	Business and Financial Operations Occupations
13101100	Agents and Business Managers of Artists, Performers, and Athletes
13102100	Purchasing Agents and Buyers, Farm Products
13102200	Wholesale and Retail Buyers, Except Farm Products
13102300	Purchasing Agents, Except Wholesale, Retail, and Farm Products
13103102	Insurance Adjusters, Examiners, and Investigators
13104101	Environmental Compliance Inspectors
13104102	Licensing Examiners and Inspectors
13104104	Government Property Inspectors and Investigators

SOC Code	SOC Description
13104107	Regulatory Affairs Specialists
13105100	Cost Estimators
13106100	Emergency Management Specialists
13107300	Training and Development Specialists
13108100	Logisticians
13108102	Logistics Analysts
13111100	Management Analysts
13112100	Meeting and Convention Planners
13119900	Business Operations Specialists, All Other
13119901	Energy Auditors
13119905	Sustainability Specialists
13201101	Accountants
13201102	Auditors
13204100	Credit Analysts
13205100	Financial Analysts
13205200	Personal Financial Advisors
13208100	Tax Examiners, Collectors, and Revenue Agents
15102100	Computer Programmers
15103100	Computer Software Engineers, Applications
15103200	Computer Software Engineers, Systems Software
15104100	Computer Support Specialists
15105100	Computer Systems Analysts
15107100	Network and Computer Systems Administrators
15109901	Software Quality Assurance Engineers and Testers

SOC Code	SOC Description
15109911	Information Technology Project Managers
15203100	Operations Research Analysts
17000000	Architecture and Engineering Occupations
17101100	Architects, Except Landscape and Naval
17101200	Landscape Architects
17102200	Surveyors
17203100	Biomedical Engineers
17204100	Chemical Engineers
17205100	Civil Engineers
17205101	Transportation Engineers
17205102	Water/Wastewater Engineers
17207100	Electrical Engineers
17207200	Electronics Engineers, Except Computer
17208100	Environmental Engineers
17211101	Industrial Safety and Health Engineers
17211200	Industrial Engineers
17214100	Mechanical Engineers
17217100	Petroleum Engineers
17219903	Energy Engineers
17219910	Wind Energy Engineers
17301101	Architectural Drafters
17301201	Electronic Drafters
17301202	Electrical Drafters
17301300	Mechanical Drafters

SOC Code	SOC Description
17302301	Electronics Engineering Technicians
17302303	Electrical Engineering Technicians
17302500	Environmental Engineering Technicians
17302600	Industrial Engineering Technicians
17302900	Engineering Technicians, Except Drafters, All Other
17302909	Manufacturing Production Technicians
17303101	Surveying Technicians
17303102	Mapping Technicians
19000000	Life, Physical, and Social Science Occupations
19101300	Soil and Plant Scientists
19102001	Biologists
19102300	Zoologists and Wildlife Biologists
19103101	Soil and Water Conservationists
19103103	Park Naturalists
19103200	Foresters
19203100	Chemists
19204100	Environmental Scientists and Specialists, Including Health
19204101	Climate Change Analysts
19204102	Environmental Restoration Planners
19301100	Economists
19302100	Market Research Analysts
19305100	Urban and Regional Planners
19309200	Geographers
19309900	Social Scientists and Related Workers, All Other

SOC Code	SOC Description
19401101	Agricultural Technicians
19401102	Food Science Technicians
19406100	Social Science Research Assistants
19409100	Environmental Science and Protection Technicians, Including Health
19409900	Life, Physical, and Social Science Technicians, All Other
21101100	Substance Abuse and Behavioral Disorder Counselors
21101200	Educational, Vocational, and School Counselors
21101500	Rehabilitation Counselors
21109300	Social and Human Service Assistants
23101100	Lawyers
23201100	Paralegals and Legal Assistants
25000000	Education, Training, and Library Occupations
25102200	Mathematical Science Teachers, Postsecondary
25103100	Architecture Teachers, Postsecondary
25105300	Environmental Science Teachers, Postsecondary
25106300	Economics Teachers, Postsecondary
25112200	Communications Teachers, Postsecondary
25119300	Recreation and Fitness Studies Teachers, Postsecondary
25119400	Vocational Education Teachers, Postsecondary
25119900	Postsecondary Teachers, All Other
25401300	Museum Technicians and Conservators
25402100	Librarians
25904100	Teacher Assistants
25909900	Education, Training, and Library Workers, All Other

SOC Code	SOC Description
27000000	Arts, Design, Entertainment, Sports, and Media Occupations
27101100	Art Directors
27101200	Craft Artists
27101400	Multi-Media Artists and Animators
27102300	Floral Designers
27102400	Graphic Designers
27102500	Interior Designers
27102600	Merchandise Displayers and Window Trimmers
27201203	Program Directors
27202100	Athletes and Sports Competitors
27303100	Public Relations Specialists
27304300	Writers and Authors
27309100	Interpreters and Translators
27309900	Media and Communication Workers, All Other
27401100	Audio and Video Equipment Technicians
27401200	Broadcast Technicians
27401400	Sound Engineering Technicians
29000000	Healthcare Practitioners and Technical Occupations
29105100	Pharmacists
29106900	Physicians and Surgeons, All Other
29111100	Registered Nurses
29112300	Physical Therapists
29112900	Therapists, All Other
29201200	Medical and Clinical Laboratory Technicians

SOC Code	SOC Description
29901100	Occupational Health and Safety Specialists
29909900	Healthcare Practitioners and Technical Workers, All Other
31909200	Medical Assistants
33101100	First-Line Supervisors/Managers of Correctional Officers
33102101	Municipal Fire Fighting and Prevention Supervisors
33201101	Municipal Fire Fighters
33301200	Correctional Officers and Jailers
35000000	Food Preparation and Serving Related Occupations
35101200	First-Line Supervisors/Managers of Food Preparation and Serving Workers
35202100	Food Preparation Workers
35301100	Bartenders
35302100	Combined Food Preparation and Serving Workers, Including Fast Food
35303100	Waiters and Waitresses
35304100	Food Servers, Nonrestaurant
35902100	Dishwashers
37101100	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers
37101200	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers
37201100	Janitors and Cleaners, Except Maids and Housekeeping Cleaners
37201200	Maids and Housekeeping Cleaners
37201900	Building Cleaning Workers, All Other
37301100	Landscaping and Groundskeeping Workers
37301200	Pesticide Handlers, Sprayers, and Applicators, Vegetation
37301300	Tree Trimmers and Pruners

SOC Code	SOC Description
37301900	Grounds Maintenance Workers, All Other
39101200	Slot Key Persons
39102100	First-Line Supervisors/Managers of Personal Service Workers
39202100	Nonfarm Animal Caretakers
39303100	Ushers, Lobby Attendants, and Ticket Takers
39309100	Amusement and Recreation Attendants
39602100	Tour Guides and Escorts
39603200	Transportation Attendants, Except Flight Attendants and Baggage Porters
39901100	Child Care Workers
39902100	Personal and Home Care Aides
41000000	Sales and Related Occupations
41101100	First-Line Supervisors/Managers of Retail Sales Workers
41201100	Cashiers
41202100	Counter and Rental Clerks
41202200	Parts Salespersons
41203100	Retail Salespersons
41401200	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
41902100	Real Estate Brokers
41904100	Telemarketers
41909100	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers
43101100	First-Line Supervisors/Managers of Office and Administrative Support Workers
43201100	Switchboard Operators, Including Answering Service
43302102	Billing, Cost, and Rate Clerks

SOC Code	SOC Description
43303100	Bookkeeping, Accounting, and Auditing Clerks
43306100	Procurement Clerks
43405100	Customer Service Representatives
43415100	Order Clerks
43416100	Human Resources Assistants, Except Payroll and Timekeeping
43419900	Information and Record Clerks, All Other
43502100	Couriers and Messengers
43503200	Dispatchers, Except Police, Fire, and Ambulance
43505100	Postal Service Clerks
43505300	Postal Service Mail Sorters, Processors, and Processing Machine Operators
43506100	Production, Planning, and Expediting Clerks
43507100	Shipping, Receiving, and Traffic Clerks
43508100	Stock Clerks and Order Fillers
43508101	Stock Clerks, Sales Floor
43508103	Stock Clerks- Stockroom, Warehouse, or Storage Yard
43508104	Order Fillers, Wholesale and Retail Sales
43511100	Weighers, Measurers, Checkers, and Samplers, Recordkeeping
43601100	Executive Secretaries and Administrative Assistants
43601400	Secretaries, Except Legal, Medical, and Executive
43902100	Data Entry Keyers
43906100	Office Clerks, General
43907100	Office Machine Operators, Except Computer
43919900	Office and Administrative Support Workers, All Other
45101105	First-Line Supervisors/Managers of Logging Workers

SOC Code	SOC Description
45101107	First-Line Supervisors/Managers of Agricultural Crop and Horticultural Workers
45101108	First-Line Supervisors/Managers of Animal Husbandry and Animal Care Workers
45209100	Agricultural Equipment Operators
45209201	Nursery Workers
45209202	Farmworkers and Laborers, Crop
45209300	Farmworkers, Farm and Ranch Animals
45209900	Agricultural Workers, All Other
45301100	Fishers and Related Fishing Workers
45302100	Hunters and Trappers
45401100	Forest and Conservation Workers
45402100	Fallers
45402200	Logging Equipment Operators
45402900	Logging Workers, All Other
47000000	Construction and Extraction Occupations
47101100	First-Line Supervisors/Managers of Construction Trades and Extraction Workers
47203100	Carpenters
47203101	Construction Carpenters
47204200	Floor Layers, Except Carpet, Wood, and Hard Tiles
47204300	Floor Sanders and Finishers
47206100	Construction Laborers
47207300	Operating Engineers and Other Construction Equipment Operators
47211100	Electricians
47213100	Insulation Workers, Floor, Ceiling, and Wall
47214100	Painters, Construction and Maintenance

SOC Code	SOC Description
47215201	Pipe Fitters and Steamfitters
47215202	Plumbers
47217100	Reinforcing Iron and Rebar Workers
47218100	Roofers
47221100	Sheet Metal Workers
47222100	Structural Iron and Steel Workers
47301100	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters
47301300	Helpers--Electricians
47301500	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters
47401100	Construction and Building Inspectors
47402100	Elevator Installers and Repairers
47403100	Fence Erectors
47404100	Hazardous Materials Removal Workers
47405100	Highway Maintenance Workers
47407100	Septic Tank Servicers and Sewer Pipe Cleaners
47409900	Construction and Related Workers, All Other
47409903	Weatherization Installers and Technicians
47501100	Derrick Operators, Oil and Gas
47502100	Earth Drillers, Except Oil and Gas
47503100	Explosives Workers, Ordnance Handling Experts, and Blasters
47509900	Extraction Workers, All Other
49000000	Installation, Maintenance, and Repair Occupations
49101100	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers
49202100	Radio Mechanics

SOC Code	SOC Description
49202200	Telecommunications Equipment Installers and Repairers, Except Line Installers
49302100	Automotive Body and Related Repairers
49302300	Automotive Service Technicians and Mechanics
49302301	Automotive Master Mechanics
49302302	Automotive Specialty Technicians
49304100	Farm Equipment Mechanics
49305200	Motorcycle Mechanics
49309300	Tire Repairers and Changers
49901100	Mechanical Door Repairers
49902101	Heating and Air Conditioning Mechanics and Installers
49903100	Home Appliance Repairers
49904100	Industrial Machinery Mechanics
49904200	Maintenance and Repair Workers, General
49904300	Maintenance Workers, Machinery
49905200	Telecommunications Line Installers and Repairers
49909800	Helpers--Installation, Maintenance, and Repair Workers
49909900	Installation, Maintenance, and Repair Workers, All Other
51000000	Production Occupations
51101100	First-Line Supervisors/Managers of Production and Operating Workers
51204100	Structural Metal Fabricators and Fitters
51209100	Fiberglass Laminators and Fabricators
51209900	Assemblers and Fabricators, All Other
51302300	Slaughterers and Meat Packers
51309300	Food Cooking Machine Operators and Tenders

SOC Code	SOC Description
51404100	Machinists
51407200	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic
51411100	Tool and Die Makers
51419400	Tool Grinders, Filers, and Sharpeners
51501200	Bookbinders
51502100	Job Printers
51502200	Prepress Technicians and Workers
51502300	Printing Machine Operators
51601100	Laundry and Dry-Cleaning Workers
51609900	Textile, Apparel, and Furnishings Workers, All Other
51701100	Cabinetmakers and Bench Carpenters
51702100	Furniture Finishers
51704100	Sawing Machine Setters, Operators, and Tenders, Wood
51704200	Woodworking Machine Setters, Operators, and Tenders, Except Sawing
51801200	Power Distributors and Dispatchers
51801300	Power Plant Operators
51802100	Stationary Engineers and Boiler Operators
51803100	Water and Liquid Waste Treatment Plant and System Operators
51809900	Plant and System Operators, All Other
51809903	Biomass Plant Technicians
51901100	Chemical Equipment Operators and Tenders
51902300	Mixing and Blending Machine Setters, Operators, and Tenders
51908200	Medical Appliance Technicians

SOC Code	SOC Description
51912100	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders
51912200	Painters, Transportation Equipment
51912300	Painting, Coating, and Decorating Workers
51919500	Molders, Shapers, and Casters, Except Metal and Plastic
51919504	Glass Blowers, Molders, Benders, and Finishers
51919507	Molding and Casting Workers
51919800	Helpers--Production Workers
51919900	Production Workers, All Other
51919901	Recycling and Reclamation Workers
53000000	Transportation and Material Moving Occupations
53102100	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand
53102101	Recycling Coordinators
53103100	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators
53202200	Airfield Operations Specialists
53302200	Bus Drivers, School
53303200	Truck Drivers, Heavy and Tractor-Trailer
53309900	Motor Vehicle Operators, All Other
53603100	Service Station Attendants
53701100	Conveyor Operators and Tenders
53702100	Crane and Tower Operators
53703200	Excavating and Loading Machine and Dragline Operators
53706100	Cleaners of Vehicles and Equipment
53706200	Laborers and Freight, Stock, and Material Movers, Hand

SOC Code	SOC Description
53706300	Machine Feeders and Offbearers
53706400	Packers and Packagers, Hand
53708100	Refuse and Recyclable Material Collectors
53712100	Tank Car, Truck, and Ship Loaders
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