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## **Green-Economy Jobs Report**



**Employment  
Security  
Department**  
WASHINGTON STATE

# 2013 Green-Economy Jobs Report

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Dale Peinecke, *commissioner*

Labor Market and Performance Analysis  
Cynthia Forland, Ph.D., *director*

Report and charts prepared by Gustavo Aviles and Ernst W. Stromsdorfer, *economists*  
Statistical estimates by Alex Roubinchtein, *economist*  
Survey and data collection supervised by Baba Moussa, *economist*

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## Executive summary

This report presents the results of the 2013 Washington state green-economy jobs survey. The report presents self-reported data from a large sample of Washington employers in industries across the state economy.

The green economy is rooted in the development and use of products and services that promote environmental protection or clean energy. For the purposes of this survey, the green economy is defined as industries and businesses engaged in four core areas:

- Increasing energy efficiency.
- Producing renewable energy.
- Preventing and reducing environmental pollution.
- Providing mitigation or cleanup of environmental pollution.

## Current labor market and projected growth in the green economy

Washington's green economy provided an estimated 56,762 green jobs, approximately 2 percent of the state's total employment covered by the unemployment-insurance system.

The green economy includes a wide range of occupations that fell mainly into traditional job titles rather than job titles specific to the green economy.

Employers anticipated substantial increases in green-economy jobs, with nearly 20 percent more green jobs projected to be added from fall 2013 through fall 2015.

The greatest numbers of green jobs were found in the following industry sectors:

- Construction.
- Professional, scientific and technical services.
- Administrative and support and waste management and remediation services.
- Other services (except public administration).
- Transportation and warehousing.

Statewide, the following occupations had the greatest numbers of green jobs:

- Heating, air conditioning and refrigeration mechanics and installers.
- Heavy and tractor-trailer truck drivers.
- Janitors and cleaners, except maids and housekeeping cleaners.
- Construction laborers.
- Automotive service technicians and mechanics.

## Skill requirements

Skills held by workers in green-economy jobs were largely the same as those of workers in comparable non-green-economy jobs. Employers reported that of their green-economy employees, 77 percent in green-economy jobs had skills that were identical to or mostly the same as the non-green employees in the same job titles.

## **Education and training required by green-economy jobs**

One-third of green-economy jobs only required a high school diploma. Another 38 percent required either an apprenticeship or a certificate/license. About one-quarter of green-economy jobs required some post-secondary education.

Requirements for work experience varied, but nearly one-half of green-economy jobs required no experience. Another 26 percent required one to two years of experience. Three to five years of experience were required for 18 percent of jobs and another 7 percent required more than five years of experience.

## **Wages and benefits in the green economy**

There was a wide range in the average hourly wage rate paid to green-economy jobs across industry sectors. Green jobs in the information sector were paid an average of \$46.98 per hour while green jobs in the arts, entertainment and recreation sector were paid an average of \$10.30 per hour.

The range of hourly wage rates for green-economy jobs across major occupational groups was even wider. Healthcare practitioners and technical occupations earned an average hourly wage rate of \$117.11, while farming, fishing and forestry occupations were paid an average of only \$11.61 per hour.

The average hourly wage rate paid for all green occupations was \$24.52.

About 75 percent of workers in green-economy jobs received medical benefits and paid leave. Some 60 percent received employer-based retirement benefits.

# 2013 Green-Economy Jobs Report

## Background

This report presents the results of the employment survey of private- and public-sector employers in Washington state over the period June 1, 2013, through August 31, 2013. The survey's objective was to identify and describe the type and number of green-economy jobs in Washington's economy.

## Defining green-economy jobs

Research began in 2008 with the first iteration of the Washington state green-economy jobs report, which was the first state agency-led survey of its kind in the nation.<sup>1</sup> To determine the appropriate definitions and scope of the research consistent with legislative requirements, researchers did extensive literature review, consulted with industry, labor and other experts and solicited information and ideas from members of the state's Evergreen Jobs Leadership Team.

The research team identified the green economy as rooted in the development and use of products and services that promote environmental protection or clean energy. It is composed of industries and businesses engaged in four core areas:

- Increasing energy efficiency.
- Producing renewable energy.
- Preventing and reducing environmental pollution.
- Providing mitigation or cleanup of environmental pollution.

This foundational definition formed the basis for the 2008, 2009 and 2011 Washington state green-economy jobs studies. Several states and research studies also used the Washington state concepts completely or in part.<sup>2</sup>

## Collecting data on Washington's green economy

The 2008, 2009, 2011 and 2013 Washington state green-economy jobs studies relied on surveys of state employers. The 2008 and 2009 samples included only businesses within industries presumed to be green, but the scope was expanded to all industries for the 2011 and 2013 surveys.

The 2013 Washington state green-economy jobs survey asked employers to identify the job titles and the number of green jobs based on the green-economy jobs definition. The 2013 survey was simplified from the 2011 survey to ensure a high survey response rate and thereby help produce more reliable estimates of green-economy jobs in the state. In the 2013 questionnaire, employers no longer had to classify each green job in one of the four core areas. However, the question that captured the total number of green jobs for each job title – the data element used to estimate the total number of green-economy jobs – did not change conceptually so that results could be compared.

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<sup>1</sup> "2008 Washington State Green Economy Jobs," Labor Market and Economic Analysis, Employment Security Department, January 2009.

<sup>2</sup> See "Measurement and Analysis of Employment in the Green Economy: Workforce Information Council Green Jobs Study Group Final Report," Workforce Information Council Green Jobs Study Group, October 1, 2009. This document draws on Washington's 2008 study to define green-economy jobs. That green-economy job conceptual design has been used or cited in many of the state-level studies listed in *Appendix Figure A4-1*.

An important addition to the questionnaire was a question on the average hourly wage rate paid for each green job title. This provided a direct measure of the average hourly wage rate and eliminated the need to rely on secondary sources for wage rate data, such as the Occupational Employment Statistics (OES) database, as was necessary for the 2008, 2009 and 2011 reports. Other than the changes in the questionnaire, the scientific sampling, survey and estimation methodologies were the same for both the 2011 and 2013 studies.<sup>3</sup>

In the fall of 2013, 21,000 firms were surveyed. The survey yielded 12,537 employer responses, for a 59.7 percent response rate. Of those 12,537 employers, 924 employers, 7.4 percent, reported having green-economy jobs. For 2011, 21,374 employers were surveyed and yielded 14,298 employer responses. Of these, 2,411 employers reported having green-economy jobs. Thus, in 2011, 16.9 percent of the responding employers reported having green-economy jobs, more than twice as many as in 2013. See *Appendix 1* for more information about the study design and how the survey was conducted and *Appendix 3* for the complete survey form.

## Legislative requirements

State law (RCW 50.12.320, 43.330.310) requires the Employment Security Department to conduct labor market research to analyze:

- The current labor market and projected job growth in the green economy.
- The current and projected recruitment and skill requirements of green-economy employers.
- The wage and benefits ranges of jobs within green-economy industries.
- The education and training requirements of workers in green-economy industries.

The Employment Security Department must also:

- Propose which industries should be considered high-demand green industries.
- Identify occupations that are part of career pathways to middle- and high-wage occupations.
- Conduct an analysis of occupations in the forest-products industry.

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<sup>3</sup> “2011 Green-Economy Jobs Report,” Labor Market and Economic Analysis, Employment Security Department, June 2012.

# Results of the 2013 Washington state green-economy jobs survey

The findings in this report are self-reported survey data from a scientific sample of the population of Washington employers in calendar year 2013. These data generated statistical estimates of green-economy jobs for the entire state economy. The 2013 survey found an estimated 56,762 green-economy jobs in the Washington economy, of which 92 percent were in the private sector. The total estimate of green-economy jobs represented 2.0 percent of private-sector employment and 0.9 percent of public-sector employment.

To date, green-economy job studies in Washington and across the nation have not identified any new industries and few new occupations that are uniquely “green,” such as wind-turbine technician or solar-panel designer. For the most part, employers are adding work responsibilities and activities identified as green to existing jobs. Employers appear to be “greening” jobs through their products and services and through the work practices they require of employees.

## Comparison of 2011 and 2013 results

The 2013 statewide estimate of 56,762 green-economy jobs contrasts with the 2011 estimate of 120,305 green-economy jobs. Thus, employers reported 52.8 percent fewer green jobs in 2013 than they did in 2011. However, the green-job estimates for 2013 and 2011 *both* fall in the range of estimated green-economy jobs of five other states, which, like Washington state, had a labor force of between three and four million workers.<sup>4</sup>

The sharp drop in reported green-economy jobs requires further discussion. The scientific sampling, survey and estimation methodologies were the same for both the 2011 and 2013 studies. Although changes were made with the 2013 questionnaire, the key questions and basic definition of green-economy jobs did not change in any conceptual way.

We looked further at the responses of employers who responded in both 2011 and 2013. About 1,200 employers responded to both surveys and they reported nearly 5,000 green-economy jobs in 2013, down from nearly 40,000 in 2011. Therefore, one possible, but important, reason for the drop in the estimated number of green jobs is that employers had a stricter interpretation of the green-economy jobs definition and whether they had any jobs that fell within it.

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<sup>4</sup> The states and their green-economy job counts are: Arizona with 30,716, Indiana with 46,879, Massachusetts with 79,994, Missouri with 131,103 and Tennessee with 43,804. *Appendix 5* provides further detail on other states' studies.

## Green-economy jobs by industry

Employers were classified into industries based on the North American Industry Classification System (NAICS).<sup>5</sup> *Figure 1* gives the distribution of green-economy jobs across industry sectors. These results include both public and private green-economy jobs.

The top five industry sectors were as follows:

- Construction was the leading sector, accounting for more than one-quarter of green jobs in the state and an estimated 7.2 percent of covered employment in this sector.
- Professional, scientific and technical services accounted for 14.1 percent of all green jobs and an estimated 3.8 percent of covered employment in this sector.
- Administrative and support and waste management services accounted for 11.8 percent of all green jobs and an estimated 4.9 percent of covered employment in this sector.
- Other services (except public administration) accounted for 9.2 percent of all green jobs and an estimated 4.0 percent of covered employment in this sector.
- Transportation and warehousing accounted for 6.3 percent of all green jobs and an estimated 4.4 percent of covered employment in this sector.

At the other end of the spectrum, the following industry sectors had the fewest green-economy jobs, in descending order: agriculture, forestry, fishing and hunting; real estate and rental and leasing; health care and social assistance; utilities; and educational services.

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<sup>5</sup> The U.S. Bureau of Labor Statistics, other federal agencies and most state employment agencies use NAICS for industry-based research and reporting.

**Figure 1.** Green-economy jobs by industry sector  
Washington state, 2013  
Source: Employment Security Department/LMPA

NAICS	Industry sector	Total green jobs	Percent of green jobs	Estimated percent of covered employment <sup>1</sup>
23	Construction	15,013	26.5%	7.2%
54	Professional, scientific and technical services	7,984	14.1%	3.8%
56	Administrative and support and waste management services	6,720	11.8%	4.9%
81	Other services (except public administration)	5,194	9.2%	4.0%
48-49	Transportation and warehousing <sup>2</sup>	3,593	6.3%	4.4%
31-33	Manufacturing	3,589	6.3%	1.7%
44-45	Retail trade	3,528	6.2%	1.4%
42	Wholesale trade	3,185	5.6%	2.5%
92	Public administration	2,108	3.7%	1.4%
72	Accommodation and food services	1,486	2.6%	0.6%
11	Agriculture, forestry, fishing and hunting	1,282	2.3%	0.9%
53	Real estate and rental and leasing	820	1.4%	1.3%
62	Healthcare and social assistance	663	1.2%	0.3%
22	Utilities <sup>2</sup>	513	0.9%	3.8%
61	Educational services <sup>2</sup>	128	0.2%	0.1%
21	Mining, quarrying and oil and gas extraction	N/A <sup>3</sup>	N/A	N/A
51	Information	N/A	N/A	N/A
52	Finance and insurance	N/A	N/A	N/A
55	Management of companies and enterprises	N/A	N/A	N/A
	<b>Total<sup>4</sup></b>	<b>56,762</b>	<b>98.3%</b>	<b>2.0%</b>

<sup>1</sup>Shares were estimated based on sample design. For more detail, see *Appendix 2*.

<sup>2</sup>These sectors contain some public-sector jobs.

<sup>3</sup>Only results, which passed publication standards (based on number of responses and confidence intervals), are reported here. See *Appendix 1* for more details about these standards.

<sup>4</sup>Total does not sum to 100 percent due to rounding and sectors that did not pass publication standards.

The three sectors of construction, professional, scientific and technical services and administrative and support and waste management services accounted for 29,717 green jobs, or 52.4 percent of all green jobs in the state.

## Public-sector green-economy jobs by industry

Figure 2 focuses on the subset of green-economy jobs in the public sector. The public sector had an estimated 4,020 green jobs statewide, representing 7.1 percent of all green jobs statewide and 0.9 percent of total public-sector employment. Public administration provided more than half of all public-sector green jobs, 52.4 percent, while transportation and warehousing provided an additional 35.0 percent.

**Figure 2.** Public-sector green-economy jobs by industry sector  
Washington state, 2013  
Source: Employment Security Department/LMPA

NAICS	Industry sector	Total public-sector green jobs	Percent of public-sector green jobs
92	Public administration	2,108	52.4%
48-49	Transportation and warehousing	1,406	35.0%
22	Utilities	424	10.5%
61	Educational services	82	2.0%
	<b>Total*</b>	<b>4,020</b>	<b>99.9%</b>

\*Total does not sum to 100 percent due to rounding.

The public sector provided 7.1 percent of green jobs statewide. Of these, public administration provided more than half of those green jobs.

## Green-economy jobs by occupation

For this survey, every job title was coded based on the Standard Occupational Classification (SOC) system.<sup>6</sup> Figure 3 displays the top 25 green-economy occupations in the state.

These top-25 occupations totaled 32,895 jobs and comprised 58.0 percent of the total number of green-economy jobs in the state.<sup>7</sup> The top five occupations were as follows:

- Heating, air conditioning and refrigeration mechanics and installers was the leading occupation, accounting for 3,148 green-economy jobs at 5.6 percent.
- Heavy and tractor-trailer truck drivers accounted for 2,597 green-economy jobs at 4.6 percent.
- Janitors and cleaners, except maids and housekeeping cleaners, accounted for 2,442 green-economy jobs at 4.3 percent.
- Construction laborers accounted for 2,199 green-economy jobs at 3.9 percent.
- Automotive service technicians and mechanics accounted for 2,157 green-economy jobs at 3.8 percent.

<sup>6</sup> The U.S. Bureau of Labor Statistics, other federal agencies and most state employment agencies also use SOC codes for occupation-based research and reporting.

<sup>7</sup> Shares of total covered employment by occupation are not available. Appendix 4 provides a complete list of green-economy jobs by occupation, including average hourly wage rates.

At the other end of the spectrum, the following occupations had the fewest green-economy jobs, in descending order: construction managers; farmworkers and laborers, crop, nursery and greenhouse; operating engineers and other construction equipment operators; cashiers; and insulation workers, floor, ceiling and wall.

**Figure 3.** Top 25 green-economy jobs by occupation  
Washington state, 2013  
Source: Employment Security Department/LMPA

SOC	Occupation	Total green jobs	Percent of green jobs
49-9021	Heating, air conditioning and refrigeration mechanics and installers	3,148	5.6%
53-3032	Heavy and tractor-trailer truck drivers	2,597	4.6%
37-2011	Janitors and cleaners, except maids and housekeeping cleaners	2,442	4.3%
47-2061	Construction laborers	2,199	3.9%
49-3023	Automotive service technicians and mechanics	2,157	3.8%
47-2111	Electricians	1,956	3.5%
53-3021	Bus drivers, transit and intercity	1,638	2.9%
17-2051	Civil engineers	1,418	2.5%
41-2031	Retail salespersons	1,353	2.4%
17-1011	Architects, except landscape and naval	1,222	2.2%
37-3011	Landscaping and groundskeeping workers	1,194	2.1%
47-2121	Glaziers	1,049	1.9%
19-2041	Environmental scientists and specialists, including health	1,049	1.9%
47-2031	Carpenters	962	1.7%
13-1199	Business operations specialists, all other	945	1.7%
47-4041	Hazardous materials removal workers	879	1.6%
51-9199	Production workers, all other	822	1.5%
47-2152	Plumbers, pipefitters and steamfitters	801	1.4%
41-4012	Sales representatives, wholesale and manufacturing, except technical and scientific products	783	1.4%
53-7081	Refuse and recyclable material collectors	764	1.4%
11-9021	Construction managers	754	1.3%
45-2092	Farmworkers and laborers, crop, nursery and greenhouse	736	1.3%
47-2073	Operating engineers and other construction equipment operators	714	1.3%
41-2011	Cashiers	688	1.2%
47-2131	Insulation workers, floor, ceiling and wall	625	1.1%
	<b>Total for top 25 green-job occupations</b>	<b>32,895</b>	<b>58.0%</b>

The top 25 green occupations comprised 58.0 percent of total green-economy jobs in the state.

## Comparison of 2011 and 2013 green-economy jobs by industry and occupation

### Comparison by industry

Figure 4 compares the 2011 and 2013 statewide estimates of green-economy jobs by industry sector. Most industry sectors reported fewer green jobs in 2013 compared to 2011. Only one sector saw an increase, accommodation and food services. The greatest percentage decline was in educational services, which dropped by 96.0 percent.

As discussed, since no changes were made in the basic methodology of the surveys from 2011 to 2013, responding employers' interpretation of the green-economy jobs definition may have contributed to the reduction in the number of estimated green jobs.

These large differences support the observed trend described in the 2011 green-economy jobs report that, for the most part, employers continue to add work responsibilities and activities identified as "green" to existing jobs. The continuous "greening" of existing jobs makes it difficult to differentiate a "green job" from an existing job that has been subtly greened.

**Figure 4.** Comparison of 2011 and 2013 green-economy jobs by industry sector  
Washington state, 2011 and 2013  
Source: Employment Security Department/LMPA

NAICS	Industry sector	Total green jobs in 2011	Total green jobs in 2013	Change from 2011 to 2013	Percent change
11	Agriculture, forestry, fishing and hunting	12,008	1,282	-10,725	-89.3%
22	Utilities	1,450	513	-937	-64.6%
23	Construction	29,864	15,013	-14,851	-49.7%
31-33	Manufacturing	11,309	3,589	-7,721	-68.3%
42	Wholesale trade	5,949	3,185	-2,764	-46.5%
44-45	Retail trade	3,960	3,528	-432	-10.9%
48-49	Transportation and warehousing	6,277	3,593	-2,684	-42.8%
51	Information	360	N/A*	N/A	N/A
52	Finance and insurance	1,405	N/A	N/A	N/A
53	Real estate and rental and leasing	1,364	820	-544	-39.9%
54	Professional, scientific and technical services	11,704	7,984	-3,720	-31.8%
56	Administrative and support and waste management	12,542	6,720	-5,822	-46.4%
61	Educational services	3,185	128	-3,057	-96.0%
62	Healthcare and social assistance	3,626	663	-2,964	-81.7%
71	Arts, entertainment and recreation	324	N/A	N/A	N/A
72	Accommodation and food services	606	1,486	880	145.0%
81	Other services (except public administration)	6,749	5,194	-1,555	-23.0%
92	Public administration	7,416	2,108	-5,308	-71.6%
	<b>Total</b>	<b>120,304</b>	<b>56,762</b>	<b>-63,542</b>	<b>-52.8%</b>

\*Results did not meet publication standards.

Most industry sectors reported fewer green jobs in 2013 compared to 2011. The greatest percentage decline was in educational services (96.0 percent). Only accommodation and food services saw an increase (145.0 percent).

## Comparison by occupation

Figure 5 shows the same relatively large declines in estimated green-economy jobs, but by major occupational group. Most occupational groups had fewer green jobs in 2013 compared to 2011, but three did see an increase. Food preparation and serving-related occupations increased by 214.9 percent, art, design, entertainment, sports and media occupations increased by 27.8 percent and building and grounds cleaning and maintenance increased by 16.1 percent. The greatest percentage decline was in farming, fishing and forestry occupations (92.0 percent), but education, training and library occupations was a very close second (91.8 percent).

**Figure 5.** Comparison of 2011 and 2013 green-economy jobs by major occupational group Washington state, 2011 and 2013  
Source: Employment Security Department/LMPA

SOC	Major occupational group	Total green jobs in 2011	Total green jobs in 2013	Change from 2011 to 2013	Percent change
11-0000	Management	7,128	2,403	-4,725	-66.3%
13-0000	Business and financial operations	3,348	1,425	-1,923	-57.4%
15-0000	Computer and mathematical	771	715	-56	-7.3%
17-0000	Architecture and engineering	13,109	5,126	-7,983	-60.9%
19-0000	Life, physical and social science	3,239	2,604	-635	-19.6%
21-0000	Community and social service	1,677	N/A*	N/A	N/A
23-0000	Legal	112	89	-23	-20.5%
25-0000	Education, training and library	1,005	82	-923	-91.8%
27-0000	Arts, design, entertainment, sports and media	471	602	131	27.8%
29-0000	Healthcare practitioners and technical	745	N/A	N/A	N/A
31-0000	Healthcare support	618	N/A	N/A	N/A
33-0000	Protective service	1,471	N/A	N/A	N/A
35-0000	Food preparation and serving-related	309	973	664	214.9%
37-0000	Building and grounds cleaning and maintenance	3,980	4,621	641	16.1%
39-0000	Personal care and service	1,493	N/A	N/A	N/A
41-0000	Sales and related	5,863	3,816	-2,047	-34.9%
43-0000	Office and administrative support	3,883	1,201	-2,682	-69.1%
45-0000	Farming, fishing and forestry	12,265	978	-11,287	-92.0%
47-0000	Construction and extraction	23,573	12,012	-11,561	-49.0%
49-0000	Installation, maintenance and repair	11,236	6,793	-4,443	-39.5%
51-0000	Production	10,894	4,501	-6,393	-58.7%
53-0000	Transportation and material moving	13,114	7,516	-5,598	-42.7%
	<b>Total</b>	<b>120,304</b>	<b>56,762</b>	<b>-63,542</b>	<b>-52.8%</b>

\*Results did not meet publication standards.

Similar to the industry sectors, the major occupational groups had fewer green jobs in 2013 compared to 2011, overall. The greatest percentage decline was in farming, fishing and forestry occupations (92.0 percent) and the largest percentage increase was in food preparation and serving-related occupations (214.9 percent).

## Expected growth of green-economy jobs

For each green-job occupation identified, the survey asked employers how many green-economy jobs they expected to have two years in the future. The information collected provided some insight into employers' future green-jobs employment, but does not directly translate into a precise forecast of future employment in green-economy jobs.

Employers who responded to this future-looking question expected an average increase of 19.5 percent in their green-economy jobs over the next two years. (See *Figure 6*.)

Employers expected the greatest increase in computer and mathematical occupations, with an estimated growth of 109.2 percent from fall 2013 to fall 2015. Additional occupational groups where high growth was expected were business and financial operations (62.3 percent), management (58.1 percent) and architecture and engineering (35.2 percent).

Employers expected growth rates of less than 10 percent in farming, fishing and forestry (6.7 percent) and transportation and material moving (2.3 percent). Employers expected a decline in sales and related occupations of 17.1 percent.

**Figure 6.** Expected future green-economy jobs by major occupational group, fall 2015  
Washington state, 2013  
Source: Employment Security Department/LMPA

SOC	Major occupational group	Expected change in green jobs for fall 2015
15-0000	Computer and mathematical	109.2%
13-0000	Business and financial operations	62.3%
11-0000	Management	58.1%
17-0000	Architecture and engineering	35.2%
47-0000	Construction and extraction	28.1%
37-0000	Building and grounds cleaning and maintenance	27.4%
35-0000	Food preparation and serving-related	25.9%
51-0000	Production	17.5%
49-0000	Installation, maintenance and repair	16.3%
43-0000	Office and administrative support	13.8%
19-0000	Life, physical and social science	12.6%
27-0000	Arts, design, entertainment, sports and media	12.2%
45-0000	Farming, fishing and forestry	6.7%
53-0000	Transportation and material moving	2.3%
41-0000	Sales and related	-17.4%
	<b>Average growth rate</b>	<b>19.5%</b>

At 109.2 percent, employers expected the highest green-economy job growth in computer and mathematical occupations from 2013 to 2015.

## Educational, experience and skill requirements in the green economy

For each green-economy job, the survey asked employers for information on the job's educational, experience and skill requirements.

### Educational requirements for green-economy jobs

The educational requirements for the reported green-economy jobs are shown in *Figure 7*. An educational requirement of high school only was most common, reported for 32.5 percent of green-economy jobs. An apprenticeship was required for 15.9 percent of the green jobs. Employers reported that 22.0 percent of green jobs required a certificate, license or similar credential to perform their green-job functions. Post-secondary education was required for a total of 21.9 percent of the green jobs, a combination of 2.8 percent requiring an associate degree, 15.0 percent requiring a bachelor's degree and 4.1 percent requiring a post-graduate degree..

Figure 7. Educational requirements for green-economy jobs  
Washington state, 2013

Source: Employment Security Department/LMPA

Educational requirement	Percent of green jobs
High school only	32.5%
Apprenticeship only	15.9%
Certificate, license, etc. only	22.0%
AA or AAS degree	2.8%
BA or BS degree	15.0%
Post-graduate or professional degree	4.1%
Not identified	7.6%

Almost one-third of the reported green-economy jobs required only a high school education.

### Experience requirements for green-economy jobs

As shown in *Figure 8*, almost one-half, 46.8 percent, of the reported green jobs required no experience. Only one-quarter of the green jobs required as much as one to two years of experience. Three to five years of experience were required in about one out of six green jobs. Only 7.2 percent of the reported green jobs required over five years of experience, one out of every 14 green jobs.

**Figure 8.** Experience requirements for green-economy jobs  
Washington state, 2013  
Source: Employment Security Department/LMPA

Experience requirement	Percent of green jobs
None	46.9%
1 to 2 years	25.0%
3 to 5 years	17.2%
More than 5 years	7.2%
Not identified	3.6%

Nearly half of reported green-economy jobs required no experience.

### Skill requirements for green-economy jobs

*Figure 9* reports the skill requirements for a given green job compared to the same job title that is non-green. For a given job title, employers reported that the skills of a green job and a non-green job were identical for 35.1 percent of the reported job titles. For another 42.3 percent of the green jobs, the skills required were mostly the same as those for the non-green job of the same job title. In only 12.9 percent of the job titles reported, the skills were mostly different when comparing green and non-green jobs. Finally, the surveyed employers reported that green skills and non-green skills for the same job title were entirely different for only 2.6 percent of their green jobs.

In summary, there was little skill difference between green jobs and non-green jobs. Overall, green jobs were not unique in terms of their skill requirements compared to non-green jobs.

**Figure 9.** Comparative skill requirements for green-economy jobs  
Washington state, 2013  
Source: Employment Security Department/LMPA

Skill requirements compared to non-green counterparts	Percent of green jobs
Skills are identical	35.1%
Skills are mostly the same	42.3%
Skills are mostly different	12.9%
Skills are entirely different	2.6%
Not identified	7.0%

Overall, green-economy jobs were not unique in terms of their skill requirements compared to non-green jobs.

## Wage rates and benefits compensation in the green economy

A major improvement of the 2013 survey questionnaire was asking employers about average hourly wage rates and benefits for each green job title. Previous survey questionnaires did not ask employers to report this information, so non-green-specific occupational employment statistics were relied upon to provide that information.

### Average hourly green-job wage rates by industry

*Figure 10* shows the green-economy job's average hourly wage rate by industry sector. Green jobs in the information industry sector were paid the highest average hourly wage rate of \$46.98 per hour. Green jobs in the professional, scientific and technical services industry sector were paid an average hourly wage rate of \$40.45 per hour. Green jobs in all other sectors were paid an average hourly wage rate of less than \$40.00 per hour.

Green jobs in the arts, entertainment and recreation industry sector were paid an average hourly wage rate of \$10.30 per hour. Green jobs in two other sectors were also paid, on average, less than \$13.00 per hour: retail trade (\$12.73) and accommodation and food services (\$12.12).

Thus, the green job in the information sector was paid almost four times more per hour than the green job in the arts, entertainment and recreation industry sector. This finding is consistent with the results of the Quarterly Census of Employment and Wages (QCEW) for all jobs, green and non-green, in these two sectors. The results of QCEW show that a job in the information sector in 2013 was paid, on average, over four times more than a job in the arts, entertainment and recreation industry sector.<sup>8</sup>

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<sup>8</sup> Statewide in 2013, the annual average weekly wage for the information industry sector was \$2,602. In arts, entertainment and recreation it was \$534. U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Data file Q52744.

**Figure 10.** Average hourly wage rates for green-economy jobs by industry  
Washington state, 2013  
Source: Employment Security Department/LMPA

NAICS	Industry sector	Average hourly wage rate
51	Information	\$46.98
54	Professional, scientific and technical services	\$40.45
62	Healthcare and social assistance	\$39.26
61	Educational services	\$35.73
22	Utilities	\$34.26
92	Public administration	\$33.33
23	Construction	\$26.62
42	Wholesale trade	\$22.74
48-49	Transportation and warehousing	\$19.55
31-33	Manufacturing	\$19.45
81	Other services (except public administration)	\$17.49
56	Administrative and support and waste management and remediation services	\$17.27
11	Agriculture, forestry, fishing and hunting	\$15.97
53	Real estate and rental and leasing	\$15.83
44-45	Retail trade	\$12.73
72	Accommodation and food services	\$12.12
71	Arts, entertainment and recreation	\$10.30
	Average for all industries	\$25.75

While the average hourly wage rate for all green-economy jobs was \$25.75 per hour, there was a large difference between the highest, information at \$46.98, to the lowest, arts, entertainment and recreation at \$10.30, by industry sector.

### Average hourly green-job wage rates by occupation

Figure 11 displays the average hourly wage rates paid to green jobs in the top 25 occupations. Topping the list is civil engineers that were paid an average hourly wage of \$45.77. The remaining occupations were paid, on average, less than \$40.00 per hour.

Of the top 25 occupations, those that were paid an average hourly wage rate less than \$13.00, were retail salespersons (\$11.69), farmworkers and laborers, crop, nursery and greenhouse (\$11.02) and cashiers (\$9.46).

**Figure 11.** Average hourly wage rates for top 25 green-job occupations  
Washington state, 2013  
Source: Employment Security Department/LMPA

SOC	Occupation	Average hourly wage rate
17-2051	Civil engineers	\$45.77
17-1011	Architects, except landscape and naval	\$37.59
11-9021	Construction managers	\$36.75
19-2041	Environmental scientists and specialists, including health	\$36.47
13-1199	Business operations specialists, all other	\$30.48
47-2111	Electricians	\$29.64
41-4012	Sales representatives, wholesale and manufacturing, except technical and	\$29.06
47-2152	Plumbers, pipefitters and steamfitters	\$28.43
47-2073	Operating engineers and other construction equipment operators	\$27.18
47-2121	Glaziers	\$25.38
49-9021	Heating, air conditioning and refrigeration mechanics and installers	\$24.73
47-4041	Hazardous materials removal workers	\$22.38
53-3021	Bus drivers, transit and intercity	\$22.31
47-2031	Carpenters	\$22.18
49-3023	Automotive service technicians and mechanics	\$20.27
51-9199	Production workers, all other	\$17.02
47-2061	Construction laborers	\$16.82
53-3032	Heavy and tractor-trailer truck drivers	\$16.13
37-2011	Janitors and cleaners, except maids and housekeeping	\$15.73
53-7081	Refuse and recyclable material collectors	\$15.41
47-2131	Insulation workers, floor, ceiling and wall	\$15.33
37-3011	Landscaping and groundskeeping workers	\$13.75
41-2031	Retail salespersons	\$11.69
45-2092	Farmworkers and laborers, crop, nursery and greenhouse	\$11.02
41-2011	Cashiers	\$9.46
	<b>Average for top 25 occupations</b>	<b>\$25.75</b>

The range of average hourly wage rates paid to the top 25 green-job occupations was very wide, from a high of \$45.77 per hour for civil engineers to just \$9.46 for cashiers.

### **Average hourly wage rate by educational requirement**

The average hourly wage rate among green jobs by educational requirement suggests that the average hourly wage rate increases when the educational requirements increase (*Figure 12*).

Green-economy jobs that required a high school education were paid an average hourly wage rate of \$17.73. Green jobs that required an apprenticeship were paid, on average, \$18.81 per hour, \$1.08 more per hour than green jobs that required a high school education.

Relative to the green job that required a high school education, a green job that required an associate degree resulted in a wage rate increase of \$14.17 more per hour. A green job that required a bachelor's degree paid an average hourly wage rate of \$37.50 per hour. Finally, a green job that required a post-graduate or professional degree paid an average hourly wage rate of \$56.57.

**Figure 12.** Average hourly wage rates for green-economy jobs by educational requirement

Washington state, 2013

Source: Employment Security Department/LMPA

Educational requirement	Average hourly wage rate
High school only	\$17.73
Apprenticeship only	\$18.81
Certificate, license, etc. only	\$23.72
AA or AAS degree	\$31.90
BA or BS degree	\$37.50
Post-graduate or professional degree	\$56.57

Green-economy jobs with higher educational and training requirements were paid much higher average hourly wage rates.

#### Average hourly wage rate by experience requirement

Employers reported a wide range of required experience for workers to be employed in their green-economy jobs. As the data show in *Figure 13*, green jobs requiring more experience were paid much higher average hourly earnings. The green job that required no experience was paid an average hourly wage rate of \$18.67. In sharp contrast, the worker who was required to bring more than five years' experience to the green job was paid an average hourly wage rate of \$43.57 per hour.

**Figure 13.** Average hourly wage rates for green-economy jobs by years of required experience

Washington state, 2013

Source: Employment Security Department/LMPA

Experience requirement	Average hourly wage rate
None	\$18.67
1 to 2 years	\$24.45
3 to 5 years	\$32.56
More than 5 years	\$43.57

Green-economy jobs that required more experience were paid higher average hourly wage rates.

### Average hourly wage rate for a given green-economy job by comparative skill difference

Figure 14 shows the variation in average hourly wage rates for green-economy jobs by similarity of their skill requirements to the same, but non-green, jobs. When skills were identical, the green worker in a given job and the non-green worker in that same job earned an average hourly wage rate of \$21.56. In contrast, for a given job title, when the skills of the green-job worker were entirely different from the skills of the non-green worker in the same job, the green-job worker earned an average hourly wage rate of \$35.60. The more different the green skills were for a given job, the higher average hourly wage rate.

**Figure 14.** Average hourly wage rates for green-economy jobs by comparative skill level  
Washington state, 2013  
Source: Employment Security Department/LMPA

Skill requirements compared to non-green counterparts	Average hourly wage rate
Skills are identical	\$21.56
Skills are mostly the same	\$25.57
Skills are mostly different	\$27.83
Skills are entirely different	\$35.60

The more different the skill level of a green-economy job, the higher the average hourly wage rate.

### Benefits paid by green-economy employers

Benefits paid in green-economy jobs varied by industry. However, results did not meet publication standards for many of the industry sectors. Overall, 74.5 percent of green-economy jobs offered medical benefits, 77.9 percent offered paid leave and 59.6 percent offered retirement benefits. These numbers are consistent with results of the 2013 Employee Benefits Survey Report.<sup>9</sup>

### Industry certification by core area

Many industries offered industry certifications to employers related to the four core areas that define green economic activities. The percent of employers who reported certifications in one or more of the core areas is given in Figure 15. It is notable that of those firms certified in any of the four core areas, only 8.5 percent of these firms were certified in the core area of producing renewable energy. Certifications to prevent and reduce environmental pollution, at 34.2 percent, represented the largest certified core area.

Although the data showed that certification levels varied by industry sector, the results of the analysis did not meet publication standards to present the estimated percent of employers with certification.

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<sup>9</sup> “2013 Employee Benefits Survey Report,” Labor Market and Economic Analysis, Employment Security Department, March 2014.

**Figure 15.** Employers with green-job certifications, licenses and related credentials in any of the four green core areas Washington state, 2013  
Source: Employment Security Department/LMPA

Core area	Percent of employers with certification
Increasing energy efficiency	25.7%
Producing renewable energy	8.5%
Preventing and reducing environmental pollution	34.2%
Providing mitigation or cleanup of environmental pollution	19.6%

Certifications were highest in the core area of preventing and reducing environmental pollution.

## Regional distribution of green-economy jobs

Estimates of the regional distribution of green-economy jobs are presented in *Figure 16*. The Seattle-King County workforce development area (WDA) is the largest labor market area among the workforce development areas and accounted for the largest number of green-economy jobs (20,133, 35.5%). The combined Snohomish County, Seattle-King County and Pierce County WDAs accounted for 51.4 percent of all green-economy jobs. See *Appendix 7* for a map of Washington’s workforce development areas.

The estimates of the regional distribution of green-economy jobs do not include green-economy jobs of employers who reported for their entire group of establishments in the state. These employers accounted for 3,664 green-economy jobs, 6.5 percent of the statewide total. *Figure 16* groups them separately.

**Figure 16.** Regional distribution of green-economy jobs Washington state, 2013  
Source: Employment Security Department/LMPA

Workforce development area	Total green jobs	Percent of green jobs
Seattle-King County	20,133	35.5%
Northwest Washington	5,256	9.3%
Snohomish County	4,736	8.3%
Pierce County	4,294	7.6%
Pacific Mountain	4,161	7.3%
Southwest Washington	3,016	5.3%
Spokane	2,972	5.2%
Olympic Consortium	2,871	5.1%
Benton-Franklin	2,084	3.7%
North Central Washington	1,502	2.6%
Eastern Washington	1,039	1.8%
South Central Washington	1,033	1.8%
WDA could not be determined	3,664	6.5%
<b>Total</b>	<b>56,762</b>	<b>100.0%</b>

The large labor market of the Seattle-King County WDA accounted for 35.5 percent of all green jobs.

## **The forest-products industry**

State law (RCW 43.330.310) requires the Employment Security Department to conduct labor market research to determine key growth factors and employment projections in the forest-products industry and define the education and skill standards required for current and emerging green jobs in the forest-products industry.

The forest-products industry accounted for an estimated 570 of the state's green-economy jobs, paying an average hourly wage of \$20.07. Two sub-industries, logging and sawmills evenly split 85 percent of these jobs. Data limitations prevented detailed analysis of growth, employment projections and educational and skill requirements of green-economy jobs in the forest-products industry.



# Appendices

## Appendix 1. Study design

The purpose of the Washington state 2013 green-economy jobs study is to identify jobs that produced goods or provided services supporting any of the following four green core areas: increasing energy efficiency; producing renewable energy; preventing and reducing environmental pollution; and providing mitigation or cleanup of environmental pollution. The study established baseline measures that provided statistically reliable estimates of the number of green-economy jobs in Washington state based on a survey of employers.

This study measured only those jobs directly related to the core areas as identified and self-reported by employers. The study did not include jobs in secondary or indirect jobs, such as secretaries working in a green-jobs establishment. By using the conservative approach of including only direct green-economy jobs, the total effect of green industries and green jobs in the economy was understated.

The same study definitions and design developed for the 2011 green-economy jobs study were used for the 2013 study.

### Sample Design

The survey is a scientific stratified sample drawn by using the method of probability of selection proportional to size (PPS) without replacement. The official source for this sample is the Enhanced Quarterly Unemployment Insurance (EQUI) file for third-quarter 2012. The EQUI file contains all employment covered by the unemployment-insurance system for Washington state. Private and public sector employers (except private households) with positive employment in third quarter 2012 were included. Only master (primary) accounts were used and consequently individual locations were removed (e.g., the various stores – establishments – of McDonald's or Starbucks).

The universe includes 142,080 employers covered by unemployment insurance, of which 1,915 employers are public-sector employers. The total sample of 21,000 employers was stratified into two strata: presumed green and all others. Presumed green employers are those included in the industries identified in the 2009 green-economy jobs study.<sup>10</sup>

The distribution of sample sizes presented in *Figure A1-1* were defined based on the assumption of a certainty proportion of three, for presumed green, to four, for all others. Thus, the assumption yielded a sample size of 8,350 units (firms) for all others – about 10 percent of the population size of all other firms and 12,650 units for presumed green firms – about 24 percent of the population size of firms presumed to be green.

*Figure A1-1* also shows the stratum response rates. The response rates were calculated using valid responses. Valid responses were those that showed no contradiction among item responses and were used to calculate at least one estimation.

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<sup>10</sup> “2009 Washington State Green Economy Jobs,” Labor Market and Economic Analysis, Employment Security Department, March 2010.

**Figure A1-1.** Employer sample size and response rates  
 Washington state, 2013  
 Source: Employment Security Department/LMPA

Stratum	Population of firms in the universe	Firms included in the sample	Valid responses	Response rate
Presumed green industries	55,078	12,650	7,521	59.5%
All other industries	87,002	8,350	5,016	60.1%
<b>Total</b>	<b>142,080</b>	<b>21,000</b>	<b>12,537</b>	<b>59.7%</b>

The total employment referenced in this report is the employment of the sample weighted to reflect the total population from which it was drawn. The estimated shares in total employment were based on weights adjusted by strata. Consequently, except for strata, multiplying these weights by total covered employment would not produce the universe for the domains used in the tables (for industries and areas). See *Appendix 2* for more information.

### **Publishing standards**

For an estimate to be publishable, it had to pass three criteria:

- The number of respondents in any given cell had to be at least four.
- The coefficient of variation had to be less than 50 percent.
- The lower limit of the 95 percent confidence interval had to be greater than zero.

## Appendix 2. Technical notes

### Sample selection

SAS software was used for sample selection and estimations.

The sample was stratified by two strata: presumed green and all others. The size of each primary sampling unit (PSU) was defined by the average total covered employment in third-quarter 2012. Once firm employment size was determined, for each stratum the default selection method was used – the probability of selection proportional to size (PPS) without replacement. This method is more complex than selection with replacement, but provides the ability to produce estimations that are more accurate. Under the PPS method of sample selection without replacement, the probability of selection for each unit is equal to:

$$\text{(Unit size) x (number of units in sample) / total sample size.}$$

A “certainty” option was applied by an iteration, which provided a smooth transition of probabilities from sample units with a certainty of selection to the selection of those firms with the next largest firm size.

The certainties were defined as the result of statistical iteration. As a result, presumed green firms that employed 40 or more workers were selected with certainty and all other firms with an employment size of 160 or more workers were selected with certainty.

To avoid extreme weights for small units a MINSIZE option was applied, which interpreted each sampling unit of size less than MINSIZE as equal the MINSIZE value to establish the probability of selection. MINSIZE for presumed green jobs was defined as 5, which limited the maximum initial weight to about 8. For all others, the MINSIZE was defined as 7, which limited the maximum initial weight to about 23.

### Weighting adjustments

To account for missing values due to non-responses and invalid responses, each stratum was assumed to have the same distribution as the respondents in the primary sample unit (PSU) with valid responses. Primary weights were adjusted for missing values based on this assumption and the final weights used for the population estimates were then calculated.

### Estimations

All estimates of variance (except for median wage rates) were produced using the DOMAIN statement SURVEYMEANS procedure (PROCSURVEYMEANS) in SAS described as follows.

“The DOMAIN statement requests analysis for domains (subpopulations) in addition to analysis for the entire study population. The DOMAIN statement names the variables that identify domains, which are called domain variables.

It is common practice to compute statistics for domains. The formation of these domains might be unrelated to the sample design. Therefore, the sample sizes for the domains are random variables. Use a DOMAIN statement to incorporate this variability into the variance estimation.”<sup>11</sup>

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<sup>11</sup> *SAS/STAT 9.22 User's Guide*, SAS Institute Inc., Cary, 2010.

The estimated shares in total employment were based on weights adjusted by strata. Except for the strata, multiplying these weights by total covered employment would not produce the same universe for the domains used in the figures (e.g., industries and workforce development areas). Consequently, for each industry sector and workforce development area (WDA), multiplying the initial universe (Enhanced Quarterly Unemployment Insurance) by the estimated percent of green jobs in total covered employment cannot produce the number of estimated green jobs.

**Figure A2-1.** Green-economy jobs shares by stratum  
 Washington state, 2013  
 Source: Employment Security Department/LMPA

Stratum	Total green jobs	Estimated percent of covered employment
Presumed green industries	35,866	3.2%
All other industries	20,896	1.2%
Total	56,762	2.0%

## Appendix 3. Survey form

# WASHINGTON STATE 2013 GREEN JOBS SURVEY

1

Washington State  
Employment Security Department  
Labor Market and Economic Analysis



### ABOUT THE SURVEY

Washington has long been a leader in environmental stewardship, climate protection, the development of renewable energy and energy efficiency. Washington state has established goals to grow business sectors and jobs that support environmental protection and clean energy.

The Employment Security Department is conducting this survey to determine the number of jobs that directly support environmental protection and clean energy goals. We are surveying firms about production of any goods or services that support any of the following four core areas:

1. Increasing energy efficiency
2. Producing renewable energy
3. Preventing and reducing environmental pollution
4. Providing mitigation or cleanup of environmental pollution

Please direct this survey to your Operations Manager or Human Resources Department. Include information about all your locations in Washington state. All information

collected is confidential and will not be provided to any other entity; it is used for statistical research purposes only. Survey results are presented in aggregate form so that no individual response can be identified.

If you or any of your staff have worked in any of these four core areas as their primary job function within the **past three months**, fill out both sections below and continue to page two. If not, please fill out both sections below and return using the following options.

### OPTIONS FOR RESPONDING TO THE SURVEY

- Enclosed postage-paid envelope
- Fax both sides to 866-406-2449
- Contact us at 888-346-3807

In order to use your information, please respond within 15 days. Your prompt response is appreciated and reduces follow-up costs.

### Please report for all Washington state business locations

How many employees do you currently have in Washington state? \_\_\_\_\_

Number of employees who are full time: \_\_\_\_\_

Number of employees who are part time: \_\_\_\_\_

Do you provide goods or services in any of the four core areas? Yes  No

If 'Yes,' please complete page one and two and return survey.

If 'No,' complete page one and return survey.

### Contact person

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Telephone: \_\_\_\_\_

Date: \_\_\_\_\_

### Thank you for your participation.

*The Employment Security Department is an equal-opportunity employer and provider of programs and services. Auxiliary aids and services are available upon request to people with disabilities. Washington Relay Service: 800-833-6384*

Page 1

# WASHINGTON STATE 2013 GREEN JOBS SURVEY 2

Please enter information for the past three months' business activities only.								
SECTION 1: Green occupation(s)/job title(s)								
Please identify the green occupation(s)/job title(s) among your employees over the past three months, excluding consultants, outside contractors, vendors and others not considered employees.	How many workers did you employ in this green job title? # _____	What was the average <b>hourly wage rate</b> for this green job title, before taxes and deductions? \$ _____ per hour	What were your <b>educational requirements</b> for this green job title? (Please select only the most important response.) 1. Apprenticeship only 2. Certificate, license, etc. only 3. High school only 4. AA or AAS degree 5. BA or BS degree 6. Post-graduate or professional degree	Did you <b>require experience</b> in this green job title? 1. None 2. 1 to 2 years 3. 3 to 5 years 4. More than 5 years	Overall, <b>how different were the skills of employees</b> in this green job title compared to other employees with the same job titles but who were not working in one of the four green "core areas"? (Please select only one response.) 1. Skills are identical 2. Skills are mostly the same 3. Skills are mostly different 4. Skills are entirely different	How many <b>employees</b> are you expecting to have employed in this green job title <b>two years from today</b> ? # _____		
<b>Job title: <i>Example</i></b> Civil Engineer  What does the worker make or do? Green Construction - Pollution Control Systems	2	\$42.11	6	3	2	3		
<b>Job title:</b>  What does the worker make or do?								
<b>Job title:</b>  What does the worker make or do?								
<b>Job title:</b>  What does the worker make or do?								
<b>Job title:</b>  What does the worker make or do?								
<b>Job title:</b>  What does the worker make or do?								
SECTION 2: Benefits								
Did your organization offer any of the following benefits to your employees?	Medical insurance		Retirement plans – defined benefit and/or defined contribution		Paid leave – sick, vacation, holiday or other undesignated leave			
	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
SECTION 3: Industry certification								
Does your organization have any special industry certifications that relate to any of the following four core areas?	Increasing energy efficiency		Producing renewable energy		Preventing and reducing environmental pollution		Providing mitigation or cleanup of environmental pollution	
	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>

**If more space is needed, please contact us for another copy or make a photocopy of this page.**  
 Washington State Employment Security Department, Labor Market and Economic Analysis; PO Box 9046 Olympia, WA 98507-9046  
 Phone: 888-346-3807; Fax: 866-406-2449; Email: wagreen@esd.wa.gov

## Appendix 4. Detailed occupational estimates

Figure A4-1 lists the number of green-economy jobs by occupation. This list does not offer a complete set of the occupations reported by employers as green-economy jobs. For reasons of sample size or uncertainty, estimations may be judged too imprecise to be used in extrapolations to the entire state economy. Throughout the report, estimates were suppressed if they are based on fewer than four survey respondents, contain the value of zero within a 95% confidence interval, or have a coefficient of variation greater than 0.5.

**Figure A4-1.** Detailed Standard Occupational Classification codes, job counts and average hourly wage rates of green-economy occupations  
Washington state, 2013

Source: Employment Security Department/LMPA

SOC	Occupation	Total green jobs	Average hourly wage rate
49-9021	Heating, air conditioning and refrigeration mechanics and installers	3,148	\$24.73
53-3032	Heavy and tractor-trailer truck drivers	2,597	\$16.13
37-2011	Janitors and cleaners, except maids and housekeeping cleaners	2,442	\$15.73
47-2061	Construction laborers	2,199	\$16.82
49-3023	Automotive service technicians and mechanics	2,157	\$20.27
47-2111	Electricians	1,956	\$29.64
53-3021	Bus drivers, transit and intercity	1,638	\$22.31
17-2051	Civil engineers	1,418	\$45.77
41-2031	Retail salespersons	1,353	\$11.69
17-1011	Architects, except landscape and naval	1,222	\$37.59
37-3011	Landscaping and groundskeeping workers	1,194	\$13.75
19-2041	Environmental scientists and specialists, including health	1,049	\$36.47
47-2121	Glaziers	1,049	\$25.38
47-2031	Carpenters	962	\$22.18
13-1199	Business operations specialists, all other	945	\$30.48
47-4041	Hazardous materials removal workers	879	\$22.38
51-9199	Production workers, all other	822	\$17.02
47-2152	Plumbers, pipefitters and steamfitters	801	\$28.43
41-4012	Sales reps., wholesale and manufacturing, exc. technical and scientific products	783	\$29.06
53-7081	Refuse and recyclable material collectors	764	\$15.41
11-9021	Construction managers	754	\$36.75
45-2092	Farmworkers and laborers, crop, nursery and greenhouse	736	\$11.02
47-2073	Operating engineers and other construction equipment operators	714	\$27.18
41-2011	Cashiers	688	\$9.46
47-2131	Insulation workers, floor, ceiling and wall	625	\$15.33
17-2199	Engineers, all other	600	\$39.76
47-1011	First-line supervisors of construction trades and extraction workers	575	\$36.01
53-7061	Cleaners of vehicles and equipment	571	\$12.27

47-2181	Roofers	558	\$16.58
27-1021	Commercial and industrial designers	493	\$29.60
49-9071	Maintenance and repair workers, general	480	\$16.43
53-7062	Laborers and freight, stock and material movers, hand	474	\$16.31
37-2012	Maids and housekeeping cleaners	393	\$12.61
17-2081	Environmental engineers	387	\$42.01
19-4091	Environmental science and protection technicians, including health	372	\$22.02
51-2022	Electrical and electronic equipment assemblers	353	\$15.01
17-2141	Mechanical engineers	335	\$44.19
11-1011	Chief executives	316	\$61.49
15-1133	Software developers, systems software	315	\$55.81
17-2071	Electrical engineers	274	\$41.49
43-6014	Secretaries and administrative assistants, except legal, medical and executive	265	\$25.69
51-8031	Water and wastewater treatment plant and system operators	247	\$26.25
51-8099	Plant and system operators, all other	225	\$18.26
19-2042	Geoscientists, except hydrologists and geographers	219	\$33.72
43-1011	First-line supervisors of office and administrative support workers	199	\$18.28
11-9199	Managers, all other	196	\$39.38
13-1051	Cost estimators	196	\$37.63
49-3031	Bus and truck mechanics and diesel engine specialists	188	\$23.73
11-9041	Architectural and engineering managers	176	\$50.93
49-9041	Industrial machinery mechanics	173	\$20.54
41-3099	Sales representatives, services, all other	157	\$30.76
47-4099	Construction and related workers, all other	154	\$27.12
17-3029	Engineering technicians, except drafters, all other	151	\$31.96
37-1012	First-line supervisors of landscaping, lawn service and groundskeeping workers	141	\$27.57
19-3051	Urban and regional planners	134	\$39.81
45-2093	Farmworkers, farm, ranch and aquacultural animals	125	\$11.56
53-1021	First-line supervisors of helpers, laborers and material movers, hand	121	\$19.98
49-9043	Maintenance workers, machinery	116	\$23.27
11-3011	Administrative services managers	108	\$39.81
13-1041	Compliance officers	106	\$29.02
11-1021	General and operations managers	97	\$54.28
11-9121	Natural sciences managers	91	\$52.91
11-3051	Industrial production managers	90	\$38.99
17-1012	Landscape architects	85	\$33.48
23-1011	Lawyers	68	N/A*
47-4011	Construction and building inspectors	66	\$27.12
25-3099	Teachers and instructors, all other	34	\$17.75
11-3031	Financial managers	25	\$48.37
29-9011	Occupational health and safety specialists	13	\$27.30

\*Results did not meet publication standards.

## Appendix 5. Existing research on the green economy

There is a substantial amount of research on the green economy. Studies that estimated green-economy employment are the research most relevant to this report. Two nonprofit organizations, two federal agencies, 36 states and the District of Columbia have conducted or commissioned such research. The definitions of green-economy jobs in these studies were generally similar to Washington state's definition, though some studies included jobs in environmental compliance, education and training and public awareness – jobs not measured in the Washington state studies.

Many of the state-level studies were funded by Labor Market Information Improvement Grants under the American Recovery and Reinvestment Act of 2009 (ARRA). Few have been updated or repeated. The U.S. Bureau of Labor Statistics began an annual study in 2011 to measure green-economy jobs nationwide, but the study was discontinued after two years.

The studies differed by method and scope. Some focused on the private sector exclusively, while others examined both the private and public sectors. Some gathered data from employer surveys, while others employed industry statistics. A handful focused exclusively on jobs in the energy industry.

Despite these differences in method, the key findings of the studies were remarkably similar. Excluding extreme outliers, the studies estimated that green-economy jobs account for 1.3 percent to 5.2 percent of total state or other area employment, with an average estimate of 2.9 percent.<sup>12</sup> Washington state's estimate for 2011 was toward the upper end of this range; the 2013 estimate of 2.0 percent was nearer the average found in other studies. *Figures A5-1, A5-2 and A5-3* summarize the existing studies as of their most recent update. Full source information for these studies is provided in *Appendix 6*.

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<sup>12</sup> The standard deviation is 1.1. Excluded from this calculation are Pew Charitable Trusts, (nationwide, 0.5 percent), Florida (0.6 percent) and Rhode Island (two estimates: 0.3 percent and 10.7 percent).

**Figure A5-1.** Selected studies of the green economy: state reports based on surveys of employers  
 United States, 2009 through 2013  
 Source: Employment Security Department/LMPA

State	Publication year	Number of employers	Sectors included	Estimated green jobs	Green jobs (percent of employment)
Arizona	2011	5,234	Private	30,716	1.3%
California	2010	15,185	Private and public	432,840	3.4%
Colorado	2011	7,841	N/A	61,239	2.8%
Delaware	2011	711	Private	16,250	4.2%
Florida	2010	N/A	N/A	42,422	0.6%
Hawai'i	2010	4,008	Private	11,145	2.4%
Idaho	2010	3,904	Private	17,059	3.0%
Illinois*	N/A	20,342	Private and public	115,208	2.1%
Indiana	2011	N/A	Private and public	46,879	1.7%
Iowa	N/A	6,868	Private and public	N/A	4.6%
Kansas	N/A	3,088	Private	46,427	3.4%
Louisiana	2011	5,177	Private and public	30,205	1.6%
Maryland, DC, Virginia	2011	9,892	Private and public	236,000	3.0%
Massachusetts	2013	1,090	Private	79,994	1.9%
Michigan	2009	6,434	Private	109,067	3.4%
Mississippi	N/A	3,181	Private and public	17,360	1.6%
Missouri	N/A	2,537	Private and public	131,103	N/A
Montana	N/A	3,997	Private and public	N/A	4.5%
Nebraska	N/A	5,808	Private and public	30,725	3.3%
New York	N/A	8,000	Private	180,000	N/A
Ohio	N/A	7,623	Private	56,785	1.3%
Oregon	2012	3,577	Public and private	43,148	2.7%
Pennsylvania*	2010	14,619	Public and private	183,029	3.4%
South Carolina	2011	498	Public and private	86,700	4.3%
South Dakota	N/A	3,879	Public and private	N/A	3.8%
Tennessee	2011	N/A	Public and private	43,804	1.5%
Utah	N/A	5,385	Public and private	N/A	1.7%
Washington	2012	14,298	Public and private	120,305	4.3%
Wyoming	N/A	407	Public and private	N/A	5.2%

\*Note that Washington state's LMPA conducted the survey research for these two states under contract.

**Figure A5-2.** Selected studies of the green economy: state reports based on industry statistics  
 United States, 2009 through 2012  
 Source: Employment Security Department/LMPA

State	Publication year	Number of employers	Sectors included	Estimated green jobs	Green jobs (percent of employment)
Connecticut	2012	N/A	Private and public	39,207	N/A
Maine	2010	N/A	Private and public	N/A	N/A
New Hampshire	2009	N/A	Private and public	N/A	N/A
New Jersey	2009	N/A	Private	191,888	N/A
Rhode Island <sup>1</sup>	2010	N/A	Private and public	1,553	0.3%
Rhode Island <sup>2</sup>	2010	N/A	Private and public	64,420	10.7%

<sup>1</sup>Using the Pew Charitable Trusts' green-jobs definition. See "The Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America," The Pew Charitable Trusts, 2009.

<sup>2</sup> Using the O\*NET green-jobs definition. See "Greening of the World of Work: Implications for O\*NET–SOC and New and Emerging Occupations," Erich C. Dierdorff, Jennifer J. Norton, Donald W. Drewes, Christina M. Kroustalis, David Rivkin and Phil Lewis, National Center for O\*NET Development, Raleigh, North Carolina, 2009.

**Figure A5-3.** Selected studies of the green economy: nationwide reports  
 United States, 2009 through 2013  
 Source: Employment Security Department/LMPA

State	Publication year	Number of employers	Sectors included	Estimated green jobs	Green jobs (percent of employment)
Brookings Institution	N/A	N/A	Private	N/A	N/A
U.S. Bureau of Labor Statistics	2013	120,000	Private and public	3,401,279	2.6%
Pew Charitable Trusts	2009	N/A	Private	770,000	0.5%
U.S. Commerce Department	2010	N/A	Private	1,800,000	1.5%

## Appendix 6. Bibliography of green-economy job reports

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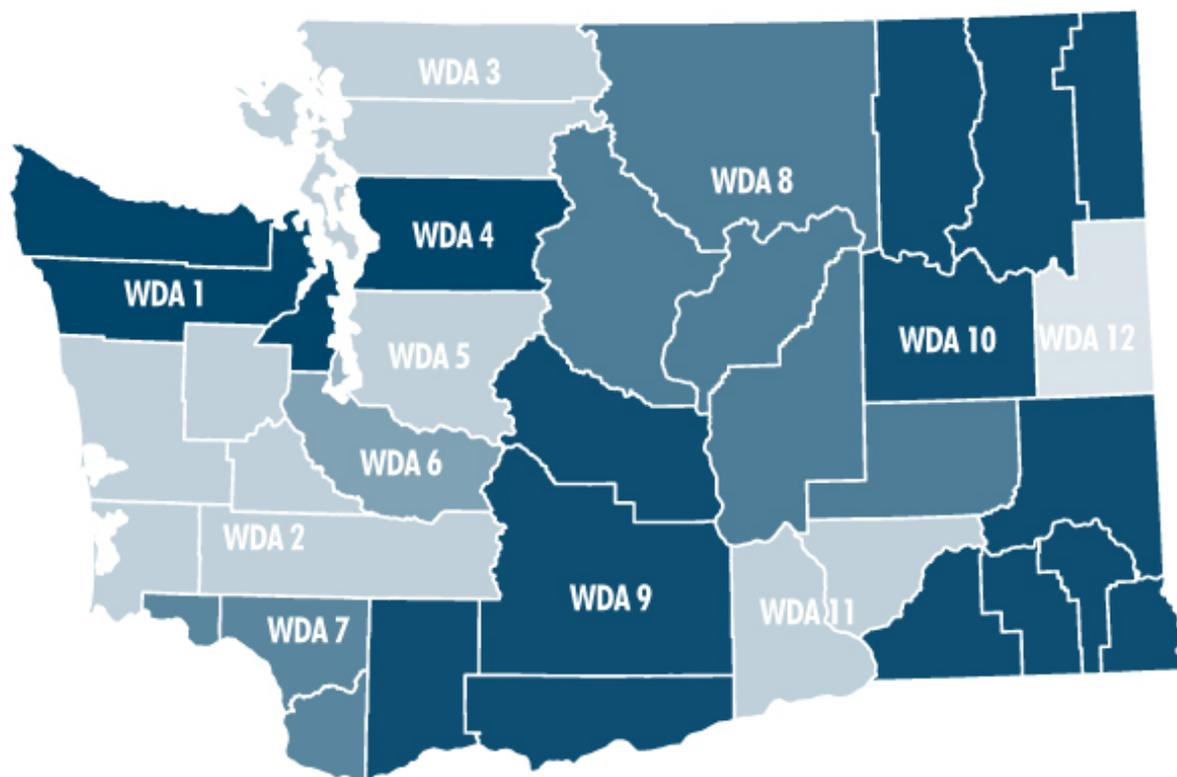
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## Appendix 7. Map of Washington's workforce development areas



WDA 1 – Olympic Consortium: Clallam, Jefferson and Kitsap counties

WDA 2 – Pacific Mountain: Grays Harbor, Lewis, Mason, Pacific and Thurston counties

WDA 3 – Northwest Washington: Island, San Juan, Skagit and Whatcom counties

WDA 4 – Snohomish County

WDA 5 – Seattle-King County

WDA 6 – Pierce County

WDA 7 – Southwest Washington: Clark, Cowlitz and Wahkiakum counties

WDA 8 – North Central Washington/Columbia Basis: Adams, Chelan, Douglas, Grant and Okanogan counties

WDA 9 – South Central: Klickitat, Kittitas, Skamania and Yakima counties

WDA 10 – Eastern Washington: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Orielle, Stevens, Walla Walla and Whitman counties

WDA 11 – Benton-Franklin

WDA 12 – Spokane County