Hawai‘i’s Green Workforce
A Baseline Assessment

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State of Hawai‘i
Department of Labor and Industrial Relations
Research & Statistics Office

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Table of Contents

List of Exhibits

TABLES

FIGURES

BOX ITEMS

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This report is intended for educational and informational purposes. References to specific products, services or companies are for illustrative purposes only, and do not reflect an endorsement by the State of Hawai'i or DLIR.

Unless specified within this report, all data and analysis should be sourced as *"State of Hawai'i, Department of Labor and Industrial Relations, Research & Statistics Office, 'Hawai'i's Green Workforce Report, 2010'"*.

KAUA‘I

460 green jobs
1.9% of county jobs
71 additional green jobs by 2012

O‘AHU

6,866 green jobs
2.0% of county jobs
1,885 additional green jobs by 2012

MAUI

2,597 green jobs
4.6% of county jobs
437 additional green jobs by 2012

HAWAI‘I

1,222 green jobs
2.5% of total jobs
510 additional green jobs by 2012

Executive Summary

This report provides a comprehensive framework for assessing green jobs in the private sector of the State of Hawai‘i. Survey responses, from a stratified random sample of all Hawai‘i businesses, provided data on 4,008 worksites for the first quarter of 2010. This represents a 44 percent overall response rate.

Green jobs are defined as those that engage in at least one of five core green areas: (1) *Generate clean, renewable, sustainable energy*; (2) *Reduce pollution and waste, conserve natural resources, recycle*; (3) *Energy efficiency*; (4) *Education, training and support of a green workforce*; and (5) *Natural, environmentally-friendly production*.

Key findings include:

- **Green jobs in the private sector of Hawai’i are estimated at 11,145, which accounts for 2.4 percent of total private employment.** Green jobs are identified in 203 occupations across 19 major industry groups. Sixty-five percent of Hawai‘i’s green jobs are found in three major industries – *Construction*, *Professional Services*, and *Administrative & Support, Waste Management & Remediation Services*. Five occupations — *Janitors & Cleaners, Forest & Conservation Technicians, Security Guards, Electricians*, and *Heating & Air Conditioning Mechanics & Installers* — account for 28 percent of the green workforce.

- **Current green job vacancies are estimated at 670, which represent 1.5 percent of Hawai‘i’s total unemployment.** Nearly three-quarters of these vacancies occur in three industries – *Construction*, *Agriculture* and *Professional Services*.

- Businesses anticipate green employment to grow faster than the overall labor market in Hawai‘i. **Between 2010 and 2012, employer worksites project the number of green jobs to increase by 26 percent to 14,048, accounting for 2.9 percent of total employment.** Occupations expected to experience the most growth in green jobs during this period are solar and insulation technicians. All counties report an increase in the number of green jobs by 2012, with O‘ahu projecting the largest number (1,885 new green jobs) and Hawai‘i County the highest rate of growth (42 percent).

- **Community colleges and trade schools fulfill 62 percent of the education and training requirements for reported green jobs.** The *Leadership in Energy and Environmental Design (LEED)* certification is the most commonly cited qualification.

- **Businesses report an average of 3.5 green practices per worksite**, with the largest numbers found in Maui and Kaua‘i counties. Recycling, use of recycled products, and energy-saving light bulbs are the most common practices. Over 90 percent of worksites report at least one green practice.

Introduction

Context for the Hawai'i Green Jobs Survey

Hawai'i experiences unique challenges in transitioning from a State that is 90 percent dependent on imported oil to one that meets the *Hawai'i Clean Energy Initiative* (HCEI) vision of being 70 percent reliant on renewable energy by 2030. Promulgated in June 2009, the HCEI aims to bring together business leaders, policy makers and a civil society committed to leading Hawai'i to energy independence. The HCEI focuses on two primary objectives to meet this aggressive energy independence goal:

Conserve: Use What We Need Efficiently

- Commit to a more energy-efficient lifestyle in our homes and on the road.
- Establish energy-efficient building codes and lower energy use at work and in our schools.

Convert: Harness What We Have Wisely

- Stop building fossil fuel plants.
- Generate 40 percent of energy locally by 2030.
- Harness energy from solar, wind, ocean, geothermal, and biomass resources.
- Establish a sustainable alternative-fuel strategy.
- Modernize the power-grid system.[1]

The Department of Labor and Industrial Relations (DLIR) has actively sought to become a more effective partner in this endeavor. Recognizing the rapidly evolving needs of the clean energy sector and the limitations of existing labor market information (LMI), Hawai'i was one of several states selected by the US Department of Labor's Employment & Training Administration to receive an LMI Improvement Grant funded through the *American Recovery and Reinvestment Act* (ARRA). It is this funding that made possible the data collection and subsequent assessment of the inaugural *Hawai'i Green Jobs Survey* ("Survey").

Photo courtesy of Tom Burke

To support the State's efforts to help build a workforce with the skills necessary to compete for green jobs, the DLIR conducted a statistical survey of Hawai'i businesses over a two-month period, May to July 2010. The purpose of this Survey was three-fold, to: (1) estimate the number of jobs that significantly contribute to environmental protection or preservation; (2) identify the occupations involved with the emerging green economy; and (3) identify the training needs of a green workforce. Businesses were also asked to provide information on their green practices, irrespective of whether or not green jobs were reported.

This Survey addresses three programmatic areas: (1) collection of data necessary to guide the planning of training programs for the short-term skills needed for emerging green industries; (2) development of LMI tools and enhancements that facilitate the reemployment of an increasing number of displaced workers; and (3) assistance to clean energy stakeholders to understand the capacity of the State's LMI system and its central role in building a skilled work force.

To develop a more comprehensive picture of the greening economy and workforce, we employed

[1] www.HawaiiCleanEnergyInitiative.org

a survey that was supplemented with analysis of LMI and other resources. This initiative relies on the support and feedback of a Green Workforce Intelligence Network (GWIN), a collaborative and expandable consortium of government, industry and education representatives, which builds upon the statewide Energy Sector Work Group for Workforce Development. Given Hawai'i 's unique isolation from other energy and grid systems, labor markets, and education and workforce development systems, the GWIN steering committee consulted regularly with counterparties in other states and regions regarding issues, best practices and innovations in workforce development and LMI. Throughout the implementation phase of the Survey, an industry and LMI user-driven improvement process has been a strategic consideration.

While a general understanding of what is meant by "green jobs" and a "green workforce" permeates various discussion forums, there is no widely accepted standard definition. To address this deficiency, the Survey provides parameters defining occupations and economic activities that qualify for inclusion. This working definition formed an objective basis for measuring the current number of green jobs, the qualifications and training necessary to compete for these positions, the green practices employers have adopted, and the trends that are shaping the industry. Responses from all businesses were later vetted by a staff panel with a voting procedure to ensure overall compliance. While no approach is absolute, adherence to a well-defined and consistent definition is needed for a more transparent interpretation of the data.

Survey data form the basis of the baseline estimation presented in this report. From a functional perspective, the DLIR will use this as a benchmark in two related areas, to: (1) project future employment in green jobs at the 2, 5 and 10-year horizons; and (2) form a skills-gap assessment[2] focusing on training capacity and demographic characteristics, including the skills of existing and potential green workers. The baseline generated from this analysis will also underscore future data collection and labor market research that track green jobs and their respective industries. Policy makers, business leaders and the public can utilize this "green" intelligence to help guide their strategic decision-making in areas such as investment, education and workforce development.

Practical applications from this baseline assessment are broad and far-reaching. Career counselors and other service providers rely on industry and occupation-based data to meet the needs of different clients, from displaced engineers who require training in green applications to lower-skilled job-seekers who require basic training to obtain entry-level jobs in the green sector. Information on green jobs and the requisite skills companies seek when filling them can also be used by leaders in the field of education to better identify relevant degrees, certifications and training programs. Universities, community colleges, and trade and vocational schools are important partners in bridging job-seekers and employers with innovative programs and curricula that address the needs of a rapidly evolving green economy. Within this context, the private sector becomes a vested stakeholder by providing the demand for a pool of skilled workers to grow its businesses. The education sector, in turn, generates revenue from expanded services (Figure 1). Such symbiosis spurs activity and innovation in the broader economy.

Ultimately, the *Hawai'i Green Jobs Survey* aims to lay the foundation upon which future initiatives can be built. Rather than being a terminus, it is the starting point from which the State of Hawai'i can structure future endeavors that facilitate the expansion of green industries across the islands.

Figure 1. Green Labor Life Cycle

[2] A skills-gap assessment seeks to address the disparity between a worker's current skills and those required to fill a green job through education and vocational training.

Methodology

Defining Green Jobs

There is no standard definition of what constitutes a "green" job. At the national level, the US Bureau of Labor Statistics (BLS) recently released what it considers to be a final definition of green jobs based upon public comments solicited during a six-month period, March to September 2010. According to this definition, "green jobs are either: (1) jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources, or (2) jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources."[3] The BLS will apply this definition for data collection beginning in FY 2011.

Meanwhile, many states have already completed or are currently undertaking surveys to measure green jobs and related economic activity. Policy direction and objectives specific to each state ultimately determine the scope of what is considered green, but the Workforce Information Council (WIC), a consortium of state and federal statistical agencies, has proposed its own working definition: "A green job is one in which the *work is essential* to products or services that improve energy efficiency, expand the use of renewable energy, or support environmental sustainability."[4]

In designing this survey and conducting its analyses, the DLIR sought a definition that was neither overly specific to be exclusionary nor so broad as to make it not useful. Given the nascence in data collection related to this area of the economy, and a recognition that an understanding of green jobs is in many ways shaped by the results of an initial assessment, we chose to supplement a broad definition with a vetting procedure. This approach provided a framework for the design of a robust scientific survey instrument and sampling procedure.

Photo Courtesy of 21st Century Technologies Hawai'i

We define five core areas as green:

- **G**enerate clean, renewable, sustainable energy
- **R**educe pollution and waste; conserve natural resources; recycle
- **E**nergy efficiency
- **E**ducational, training and support of a green workforce
- **N**atural, environmental-friendly production

For the purposes of this report, we consider a **green job** to be one that engages in economic activity that makes a positive impact on the environment or energy sustainability, either on a full- or part-time basis.

- *Generate Clean, Renewable, Sustainable Energy* refers to jobs in research, development, production, storage and distribution, and maintenance of energy (electricity and fuel) from renewable resources such as solar, wind, hydro, geothermal, ocean, and biofuels. Clean energy must have a positive net energy yield, relatively reduce greenhouse gas emissions, and be produced and distributed in a sustainable and safe manner.

[3] *Federal Register*, Vol. 75, No. 182.
[4] Workforce Information Council Green Jobs Study Group, *Final Report*, October 2009.

- *Reduce Pollution and Waste* refers to the prevention and control of commercial, transportation and industrial emissions and pollution; environmental cleanup; water treatment; and waste product management and treatment. *Conserve natural resources* refers to managing water and other finite resources more effectively. This includes land management, sustainable forestry and wildlife conservation. *Recycling* refers to re-use of materials in the production process. This area includes companies that collect aluminum, paper, glass, and other recyclable materials.

- *Energy Efficiency* refers to reducing the amount of energy used to produce a unit of output. These jobs refer to the production, construction and installation of energy-efficient products, such as Energy Star appliances and more efficient lighting. This category also includes jobs related to bicycles and public transportation, and energy-efficiency services such as retrofitting and weatherization of buildings.

- *Education, Training and Support of Green Workforce* refers to the provision of services to the other four green areas. This category includes activities to increase public awareness of environmental issues, activities to develop and enforce environmental regulations, and the provision of training in green technologies and practices to develop Hawai‘i’s green workforce.

- *Natural, Sustainable, Environmentally-Friendly Production* refers to practices that reduce the environmental impact resulting from the production of any good or service. Included are alternative methods for production, and products that require less energy, emit fewer greenhouse gases or otherwise reduce impact on the environment. Examples are net-zero energy buildings that use solar panels or photovoltaic cells, and businesses that generate energy from recycling waste created during a manufacturing process.

Support staff positions are included as green jobs only when a business is 100 percent green. When a job containing green responsibilities is performed on a part-time basis, it is considered green whenever that responsibility occurs on a *recurring* basis. This recognizes that many green functions may be of a secondary or tertiary nature.

Broadly considered, a distinction is made between jobs that are simply performed outdoors or with nature and those that significantly contribute to environmental protection or preservation. For example, professions such as groundskeepers, landscapers and tree trimmers are considered green only if a portion of their *regular* responsibilities is ostensibly green, such as composting. Lawn maintenance and soil tilling alone would not suffice. Alternatively, a pest-control technician who provides a green alternative using organic or bio-friendly chemicals would be considered green.

Other examples of green jobs include: (1) in *manufacturing*, a chemist who produces environmentally-sound packaging, equipment and cleaning products that are less caustic than traditional products; (2) in *construction*, a worker who produces or installs green building materials such as alternative cement and manufactured wood products made from scraps, or a consultant who provides green building design and construction services; (3) in *agriculture*, a technician who installs smart irrigation systems, a farmer who uses organic and sustainable methods, or a biologist who researches alternative pest control methods; and (4) in *materials*, a product designer or engineer who develops biodegradable products, or a chemical engineer who researches a new chemical catalyst to decompose waste and reduce toxins naturally.

Green practices are not equivalent to green jobs. While green practice data was collected in the Survey, it is reported separately and includes responses from all worksites, regardless of whether a green job is reported.

For example, worksites that use recycled toner cartridges and paper, or food service establishments that recycle cans and bottles, are practitioners of green practices but do not fit the definition of green jobs unless they fulfill one of the five core areas noted above. Moreover, if an economic activity is known to be environmentally harmful, then any job associated directly with it would not be classified as green.

Statistical Sampling

The data presented here is based on a survey conducted from May to July 2010 of a stratified random sample of 9,146 worksites drawn from the *Quarterly Census of Employment and Wages* (QCEW) database. The QCEW contains data on approximately 37,674 private Hawai'i worksites that report to the State's Unemployment Insurance Division.

To ensure a representative sample, the State Department of Labor and Industrial Relations (DLIR) mailed the survey to a stratified random sample of the QCEW, including all four counties – Honolulu (O'ahu), Hawai'i, Maui, and Kaua'i. O'ahu accounts for about two-thirds of all QCEW worksites, so the first level of stratification was by county (Figure 2).

Within each county, a cross-section of employers was randomly selected such that small (1-9 employees), medium (10-49 employees) and large worksites (50 or more employees) would be represented. In order to obtain complete data on worksites with potentially very large numbers of green employees, all large worksites were sampled. This decreased the variance in our random sample of small and medium-sized worksites, thus increasing the power of the sample.

The sample was further stratified to reflect a cross-section of industries, including traditional industries and those thought likely to have a large representation of green jobs. All 19 private sectors in the *North American Industry Classification System* (NAICS, see inset) were randomly sampled. Public Administration (NAICS 92) was not sampled, but we plan to include the public sector in the future.

What is the NAICS?

The *North American Industry Classification System* (NAICS) is a system for classifying establishments by type of economic activity for statistical purposes. Its purposes are: (1) to facilitate the collection, tabulation, presentation, and analysis of data relating to establishments, and (2) to promote uniformity and comparability in the presentation and analysis of statistical data describing the economy.

NAICS is used by federal statistical agencies that collect or publish data by industry. It is also widely used by State agencies, trade associations, private businesses, and other organizations. At the heart of NAICS is a production-based concept of classification; that is, NAICS classifies each establishment into a detailed industry based in the production processes it uses. The NAICS system provides five levels of classification on detailed codes that have a maximum of six digits. The classification levels are Sector, Subsector, Industry Group, NAICS Industry, and U.S. Industry.

This report focuses on data analysis at the Sector (2-digit NAICS) level. Including Government (which is not included herein), there are 20 Sectors in NAICS.

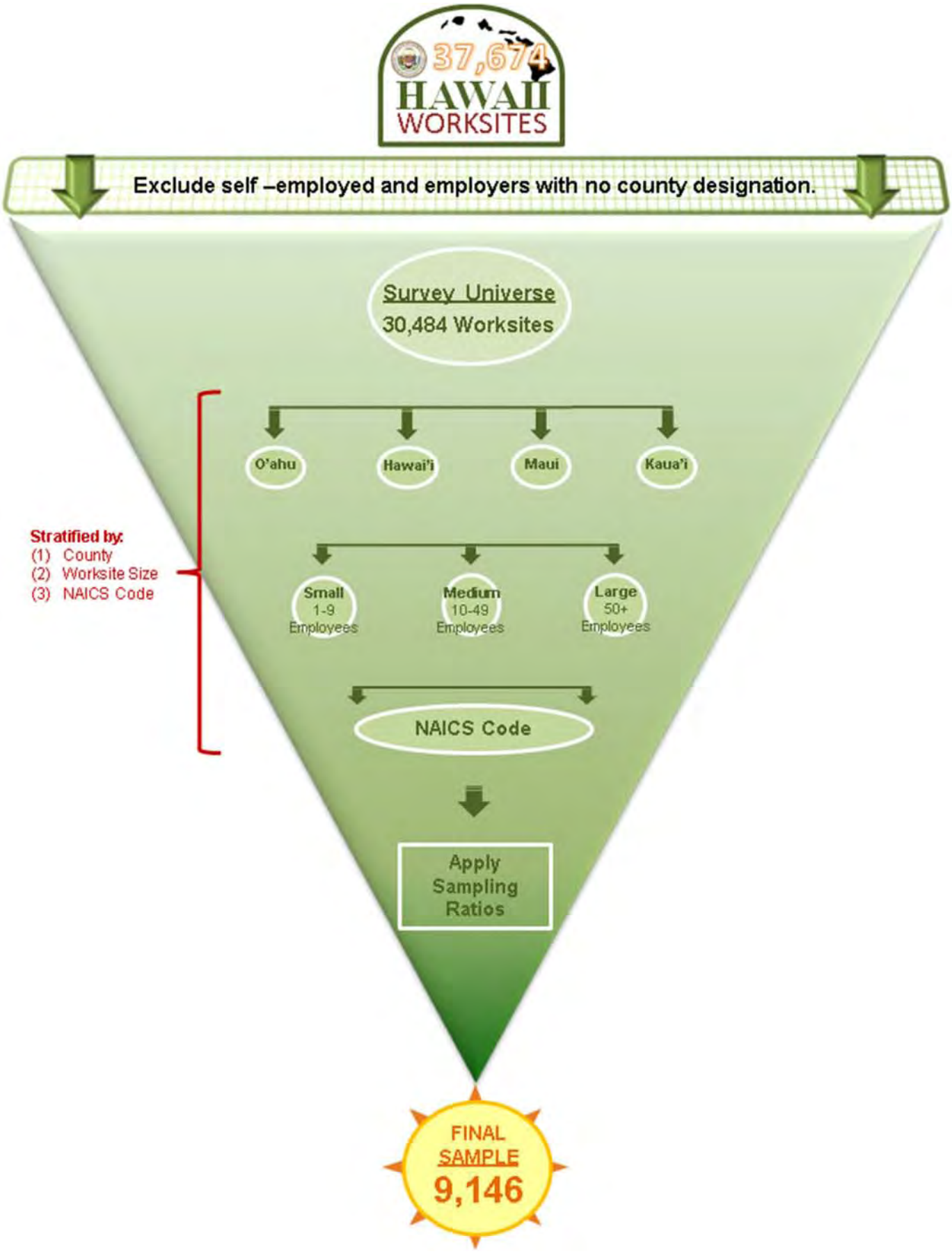
Source: U.S. Office of Management and Budget, Executive Office of the President.

Survey Response and Estimation

Businesses could respond to the survey via internet, mail, fax, or telephone within a ten-day period of the deadline. (Businesses that mailed responses prior to a ten-day grace period following the deadline are referred to as Wave 1). Based on this criterion, 2,285 surveys were received, yielding an initial response rate of 25 percent. An aggressive follow-up strategy was pursued with non-responders, which yielded an additional 1,723 responses (Wave 2). This brought the total survey response to 4,008 of the original 9,146 sampled worksites, or a final response rate of 43.8 percent.

Upon examination of the data, non-response bias was detected between Wave 1 and Wave 2 responders. To address this bias, a logistic regression was used to estimate propensity scores for prediction of likely responders and non-responders within the unsampled data. In the final estimation procedure, Wave 1 sample weights were increased to estimate the number of green jobs for likely responders, and likewise, the weight of Wave 2 sample data was increased to estimate the number of green jobs for likely non-responders. This method yields an unbiased estimate of total green jobs.

Figure 2. Statistical Sampling Methodology



Current Green Jobs

Green Jobs by Core Areas

There are an estimated 11,145 green jobs in Hawaii for the first quarter of 2010, composing 2.4 percent of total private sector employment.

Green jobs are classified into five core areas. These areas are defined based on how a particular green job best makes a positive impact on the environment or energy sustainability. Table 1 shows the number of green jobs estimated for each of these core areas with respect to geographic location.

Table 1. Green Jobs by Core Area and County

County	Green Jobs by Core Area					Total*
	Generate Energy	Reduce Pollution	Energy Efficiency	Education and Support	Natural Production	
O'ahu	806	3,419	1,677	472	492	**6,866**
Hawai'i	265	437	215	96	209	**1,222**
Maui	129	349	620	118	1,383	**2,597**
Kaua'i	64	199	40	28	129	**460**
STATE	**1,264**	**4,403**	**2,552**	**713**	**2,213**	**11,145**

*Column may not sum due to rounding.

Photo Courtesy of Kaua'i County Recycling

At the state level of aggregation, the largest core area of green employment is *Reduce Pollution & Waste; Conserve Natural Resources; Recycle*. Forty percent

Table 2. Green Jobs by Core Area and Industry

Industry	Green Jobs by Core Area										Total
	Generate Energy	%*	Reduce Pollution	%	Energy Efficiency	%	Education and Support	%	Natural Production	%	
Accommodation and Food Services	7	4%	115	66%	35	20%	4	2%	12	7%	**174**
Administrative & Support & Waste Mgmt & Remediation Services	104	3%	1,433	48%	16	1%	94	3%	1,332	45%	**2,979**
Agriculture, Forestry, Fishing, & Hunting	12	4%	27	10%	8	3%	57	21%	173	62%	**278**
Arts, Entertainment, and Recreation	4	2%	112	65%	15	9%	34	20%	8	4%	**173**
Construction	859	26%	848	25%	1,281	38%	31	1%	308	9%	**3,327**
Educational Services	1	1%	72	58%	1	1%	49	40%	1	1%	**124**
Finance and Insurance	0	NA	0	NA	0	NA	0	NA	0	NA	**0**
Health Care and Social Assistance	0	0%	93	51%	0	0%	17	9%	73	40%	**183**
Information	0	2%	0	2%	0	2%	0	2%	6	93%	**7**
Management of Companies & Enterprises	0	NA	0	NA	0	NA	0	NA	0	NA	**0**
Manufacturing	40	12%	139	40%	52	15%	14	4%	101	29%	**346**
Mining	0	1%	3	95%	0	1%	0	1%	0	1%	**3**
Other Services	54	9%	246	39%	121	19%	196	31%	9	1%	**626**
Professional, Scientific, & Technical Services	44	5%	123	13%	554	59%	166	18%	58	6%	**945**
Real Estate and Rental and Leasing	0	0%	0	0%	56	57%	0	0%	41	42%	**98**
Retail Trade	29	4%	522	76%	52	8%	14	2%	67	10%	**685**
Transportation and Warehousing	0	0%	139	80%	35	20%	0	0%	0	0%	**175**
Utilities	108	51%	61	29%	31	15%	9	4%	5	2%	**214**
Wholesale Trade	0	0%	470	58%	293	36%	26	3%	19	2%	**809**
Total:	**1,264**		**4,403**		**2,552**		**713**		**2,213**		**11,145**

* Percentages in this table indicate green jobs as a share of industry totals.

of green jobs in the State are associated with this type of green activity. The second leading core area is *Energy Efficiency*, with 23 percent of green jobs. The next largest areas are *Natural Environmentally-Friendly Production* with approximately one in five green jobs, *Generate Clean, Renewable, Sustainable Energy* with 11 percent of green jobs, and *Education, Training, and Support of a Green Workforce*, which accounts for only about 7 percent of green jobs.

At the county level, *Reducing Pollution, Conservation, and Recycling* is the leading category for O‘ahu (50 percent), Kaua‘i (43 percent) and Hawai‘i (36 percent), while in Maui, *Natural Environmentally-Friendly Production* accounts for 53 percent of all green jobs.

Most green jobs in medium and large worksites are in the *Reducing Pollution* category, at 44 percent and 43 percent, respectively. Meanwhile, the core area of *Energy Efficiency* accounted for one-third of green jobs reported by small worksites, followed by *Reduce Pollution* at 28 percent (Figure 3).

The largest number of green jobs is in the *Reduce Pollution* core area (Table 2), but there are a few notable exceptions in certain industries. In *Agriculture*, 62 percent of green jobs are categorized in the *Natural Production* area, while in the *Utilities* sector, 51 percent are in *Generate Energy* and 29 percent are in *Reduce Pollution*. *Energy Efficiency* is the leading core area for *Professional, Scientific and Technical Services* (59 percent) and *Construction* employment (38 percent).

Green Jobs by County

Based on survey data, green jobs represent 2.4 percent of total employment in the State of Hawai‘i. With the exception of Maui, the share of total jobs reported as green by each county did not differ markedly from the

Table 3. Green Jobs by County

County	Green Jobs	Percent of Total Green Jobs	Total Jobs	Green to Total Jobs
O'ahu	6,866	62%	336,122	2.0%
Hawai'i	1,222	11%	49,749	2.5%
Maui	2,597	23%	56,184	4.6%
Kaua'i	460	4%	23,780	1.9%
Total:	**11,145**		**465,835**	**2.4%**

Figure 3. Green Jobs by Core Area and Worksite Size

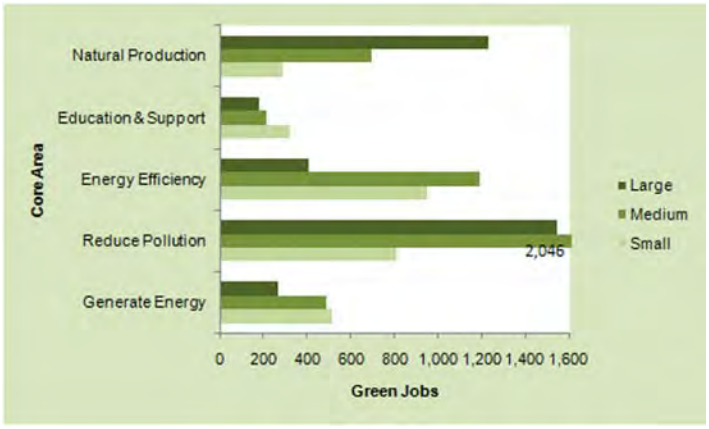


Figure 4. Total Employment by County

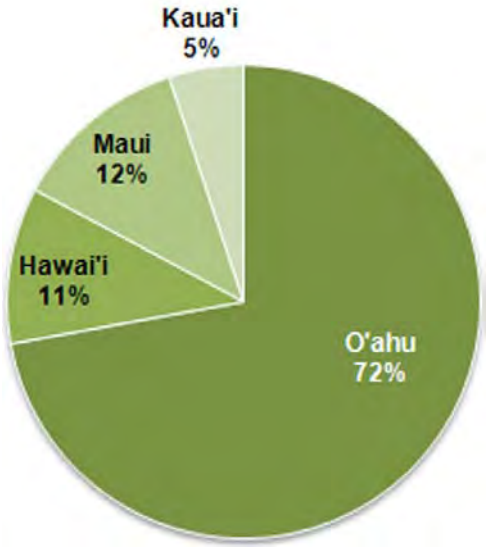


Figure 5. Green Jobs by County

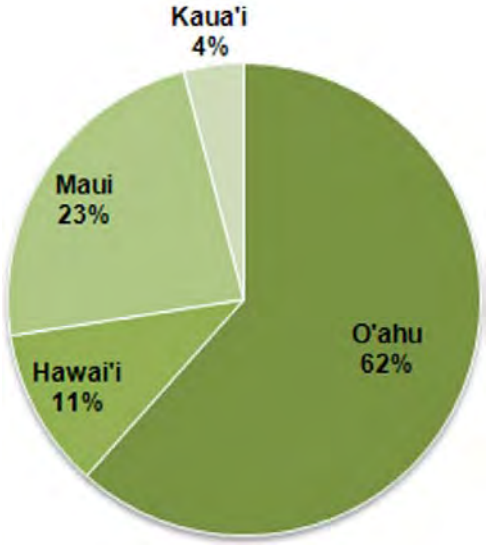


Table 4. Green Jobs by Industry and County

Industry	State		County			
	Green Jobs*	Total Jobs	O'ahu	Hawai'i	Maui	Kaua'i
Construction	3,327	29,307	2,246	488	516	77
Administrative & Support & Waste Mgmt & Remediation Services	2,979	40,132	1,528	70	1,219	161
Professional, Scientific, & Technical Services	945	24,358	780	46	107	12
Wholesale Trade	809	17,572	609	158	26	15
Retail Trade	685	67,313	527	37	115	6
Other Services	626	24,201	443	58	89	36
Manufacturing	347	13,498	209	22	106	10
Agriculture, Forestry, Fishing, & Hunting	278	6,482	30	183	50	14
Utilities	214	3,210	120	15	61	18
Health Care and Social Assistance	183	59,895	101	0	82	0
Transportation and Warehousing	175	23,101	175	0	0	0
Accommodation and Food Services	174	88,978	36	67	48	23
Arts, Entertainment, and Recreation	173	10,532	36	0	49	87
Educational Services	124	13,758	15	77	31	1
Real Estate and Rental and Leasing	98	11,461	5	1	91	0
Information	7	8,859	0	0	6	0
Mining	3	346	3	0	0	0
Finance and Insurance	0	16,015	0	0	0	0
Management of Companies & Enterprises	0	6,816	0	0	0	0
Total:	**11,145**	**465,835**	**6,866**	**1,222**	**2,597**	**460**

*Column may not sum to due to rounding.

Table 5. Top Industries for Green Jobs

Industry	Green Jobs	% of Total Green Jobs	Total Jobs	% Green to Total Jobs
Construction	3,327	30%	29,307	11%
Administrative & Support & Waste Mgmt & Remediation Services	2,979	27%	40,132	7%
Professional, Scientific, & Technical Services	945	8%	24,358	4%
Wholesale Trade	809	7%	17,572	5%
Retail Trade	685	6%	67,313	1%

statewide figure (Table 3). While the share of green jobs in other counties is within the range of 1.9 percent to 2.5 percent, Maui reported an outsized 4.6 percent. Maui accounts for 12 percent of the State's total employment, yet its green jobs comprise 23 percent of the State's total. Meanwhile, Kaua'i and Hawai'i counties' share of total and green jobs relative to the State are comparable. In Kaua'i, this equates to four percent of green and five percent of total jobs in the State. Hawai'i County has 11 percent for both green and total jobs. In contrast, O'ahu supports 62 percent of the State's green jobs, against a 72 percent share of total employment (Figure 4 and Figure 5). Kaua'i's green jobs as a share of total jobs are the smallest at 1.9 percent.

Green Jobs by Industry

Construction is the fifth-largest private-industry sector as of the fourth quarter of 2009. Not coincidentally, *Construction* has the largest number of green jobs at 3,327, or 30 percent of the State's total green jobs (Table 4 and Table 5). Green jobs represent 11 percent of that industry's total employment. *Construction* led in O'ahu and Hawai'i, reporting 2,246 and 488 green jobs, respectively (Table 4). Over one of every eight *Construction* jobs in Hawai'i County is green.

The next largest industries with green jobs are in *Administrative & Support & Waste Management & Remediation Services (ASWMRS)*; *Professional, Scientific, & Technical Services*; *Wholesale Trade*; and *Retail Trade*. Seventy-percent of all green jobs are concentrated within these five industries. While O'ahu County reported the largest number of green

Table 6. Top Industries for Green Jobs by County

Industry	Green Jobs	% of Total Green Jobs	County Total Jobs	% Green to County Jobs
O'ahu				
Construction	2,246	33%	21,382	11%
Administrative & Support & Waste Mgmt & Remediation Services	1,528	22%	31,010	5%
Professional, Scientific, & Technical Services	780	11%	20,817	4%
Hawai'i				
Construction	488	40%	3,444	14%
Agriculture, Forestry, Fishing, & Hunting	183	15%	2,329	8%
Wholesale Trade	158	13%	1,570	10%
Maui				
Administrative & Support & Waste Mgmt & Remediation Services	1,219	47%	4,411	28%
Construction	516	20%	3,009	17%
Manufacturing	115	4%	1,070	11%
Kaua'i				
Administrative & Support & Waste Mgmt & Remediation Services	161	35%	1,843	9%
Arts, Entertainment, and Recreation	87	19%	933	9%
Construction	77	17%	1,472	5%

Table 7. Green Jobs by Worksite Size

Worksite Size	Green Jobs	% of Total Green Jobs	Total Jobs	% Green to Total Jobs
Small	2,881	26%	77,175	3.7%
Medium	4,634	42%	143,138	3.2%
Large	3,630	33%	245,522	1.5%
Total:	**11,145**		**465,835**	

jobs in *ASWMRS*, Maui holds a disproportionately larger share of its green work force in this industry (Table 4).

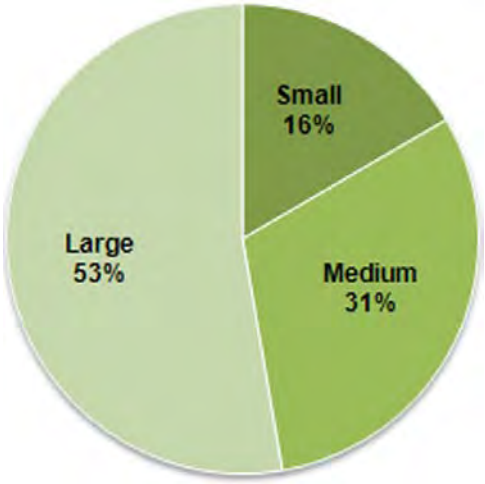
Given O'ahu's large number of technical and research institutions, a disproportionate share of its green jobs are in the *Professional, Scientific & Technical Services* industry, at 11 percent versus eight percent for the State (Table 6).

In contrast to other counties, Maui has most of its green jobs in the *Administrative and Support and Waste Management and Remediation Services* sector. This sector includes 1,219 green jobs (Table 6), which makes 28 percent of the total sector in Maui green. Maui worksites reported the greatest number of green jobs in this sector as: *Janitors and Cleaners, Landscaping and Groundskeeping Workers, Recycling and Reclamation Workers, Pest Control Workers, Commercial Divers, Sales Representatatives, Ship and Boat Captains, Environmental Science and Protection Technicians, Energy Engineers*, and *Retail Salespersons*.

Relative to other counties, Hawai'i County has a large number of green jobs in *Agriculture, Forestry, Fishing, & Hunting*. In this industry, the county is estimated to have 183 green jobs, which accounts for 15 percent of its green workforce and eight percent of its total employment (Table 6).

Despite reporting fewer green jobs overall, Kaua'i supports a relatively significant number in *Arts, Entertainment and Recreation* when compared to other counties and the State. Kaua'i reports over 87 green jobs in this industry, which represents 19 percent of its green workforce and approximately 9 percent of the sector's total employment within the county (Table 6).

Figure 6. Total Employment by Worksite Size



Green Jobs by Worksite Size

To report at the county level, it was necessary that the Survey query businesses based on the actual location of its employees whenever possible. Worksites were categorized as *small* (1-9 employees), *medium* (10-49 employees) or *large* (50+ employees).

Large employer worksites comprise over half of total employment, yet only one-third of green jobs are at the biggest employers (Table 7). In contrast, medium-size worksites have the greatest number and share of total green jobs at 42 percent. Both medium and small worksites report a greater share of green jobs relative to total employment despite a less prominent role in the overall labor market (Figure 6). According to Survey estimates, 3.2 percent of total employment at medium and 3.7 percent of total employment at small worksites is green compared to just 1.5 percent at large worksites (Table 7).

Green Jobs by Occupation

Survey data estimate 11,145 green jobs in the State of Hawai'i. These jobs are distributed across 203 occupations and classified under the *Standard Occupational Classification* (see inset).

The SOC system reflects 23 major groups[5]. In the

[5] US Office of Management & Budget, *Standard Occupational Classification Manual 2010*.

Hawai'i Green Jobs Survey, green jobs were found to be represented in all but one group, *Military Specific Occupations*. We identify job titles with fifty or more reported green jobs, and the top five major occupational groups (Table 8 and Table 9). *Construction and Extraction* reports the largest number of green jobs, which at 2,690 jobs is 61 percent larger than that of the second largest sector, *Building and Grounds Cleaning and Maintenance*. As reflected in the job titles associated with these occupational groups, many are skilled trades such as electricians, heating and air conditioner mechanics, and forest and conservation technicians. Some of these are quite new to the labor market, such as *Sustainability Specialists*. The *Sales and Related* category features jobs that facilitate the sales and distribution of green products and services.
The depth and breadth of green jobs is thought-provoking. While there are occupations such as solar photovoltaic installers, recycling and reclamation workers, environmental science and protection technicians, and hazardous materials removal workers that are tasked with predominantly green responsibilities, others are far less so. Occupations that are green on occasion include architects, electricians and plumbers.

Based on our working definition, a green job does not require its primary function or responsibility to be green. In many cases, the provisioning of a green good or service can be limited to a more secondary or tertiary role. Moreover, these jobs appear throughout the economy in occupations that are not routinely associated with green activity, such as with *janitors* and *security guards* (see inset article). Our survey data indicates that there are very few jobs dedicated entirely to environmental preservation or energy sustainability.

While the SOC provides a useful conceptual framework for categorizing the assortment of reported job titles, it may limit the identification of new or emerging green occupations. Based on a multi-stage screening process, however, no new job titles were identified among survey responses. Furthermore, there did not appear to be an overt inclination for businesses to over-report green jobs; any potential overestimation was minimized with follow-up interviews.

Wage data were beyond the scope of this survey, but for informational purposes these are reported by major SOC occupational group based on the *Occupational Employment Survey* (Table 8). To identify more promising job opportunities, growth projections are also provided on this basis.

What is the SOC?

The *Standard Occupational Classification* (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating or disseminating data. All workers are classified into one of 840 detailed occupations according to their occupational definition.

To facilitate classification, detailed occupations are combined to form 461 broad occupations, 97 minor groups and 23 major groups. Detailed occupations in the SOC with similar job duties, and in some cases skills, education and/or training, are grouped together.

This report focuses on data analysis at the detailed occupational level, although some data at the major group level will be reported as well.

Source: U.S. Office of Management and Budget, Executive Office of the President.

The Depth and Breadth of Green Jobs:
Janitors, Cleaners and Security Guards

Hawai‘i’s unique combination of industries, natural assets and environmentally-aware population leads to some surprising conclusions with regard to the large number of janitors, cleaners and security guards considered “green”. Job title descriptions submitted by businesses to the *Hawai‘i Green Jobs Survey* provide evidence of an emerging industry of janitors, cleaners and security guards that are making a significant contribution to green practices and employment in the State of Hawai‘i. The SOC occupational groups of *Janitors & Cleaners* and *Security Guards* are among the Survey’s top-five green occupations when measured in total numbers (Table 8).

While tourism is not classified as a NAICS industry, this broad services-based sector spans several major industry groups which collectively employ a large number of local workers. According to our research, a growing number of cleaning providers have incorporated eco-friendly products as a significant feature of their services. This has been coupled with the provisioning of extensive employee training and certification in areas such as water conservation, recycling and proper waste disposal. Given the principal and recurring nature of these responsibilities in such cases, this report treats these two occupations – janitors and cleaners – as green jobs and lists them under the core green area of *Natural, Sustainable and Environmentally-Friendly Production.* Based on survey data, of the estimated 13,250 janitors and cleaners in Hawai‘i, nine percent undergo special green training. These credentials are actively marketed by both employers and employees.

While the majority of security guards are tasked with protecting real estate, capital assets and public safety, an increasing number are also responsible for pollution deterrence, environmental regulation enforcement and the safeguarding of hazardous materials from the general public. As a result, select positions within the Security Guard occupational group can be categorized under the core green area of *Reduce Pollution and Waste; Conserve Our Natural Resources; Recycle*. Based on this definition, survey data estimate that 5.4 percent of the 10,250 security guards in Hawai‘i are green.

One respondent to the Survey, a security company, notes clients with special “green” requirements. For example, a landfill hires security guards to monitor the quantity of dust pollution, and notify management when mitigation measures are required. This landfill also requires that the security guards check truck compliance with solid waste rules, such as regulations against dumping hazardous materials. Furthermore, the security guards limit the number of trucks so that the facility does not exceed its capacity. Other examples are piers and shippers. Security guards at these sites report to facility safety officers, following established protocols to monitor the water and containers for toxic spills and broken safety equipment that could lead to spills. The security guards also check hazardous materials documentation on the piers, which includes individual safety papers and the correct placarding of containers. In the event of a spill or other accident, these workers are responsible for cooperating with the coast guard to quickly staunch the flow and mitigate damages. According to a representative of this company, “I think green security guards will only increase, because people really care about that stuff now.”

Table 8. Top Green Occupations and Related SOC Characteristics

Occupations	Green Jobs	All Jobs			
		2009*	2011*	Growth Rate*	Avg. Annual Salary**
Janitors and Cleaners Except Maids and Housekeeping Cleaners	1,197	13,250	13,320	0.5%	$25,904
Forest and Conservation Technicians	601	560	560	0.0%	$37,960
Security Guards	552	10,250	10,530	2.7%	$26,241
Electricians	438	2,900	2,810	-3.1%	$65,742
Heating and Air Conditioning Mechanics and Installers	348	800	800	0.0%	$51,727
Construction Carpenters	306	8,630	8,230	-4.6%	$64,052
Insulation Workers Floor Ceiling and Wall	277	NA	NA	NA	NA
Landscaping and Groundskeeping Workers	276	9,520	9,680	1.7%	$30,214
Solar Photovoltaic Installers	237	NA	NA	NA	NA
Retail Salespersons	219	23,890	24,220	1.4%	$25,925
Environmental Science and Protection Technicians Including Health	196	180	180	0.0%	$43,198
Recycling and Reclamation Workers	194	NA	NA	NA	NA
Solar Thermal Installers and Technicians	194	NA	NA	NA	NA
Laborers and Freight Stock and Material Movers Hand	191	8,390	8,260	-1.5%	$31,034
Insulation Workers Mechanical	184	NA	NA	NA	NA
Construction Laborers	173	5,410	5,240	-3.1%	$49,402
First-Line Supervisors/Mgrs of Construction Trades and Extraction Workers	167	2,410	2,320	-3.7%	$74,040
Plumbers	167	2,790	2,720	-2.5%	$54,728
Hazardous Materials Removal Workers	160	290	290	0.0%	$41,053
Maintenance and Repair Workers General	159	6,410	6,570	2.5%	$40,078
Civil Engineers	152	1,910	1,890	-1.0%	$76,639
Electrical Engineers	140	630	640	1.6%	$83,734
Sales Representatives Services All Other	126	2,910	2,920	0.3%	$55,019
Public Relations Specialists	121	1,400	1,440	2.9%	$54,161
Truck Drivers Heavy and Tractor-Trailer	121	3,870	3,860	-0.3%	$41,118
Inspectors Testers Sorters Samplers and Weighers	117	570	560	-1.8%	$33,813
Environmental Scientists and Specialists Including Health	114	810	820	1.2%	$66,561
Installation Maintenance and Repair Workers All Other	114	1,140	1,160	1.8%	$52,068
Farmworkers and Laborers Crop	106	NA	NA	NA	$25,877
Cashiers	103	14,430	14,680	1.7%	$21,568
First-Line Supervisors/Mgrs of Landscaping Lawn Service and Groundskeeping Workers	103	1,430	1,450	1.4%	$50,023
Automotive Specialty Technicians	95	NA	NA	NA	NA
First-Line Supervisors/Managers of Retail Sales Workers	89	8,880	8,970	1.0%	$40,550
Forest and Conservation Workers	82	NA	NA	NA	$34,286
Sales Representatives Wholesale and Manufacturing Technical and Scientific Products	80	560	550	-1.8%	$54,275
Graders and Sorters Agricultural Products	79	NA	NA	NA	NA
Computer Support Specialists	76	1,270	1,270	0.0%	$47,236
Farmers and Ranchers	75	NA	NA	NA	NA
Bookkeeping Accounting and Auditing Clerks	73	7,970	7,970	0.0%	$34,450
General and Operations Managers	69	9,450	9,280	-1.8%	$96,902
Interior Designers	69	150	150	0.0%	$53,584
Telemarketers	66	450	430	-4.4%	$24,158
Transportation Workers, All Other	64	1,000	1,020	2.0%	$30,255
Upholsterers	64	NA	NA	NA	$26,399
Architects Except Landscape and Naval	62	740	730	-1.4%	$75,477
First-Line Supervisors/Managers of Mechanics Installers and Repairers	61	2,170	2,200	1.4%	$67,669
Sustainability Specialists	61	NA	NA	NA	NA
Office Clerks General	58	14,700	14,670	-0.2%	$28,523
Mechanical Engineers	57	520	530	1.9%	$79,811
Purchasing Agents Except Wholesale Retail and Farm Products	55	1,050	1,090	3.8%	$60,684
Carpet Installers	54	410	380	-7.3%	$40,710
Elevator Installers and Repairers	54	240	230	-4.2%	$78,664
Energy Engineers	53	NA	NA	NA	NA
Operating Engineers and Other Construction Equipment Operators	53	1,800	1,730	-3.9%	$66,407
Sales Representatives Wholesale and Manufacturing Except Technical an	53	5,450	5,400	-0.9%	$46,060

* State of Hawai'i DLIR *Employment Forecasts for the Short-term Future 2009-11*.

** State of Hawai'i DLIR *Occupational Employment & Wages Survey, 2009*.

Table 9. Top Occupational Groups with Green Jobs

Occupational (Major Grouping)	Green Jobs	Green Job Titles (with > 50 jobs)
Construction and Extraction	2,690	Electricians (438), Carpenters (306), Insulation Workers Floor Ceiling & Wall (277), Solar Photovolatic Installers (237), Solar Thermal Installers & Technicians (194), , Insulation Workers Mechnical (184), Laborers (173), First Line Supervisors/Mgrs of Construction (167), Plumbers (167), Hazardous Materials Removal Workers (160), Tile and Marble Setters (64), Carpet Installers (54), Elevator Installers and Repairers (54), Operating Engineers (53)
Building and Grounds Cleaning and Maintenance	1,667	Janitors & Cleaners (1,197), Landscaping & Groundskeeping Workers (276), First Line Supervisors/Mgrs of Landscaping Workers (103)
Life, Physical, and Social Science	1,044	Forest & Conservation Technicians (601), Environmental Science & Protection Technicians (196), Environmental Scientists & Specialists (114)
Installation, Maintenance, and Repair	921	Heating & Air Conditioning Mechanics & Installers (348), Maintenance & Repair Workers General (159), Installation Maintenance & Repair Workers All Other (114), Automotive Speciality Technicians (95), First Line Supervisors/Mgrs of Mechanics Installers & Repairers (61)
Sales and Related	844	Retail Salespersons (219), Sales Rep. Services All Other (126), Cashiers (103), First Line Supervisors/Mgrs of Retail Sales Workers (89), Sales Rep. Whlse & Manf. Tech & Sci. Prod (80), Telemarketers (66)

Green Job Vacancies

Vacancies by County

Survey data estimate 670 green job vacancies in the State of Hawai'i. With its significant job base relative to other counties, O'ahu accounts for well over half of these green vacancies, followed by Hawai'i, Maui and Kaua'i (Figure 7). Total green vacancies across counties represent about 1.5 percent of total unemployment in the State in the first quarter of 2010. Hawai'i County reports the largest share of green job vacancies when compared to overall unemployment (Figure 8). Relative to other counties, Hawai'i has the potential to employ a disproportionately larger share of its inactive workforce in green occupations.

Figure 7. Green Job Vacancies by County

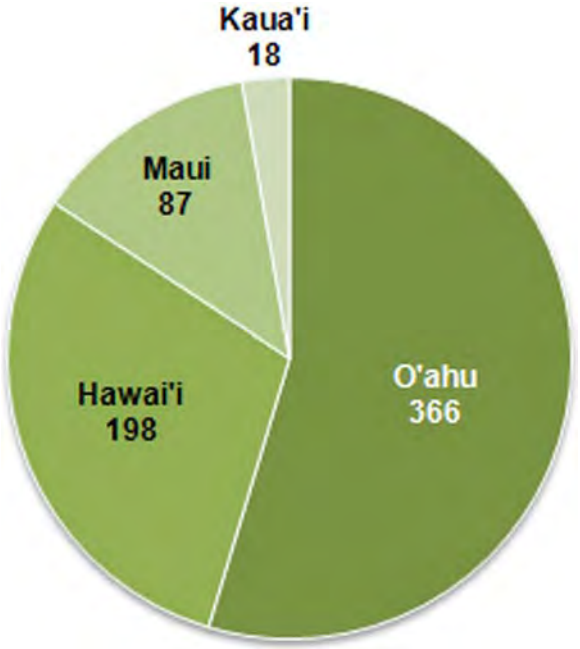


Table 10. Green Job Vacancies by County & Worksite Size

County	Vacancies by Firm Size				2010 Q1 Unemployment	Vacancies as a Share of Unemployment
	Small	Medium	Large	Total		
O'ahu	112	203	51	366	25,600	1.4%
Hawai'i	69	128	1	199	8,300	2.4%
Maui	43	32	12	87	6,600	1.3%
Kaua'i	14	1	3	18	2,900	0.6%
Total	238	365	67	670	43,400	1.5%

Workers at Kahuku Wind Project. Photo Courtesy of First Wind.

Vacancies by Industry and Worksite Size

When examining green job vacancies by NAICS industry, we find that over 74 percent are concentrated among three major industry groups: (1) *Construction*, (2) *Agriculture, Forestry, Fishing, and Hunting*, and (3) *Professional, Scientific & Technical Services*. O'ahu and Maui counties held the most vacancies in *Construction*, while Hawai'i and Kaua'i reported likewise in *Agriculture, Forestry, Fishing, and Hunting* and *Administrative & Support & Waste*

Figure 8. Green Vacancies as a Share of Total Unemployment

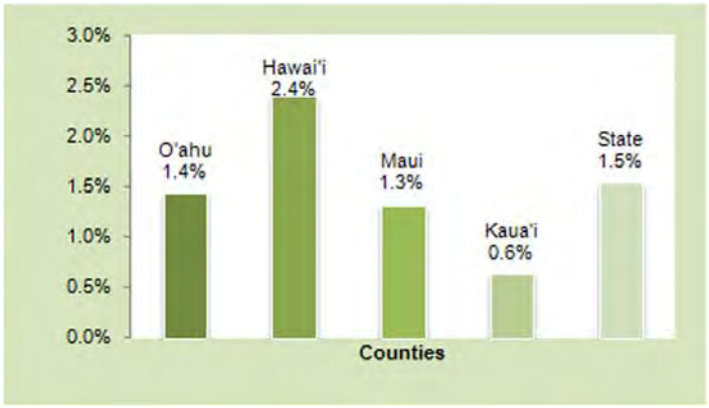


Table 11. Green Job Vacancies by County and Industry

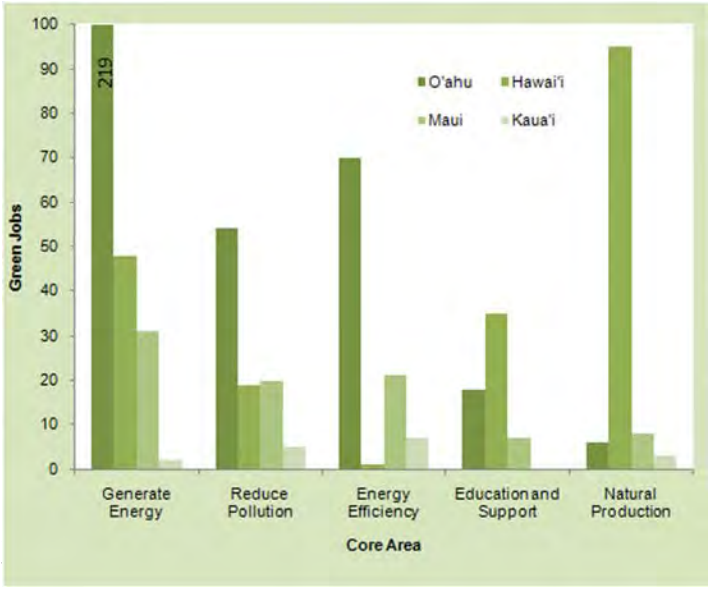
Industry Sector	Vacancies				Total
	Hawai'i	Kaua'i	Maui	O'ahu	
Construction	18	3	61	192	**273**
Agriculture, Forestry, Fishing, & Hunting	117	3	0	4	**124**
Professional, Scientific, & Technical Services	1	0	0	95	**97**
Other Services	51	3	2	0	**56**
Administrative & Support & Waste Mgmt & Remediation Services	10	4	7	21	**42**
Wholesale Trade	0	1	0	33	**34**
Utilities	0	0	3	12	**15**
Manufacturing	2	0	6	6	**14**
Educational Services	0	0	6	0	**6**
Health Care and Social Assistance	0	0	0	2	**2**
Arts, Entertainment, and Recreation	0	2	0	0	**2**
Retail Trade	0	2	0	0	**2**
Mining	0	0	0	0	**0**
Transportation and Warehousing	0	0	0	0	**0**
Information	0	0	0	0	**0**
Finance and Insurance	0	0	0	0	**0**
Real Estate and Rental and Leasing	0	0	0	0	**0**
Management of Companies & Enterprises	0	0	0	0	**0**
Accommodation and Food Services	0	0	0	0	**0**
Total	**199**	**18**	**87**	**366**	**670**

Management & Remediation Services, respectively.

Small and medium-size employer worksites account for 90 percent of all green job vacancies (Table 10). This may be a function of larger businesses being better capitalized and more able to attract and retain skilled talent, especially during periods of economic uncertainty. According to Survey data, 89 percent of green job vacancies can be found in the five largest NAICS industry sectors, with 84 percent in O'ahu and Hawai'i counties (Table 10 and Table 11).

Among the large firms, 57 percent of all green job vacancies can be attributed to two sectors: (1) *Administrative, Support, Waste Management & Remediation Services*, and (2) *Construction.* Moreover, 52 percent of O'ahu's green vacancies are in *Construction*.
For mid-size employers, 82 percent of vacancies are concentrated in *Construction* and *Agriculture, Forestry, Fishing & Hunting*, while the *Construction*

Figure 9. Green Job Vacancies by Core Areas & County



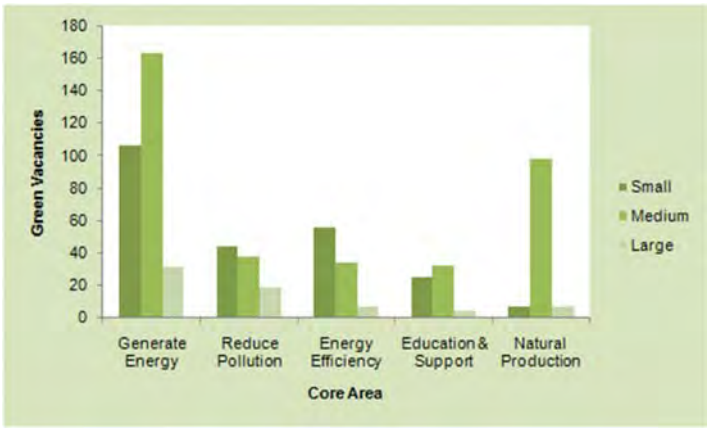
In contrast, industries that contribute the least vacancies in the green labor market are *Mining, Transportation and Warehousing, Information, Finance and Insurance, Real Estate and Rental and Leasing, Management of Companies & Enterprises,* and *Accommodation and Food Services* (Table 11). This might suggest that the greening of these industries is mature or has not yet fully begun. In particular, given the limited opportunities for the excavation of minerals and metals in Hawai'i, we would not expect to see a large number of green job vacancies in the *Mining* sector. From an operational perspective, low vacancy levels in functional areas such as leadership (*Management*), capital (*Finance*) and risk mitigation (*Insurance*) are likely because: (1) these industries account for fewer jobs relative to the overall economy; (2) these jobs are less likely to be recognized as "green" given that they cover a wider spectrum of administrative and generalist activities; and (3) some of the positions may be of a broader nature (e.g., chief operating officer or chairman of the board).

Vacancies by Core Green Areas

When the data are assessed by core green areas, most of the job vacancies appear within *Generating Clean, Renewable, Sustainable Energy* and *Natural Environmentally Friendly Production*. This is particularly the case in O'ahu, with 219 vacancies in the category. Ninety-five of the County of Hawai'i's 199 green vacancies are in the Natural Production category (Figure 9).

Reviewing job vacancies across firm size, medium-size worksites account for substantially more green vacancies than small and large worksites. In the *Generating Clean, Renewable, Sustainable Energy* category, for example, data show that medium-size firms hold 163 green vacancies. Medium-size firms also account for the majority (98) of vacancies within the *Natural Environmentally Friendly Production* category, representing 87 percent of the vacancies in this category (Figure 10). Interestingly, almost all of these vacancies also originated within the *Agriculture, Forestry, Fishing, and Hunting* category.

Figure 10. Green Job Vacancies by Core Areas & Worksite Size



Vacancies by Occupation

Table 12 depicts present estimated green job vacancies by occupational title relative to the total estimated green jobs in 2010 and those projected in 2012. The top-seven occupations -- *Sales Engineers, Solar Photovoltaic Installers, Graders and Sorters of Agricultural Products, First-Line Supervisors and Managers of Production and Operating Workers, Electricians, Retail Salespersons,* and *Janitors and Cleaners* -- include 50 percent of the total green job vacancies.

The three occupations of *Sales Engineers*, *Solar Energy System Engineers*, and *First-Line Supervisors* each have large numbers of vacancies, including relative to total current jobs. Their vacancies are between one to two times their total current green jobs. These figures may be a result of both an anticipated expansion of these occupations and the lack of a skilled and qualified labor pool from which to fill the positions.

Examination of the 2012 projected green jobs figures is instructional in showing change for each of the three occupational categories. The data shows that in all three occupations, projected job increases ranged from 196 percent to over 485 percent. These findings suggest that the present high vacancy rates in these jobs may not only be a function of lack of qualified potential employees, but also of expected expansion of green jobs in the near future.

Table 12. Top 25 Green Job Vacancies by SOC Major Groups: 2010

Occupational Title	Green Vacancies	2010 Green Jobs	Vacancies to Total Jobs
Sales Engineers	88	46	191%
Solar Photovoltaic Installers	82	237	35%
Graders and Sorters Agricultural Products	47	79	59%
First-Line Supervisors/Mgrs of Production and Operating Workers	47	48	98%
Electricians	30	438	7%
Retail Salespersons	26	219	12%
Janitors and Cleaners Except Maids and Housekeeping Cleaners	17	1,197	1%
Tailors Dressmakers and Custom Sewers	15	19	79%
Upholsterers	15	64	23%
General and Operations Managers	14	69	20%
Solar Energy Systems Engineers	14	10	140%
Computer Support Specialists	14	76	18%
Tile and Marble Setters	14	64	22%
Laborers and Freight Stock and Material Movers Hand	12	191	6%
Environmental Science and Protection Technicians Including Health	12	196	6%
Solar Sales Representatives and Assessors	12	33	36%
Maintenance and Repair Workers General	11	159	7%
First-Line Supervisors/Mgrs of Construction Trades and Extraction Workers	10	167	6%
First-Line Supervisors/Mgrs of Landscaping Lawn Service and Groundskeeping Worker	10	103	10%
Green Marketers	9	1	900%
Marketing Managers	9	17	53%
First-Line Supervisors/Managers of Office and Administrative Support Workers	9	10	90%
Executive Secretaries and Administrative Assistants	9	17	53%
Occupational Health and Safety Specialists	8	29	28%
Sales Representatives Wholesale and Manufacturing Technical and Scientific Products	8	80	10%

The functions of several of the job titles likely overlap. For example, the top green job with respect to absolute vacancies, *Solar Photovoltaic Installers*, may overlap with other jobs that could provide the same services, such as *Solar Energy Systems Engineers, Solar Sales Representatives and Assessors, Solar Energy Installation Managers, Electricians,* and *Solar Thermal Installers and Technicians.* Summed together, these occupations make 114 green vacancies, the greatest number of vacancies by a factor of 1.6.

Green Jobs Projected in 2012

Hawai‘i businesses anticipate solid growth of green jobs to the year 2012. Survey data show that employment in green-related occupations is expected to grow from 11,145 in 2010 to 14,048 in 2012, an increase of 26 percent over two years.

Such growth considerably exceeds the 1.0 percent increase projected for statewide employment during the same period.[6] Furthermore, green jobs are expected to grow from a 2.4 percent share of total state employment in 2009 to 2.9 percent by 2012. This accelerating trend is consistent with findings from a preliminary assessment of Hawai‘i ’s green workforce showing an increase in green jobs between 1998 and 2007.[7]

Figure 11. Green Jobs by Core Area: 2012

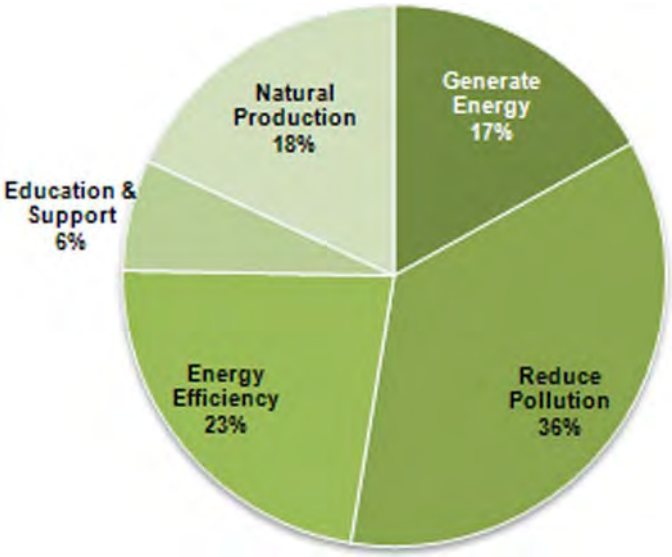
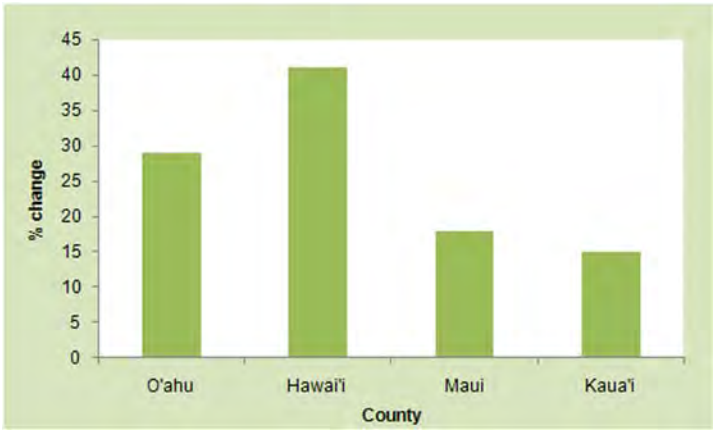


Photo Courtesy of Green Earth Cleaners on Maui

More than half of projected green jobs are found in two core green areas, *Pollution Reduction* and *Energy Efficiency* (Figure 11). Most of the projected *increase* in green employment, however, is associated with the generation of clean energy. The *Generate Clean, Renewable, Sustainable Energy* core area is expected to experience an increase of 1,119 new jobs (88 percent) between 2010 and 2012.

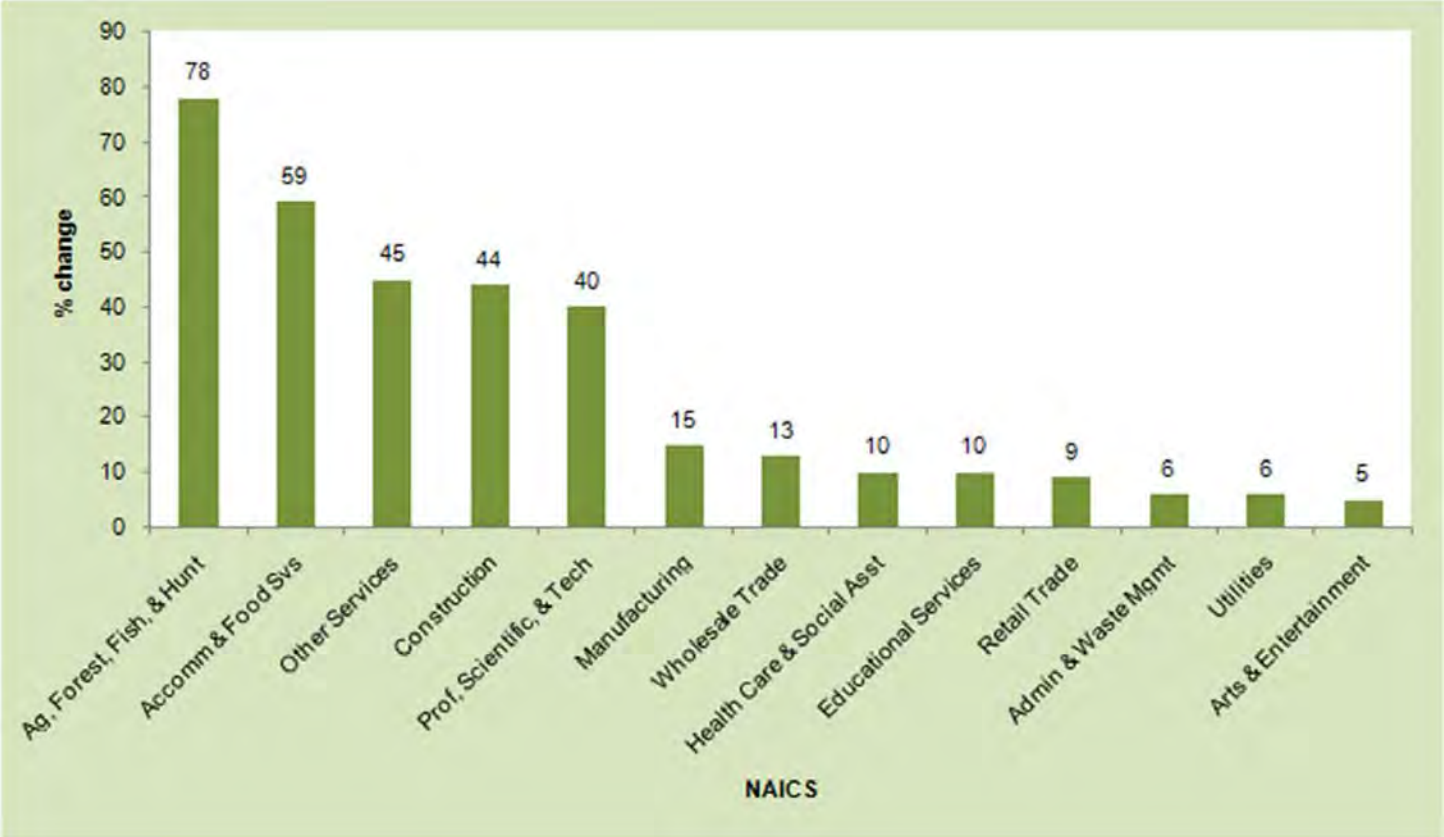
Figure 12. Green Job Growth by County: 2010-2012



[6] DLIR Research & Statistics Office, *Long-Term Industry Projections, State, 2008-2018,* 2010.

[7] Workforce Development Council, DLIR Research & Statistics Office, *Green Workforce Report: Initial Labor Market Analysis Report,* October 2009. Projected annually, the green job rate of increase is 12.7 percent from 2010 to 2012.

Figure 13. Growth in Green Jobs by Industry, 2010-2012



Job Projections by County

Survey data indicate growth in green jobs across all major counties. Consistent with its current status as the State's largest provider of green employment, O'ahu reports the most sizable green workforce at 8,750 jobs in 2012 (Table 13). This will be a 28 percent increase, or a net 1,885 additional green workers, compared to current levels. Further underscoring the anticipated demand for skilled green labor is the 42 percent increase in the County of Hawai'i. While this amounts to a smaller overall number of new jobs given that county's lower employment base, it is the largest overall rate of growth within the State and adds 510 green jobs to the State's economy (Figure 12).

Solid gains are also expected in Maui and Kaua'i, with businesses reporting an over 15 percent increase in the number of green jobs over the next two years. By 2012, these two counties are projected to support a total of 3,035 and 531 green jobs, respectively.

Photo Courtesy of Kupu Hawai'i on the Big Island.

Table 13. Green Jobs Projections by County and Industry: 2012

	Green Jobs in 2012				
Industry	**O'ahu**	**Hawai'i**	**Maui**	**Kaua'i**	**Total**
Construction	3,392	585	724	94	**4,796**
Administrative & Support & Waste Mgmt & Remediation Services	1,597	81	1,298	189	**3,164**
Professional, Scientific, & Technical Services	1,069	62	177	13	**1,321**
Wholesale Trade	690	185	26	14	**916**
Other Services	623	124	111	48	**907**
Retail Trade	559	43	134	9	**745**
Agriculture, Forestry, Fishing, & Hunting	37	393	51	15	**495**
Manufacturing	250	28	111	10	**398**
Accommodation and Food Services	36	132	78	30	**276**
Utilities	135	15	58	18	**226**
Health Care and Social Assistance	120	0	82	0	**202**
Arts, Entertainment, and Recreation	42	0	52	88	**182**
Transportation and Warehousing	175	0	0	0	**175**
Educational Services	15	83	37	2	**136**
Real Estate and Rental and Leasing	5	1	91	0	**98**
Information	0	0	6	0	**7**
Mining	3	0	0	0	**3**
Finance and Insurance	0	0	0	0	**0**
Management of Companies & Enterprises	0	0	0	0	**0**
Total	**8,750**	**1,732**	**3,035**	**531**	**14,048**

Table 14. Growth in Green Jobs by County and Industry: 2010-2012

Industry	Green Job Growth				
	O'ahu	Hawai'i	Maui	Kaua'i	Total
Construction	1,145	98	208	17	**1,468**
Professional, Scientific & Technical Services	289	16	70	1	**376**
Other Services (except Public Admin.)	181	66	21	12	**280**
Agriculture, Forestry, Fishing & Hunting	7	210	1	0	**218**
Administrative & Support & Waste Mgmt⊏& Remediation Services	68	11	79	28	**186**
Wholesale Trade	81	26	0	0	**107**
Accomodation and Food Services	0	65	30	7	**103**
Retail Trade	31	6	19	3	**60**
Manufacturing	41	6	5	0	**52**
Health Care and Social Assistance	19	0	0	0	**19**
Utilities	15	0	-3	0	**13**
Educational Services	0	6	6	0	**12**
Arts, Entertainment, and Recreation	6	0	2	1	**9**
Mining	0	0	0	0	**0**
Transportation and Warehousing	0	0	0	0	**0**
Information	0	0	0	0	**0**
Finance and Insurance	0	0	0	0	**0**
Real Estate and Rental and Leasing	0	0	0	0	**0**
Management of Companies & Enterprises	0	0	0	0	**0**
Total	**1,885**	**510**	**437**	**71**	**2,903**

New and Emerging Green Occupation: Sustainability Specialist

The green economy has generated a number of new professional, technical and administrative jobs whose principal responsibilities are to monitor and lead an establishment's green efforts. One prime example is the emerging occupation of *Sustainability Specialist*. The Hawai'i Green Jobs Survey helped identify several, predominantly large, firms that offer such career opportunities in industries ranging from professional services to food services. In 2010, there were an estimated 61 *Sustainability Specialists* in the State of Hawai'i, with a projected growth rate of 26 percent by 2012. Based on O*NET definitions, a *Sustainability Specialist* "address(es) organizational sustainability issues, such as waste stream management, green building practices, and green procurement plans" by undertaking prescribed tasks to:

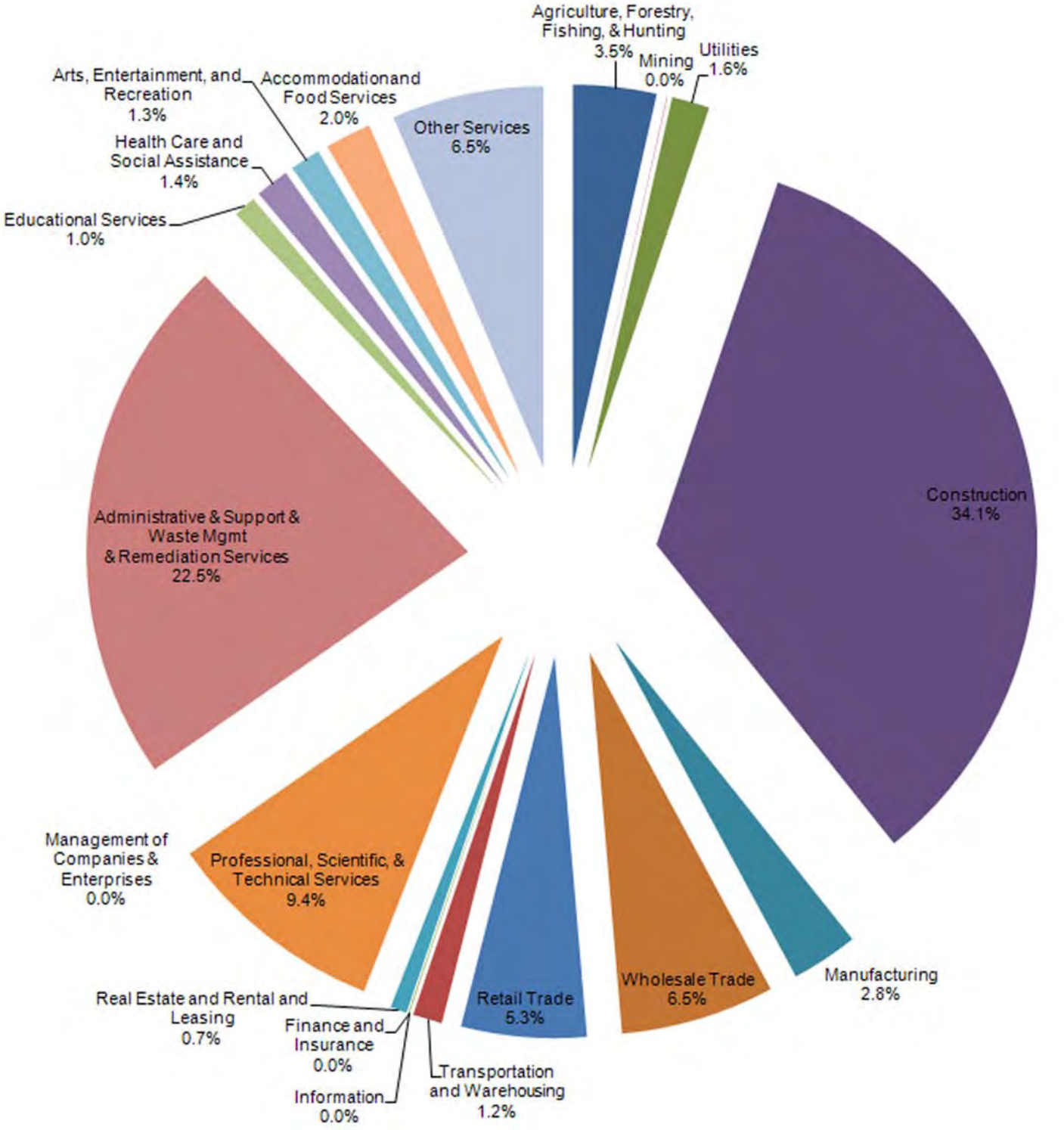
- Develop sustainability project goals, objectives, initiatives, or strategies in collaboration with other sustainability professionals;
- Monitor or track sustainability indicators, such as energy usage, natural resources usage, waste generation, and recycling;
- Assess or propose sustainability initiatives, considering factors such as cost effectiveness, technical feasibility, and acceptance.[1]

Hiring managers are interested in individuals with skill sets comparable to other corporate professionals, which include excellent written and oral communication skills, project management experience and data analysis expertise. An undergraduate degree in engineering, environmental studies or the natural sciences is also considered beneficial.

To produce students capable of entering career pathways in energy and environmental sustainability, grass root initiatives such as *Sustainable Saunders* at the University of Hawai'i aim to integrate the educational curriculum with campus-based projects and internships.[2] This holistic approach allows students from multiple disciplines to work together on current sustainability issues, while developing the skills and acumen necessary to transition successfully into the green workforce upon graduation. Moreover, such programs serve as a useful conduit transmitting the skills-needs of potential employers with front-line education providers.

[1] http://online.onetcenter.org/link/summary/13-1199.05
[2] http://sustainablesaunders.hawaii.edu

Figure 14. Green Job Projections by Industry: 2012



Job Projections by Industry

By 2012, the *Construction* and *Administrative and Waste Services* sectors are expected to yield the greatest number of green jobs at 4,796 and 3,164, respectively (Table 13). *Construction* will include 34 percent of all green jobs in 2012 (Figure 14) and experience 44 percent growth between 2010 and 2012, creating 1,468 new green jobs, the largest increase in absolute terms (Table 14).

Agriculture and Forestry is projected to experience a 78 percent increase in its green employment, the largest growth reported by any industry group during this two-year period (Figure 13). Additional high-growth industries for green jobs are *Accommodation and Food Services* (59 percent) and *Professional, Scientific and Technical Services* (40 percent).

Figure 15. Absolute Growth in Green Jobs by Worksite Size: 2010-2012

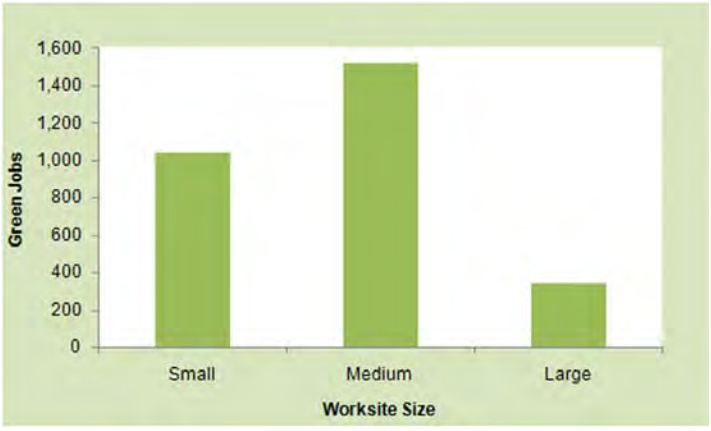


Figure 16. Growth in Green Jobs by Worksite Size: 2010-2012

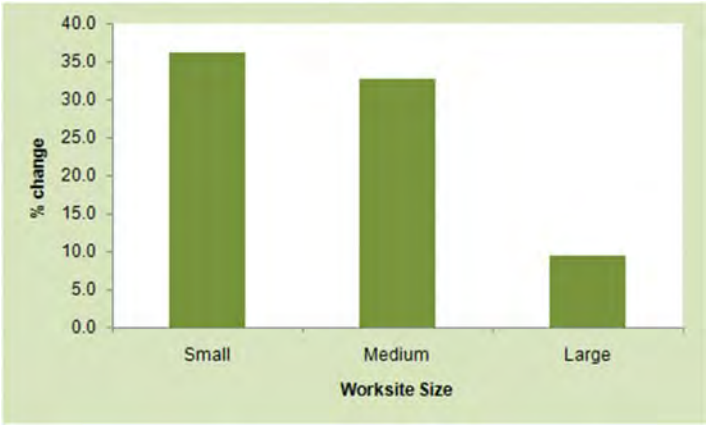


Table 15. Green Job Projections by County and Worksite Size: 2012

County	Worksite Size			Total
	Large	Medium	Small	
O'ahu	2,394	3,984	2,372	**8,750**
Hawai'i	37	947	748	**1,732**
Maui	1,398	1,073	564	**3,035**
Kaua'i	141	149	241	**531**
Total	**3,970**	**6,153**	**3,925**	**14,048**

Table 16. Growth in Green Jobs by County and Worksite Size: 2010-2012

County	Worksite Size			Total
	Large	Medium	Small	
O'ahu	227	1,011	647	**1,885**
Hawai'i	10	284	216	**510**
Maui	89	219	129	**437**
Kaua'i	14	6	51	**71**
Total	**340**	**1,520**	**1,043**	**2,903**

Job Projections by Worksite Size

Between 2010 and 2012, most of the increase in green employment is expected to occur at small and medium-size employer worksites (Figure 15). Mid-size businesses report an estimated 1,520 additional green jobs by 2012, an increase of 33 percent (Figure 16). An even greater 36 percent rate of growth is projected for small businesses, which will bring total green employment by small businesses to 3,925 jobs (Table 15). In contrast, hiring at large worksites will likely grow at a more moderate pace of nine percent, amounting to a green workforce of 3,970 or 340 new green jobs by 2012 (Table 16).

Job Projections by Occupation

Survey data show that the top three occupations with respect to absolute growth prospects in green jobs are *Solar Photovoltaic Installers*, *Sales Engineers* and *Electricians* (Table 18). In addition, *Upholsterers*, who recycle furniture, are estimated to increase by 145 positions by 2012. By 2012, employment in these areas is estimated to increase by 1,022 positions, or 142 percent.

Other occupational groups that are likely to offer a large number of total green jobs in 2012 include janitors and cleaners (1,248 jobs), forest and conservation technicians (662 jobs), and electricians (647 jobs) (Table 17).

Through the *Hawai'i Clean Energy Initiative*, the State of Hawai'i is pursuing a major push to improve home energy conservation through encouraging the use of energy-efficient appliances, building components and energy-efficient home design. LEED certification (see inset article) is a major aspect of this endeavor, training architects, designers and contractors in new technologies and methods to design energy-efficient homes and worksites. In addition to solar appliances such as water heaters, improved insulation is important for energy efficiency and the passive cooling of homes and work places.

Several SOC job categories will likely have overlapping green functions and training requirements with other SOC job categories. Two of the most important green functions relate to harnessing solar energy and improving insulation. Management of green jobs also has much skill-overlap. The occupational groups of *Heating and Air Conditioning Mechanics and Installer*; *Insulation Workers, Floor, Ceiling and Wall*; *Insulation Workers Mechanical*; and *Solar Thermal Installers and Technicians* likely provide similar functions of energy conservation, through the installation of improved insulation for both cooling and more efficient water heating. If consolidated into a single category, this job type would yield 338 new green jobs by 2012, for a total of 1,368 positions, by far the greatest number of projected green jobs in 2012.

Another example of a functional overlap is the SOC major group *First-Line Supervisors and Managers*. Green jobs in these categories include the management of any type of green job, including diverse green occupations in the agricultural, construction, janitorial, sales, and office environments. These *First-Line Supervisors* are likely fulfilling similar functions. When combined, they account for 752 green jobs, ranking green supervisors in the top-five largest green occupations projected for 2012 (Table 17).

Industry Focus: Wind Energy

Wind energy is a developing industry in the State of Hawai'i, generating a large number of green jobs during the construction phase of a project and additional jobs during maintenance.

For example, 12 wind turbines with a total capacity of 30 megawatts of power are currently being installed in Kahuku, O'ahu. According to First Wind, the site's developer, this project is expected to create 200 construction jobs, mostly in excavation, reinforced steel framing, cement, and erecting of towers by specialty cranes. These jobs are likely to last six to nine months during construction. After construction, there will be six to ten jobs required for long-term maintenance of the facility. In addition, approximately eight administrative staff are located at First Wind's O'ahu office.

This project is expected to yield enough renewable energy to power nearly 7,700 homes in Hawai'i, and recently received a $117 million loan guarantee from the U.S. Department of Energy.[1]

In addition to the Kahuku site, 21 megawatts worth of wind turbines are being installed in Maui. This new capacity will supplement the existing 61 megawatts of wind power from three large-scale farms on the Big Island (operated by Hawai'i Electric Light Company and Apollo Energy Corporation) and Maui (operated by First Wind).

Combined, approximately 112 megawatts of wind power are either on-line or currently under construction in the State. Moreover, these projects are likely to yield 25 long-term infrastructure maintenance jobs. Smaller-scale wind energy initiatives, for example at the Parker Ranch on the Big Island, also add green jobs to the local economy.[2]

[1] First Wind, "Press Release: First Wind Begins Construction of Oahu-based Kahuku Wind Project," July 13, 2010; *Honolulu Star Advertiser*, "Kahuku wind farm lands $117M loan guarantee", 7/28/2010; First Wind, personal communication, November 16, 2010.

[2] *Honolulu Star Advertiser*, "O'ahu wind farm stays on track," October 9, 2010.

Table 17. Green Job Projections by Occupation: 2012

Occupation	Green Jobs: 2012
Janitors and Cleaners Except Maids and Housekeeping Cleaners	1,248
Solar Photovoltaic Installers	684
Electricians	647
Forest and Conservation Technicians	622
Security Guards	552
Heating and Air Conditioning Mechanics and Installers	403
Construction Carpenters	345
Insulation Workers Floor Ceiling and Wall	337
Landscaping and Groundskeeping Workers	336
Solar Thermal Installers and Technicians	297
Insulation Workers Mechanical	297
Retail Salespersons	290
Sales Engineers	267
Laborers and Freight Stock and Material Movers Hand	247
Recycling and Reclamation Workers	225
Environmental Science and Protection Technicians Including Health	215
First-Line Supervisors/Managers of Construction Trades and Extraction Workers	214
Upholsterers	209
Maintenance and Repair Workers General	194
Plumbers	185
Graders and Sorters Agricultural Products	181
First-Line Supervisors/Managers of Landscaping Lawn Service and Groundskeeping Worker	179
Construction Laborers	173
Civil Engineers	169
Computer Support Specialists	167

Table 18. Top 25 Green Occupations by Growth: 2010-2012

Occupational Title	Green Jobs			
	2010	2012	Increase	Growth Rate
Solar Photovoltaic Installers	237	684	447	189%
Sales Engineers	46	267	221	480%
Electricians	438	647	209	48%
Upholsterers	64	209	145	227%
Insulation Workers Mechanical	184	297	113	61%
Solar Thermal Installers and Technicians	194	297	103	53%
Graders and Sorters Agricultural Products	79	181	102	129%
First-Line Supervisors/Managers of Production and Operating Workers	48	141	93	194%
Computer Support Specialists	76	167	91	120%
First-Line Supervisors/Managers of Landscaping Lawn Service and Groundskeepir	103	179	76	74%
Retail Salespersons	219	290	71	32%
Insulation Workers Floor Ceiling and Wall	277	337	60	22%
Landscaping and Groundskeeping Workers	276	336	60	22%
Heating and Air Conditioning Mechanics and Installers	348	403	55	16%
Laborers and Freight Stock and Material Movers Hand	191	247	56	29%
Janitors and Cleaners Except Maids and Housekeeping Cleaners	1,197	1,248	51	4%
First-Line Supervisors/Managers of Construction Trades and Extraction Workers	167	214	47	28%
Solar Energy Systems Engineers	10	56	46	460%
Construction Carpenters	306	345	39	13%
Painters Construction and Maintenance	24	62	38	158%
Maintenance and Repair Workers General	159	194	35	22%
Electric Motor Power Tool and Related Repairers	36	70	34	94%
Tile and Marble Setters	64	98	34	53%
Public Relations Specialists	121	154	33	27%
Recycling and Reclamation Workers	194	225	31	16%

Sorting invasive limu on the Big Island. Photo Courtesy of Kupu Hawai'i

Green Finance: Innovation Spurs Clean Energy Projects

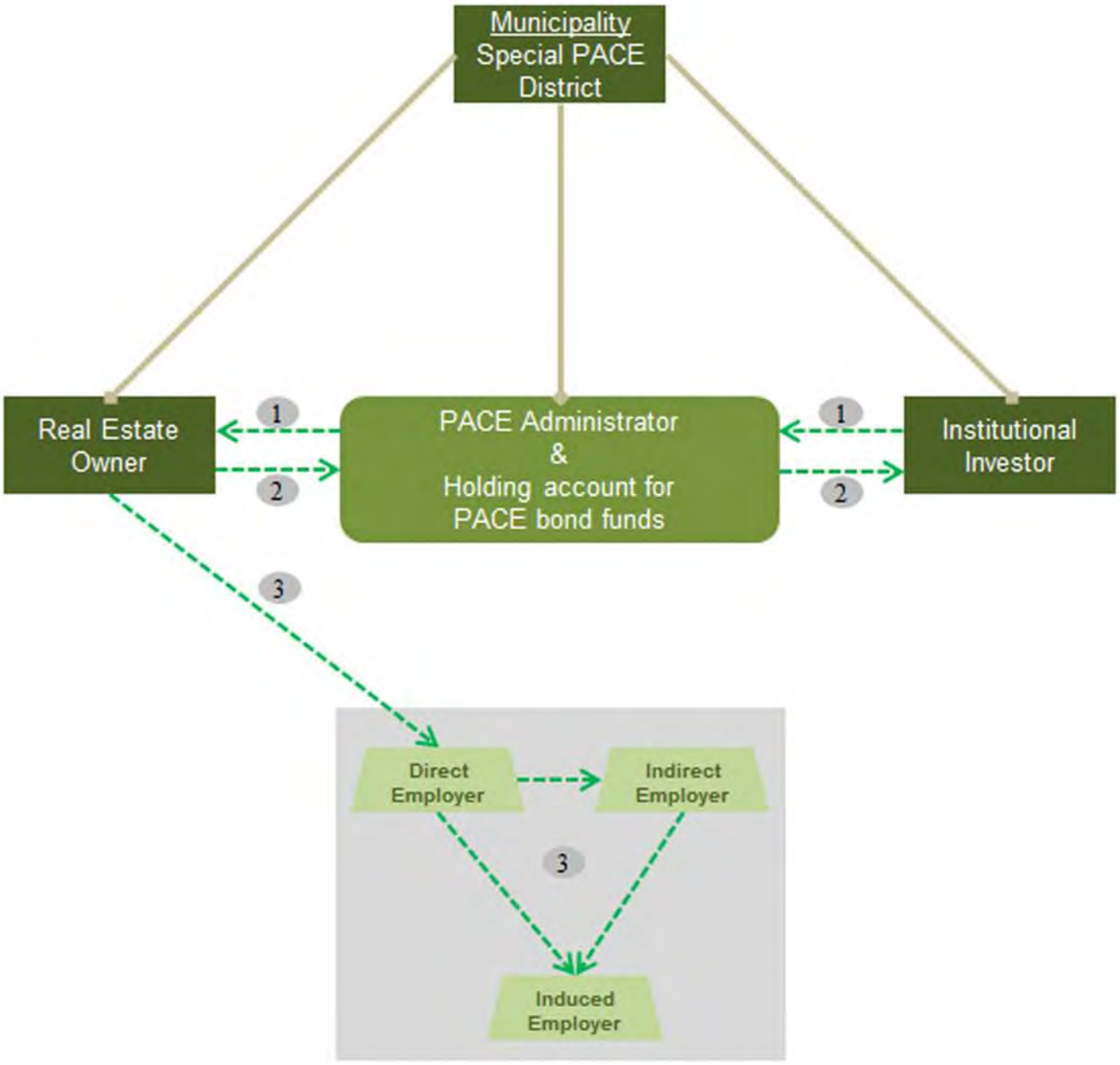
Obtaining adequate levels of financing can be a major obstacle for property owners seeking to implement clean energy and/or energy efficiency projects. Institutional investors, however, are generally not well suited to finance small, disaggregated projects, and are likely to avoid projects with high risks for default.[1] One innovative solution to this size and duration mismatch is the use of Property Assessed Clean Energy (PACE) bonds, which are legislated in 24 states including Hawai‘i.

According to a report by researchers at the University of California at Berkeley, “renewable energy (projects)… generate more jobs per unit of energy delivered than the fossil fuel-based sectors” while freeing “money otherwise spent on energy cost(s) and redirect(ing) it to stimulate the economy through additional job creation.” PACE bonds bridge the gap between the needs of prospective property owners and institutional investors. As illustrated in the model below, a municipality floats PACE bonds that are purchased by institutional investors seeking bonds backed by property taxes.[2] Property owners obtain a loan from the municipality to finance a green project, and the loan is later repaid through the assessment of a special property tax equal to 1/20th of the loan amount plus interest and payable over the following 20 years.

For example, Company X owns a mid-rise commercial building and pays $10,000 per month in utilities. Company X completes an energy audit and learns that it can save $5,000 per month in utilities by investing $200,000 in clean energy and energy efficiency (e.g., solar photovoltaic, energy efficient lighting and HVAC). Company X borrows $200,000 at a 10 percent rate and 20-year term from the County’s PACE program, allowing it to complete the green retrofit. Company X then repays the loan by making a special property tax surcharge payment of $1,950 per month. This is a financially prudent investment -- from day one, Company X realizes a $3,050 monthly return (i.e., $5,000 energy savings minus $1,950 property tax surcharge).

PACE bonds allow for a scaling-up of clean energy initiatives, and provide a wide array of social, environmental and financial benefits. From a societal perspective, local governments are able to stimulate the economy and create new green jobs, moving the state closer to a sustainable energy future. Environmentally, an expansion in the depth and breadth of clean energy projects will serve to decrease our dependence on fossil fuels and lower overall carbon emission levels. Financially, property owners realize an immediate positive return, and institutional investors have access to an asset that provides relatively steady returns with diminished risk of default.

[1] *Harvard Business Review*, “The HBR List: Breakthrough Ideas for 2010,” January-February, 2010.
[2] Max Wei, Shana Patadia, Daniel M. Kammen. “Putting renewable and energy efficiency to work: How many jobs can the clean energy industry generate in the US?” *Energy Policy* 38.2 (2010).



Economic Stimulus & Job Creation

(1) Municipal government floats PACE bonds that are purchased by institutional investors. Funds from this transaction are then used to make loans to property owners who complete energy efficient projects.
(2) Property owner makes payment for special property tax assessment. Payments pass through to an institutional investor.
(3) Property owner hires an entity (the direct employer) to design, manufacture, construct, and install the clean energy project. Direct employers hire employees and make purchases from both upstream and downstream suppliers (the indirect employers) to complete the project. Indirect employers, such as a silicon manufacturer for photovoltaic panels, then purchases supplies and hires its own employees. Finally, additional economic activity is generated when employees of direct and indirect employers spend money at downstream employer establishments such as fast food and retail stores.[2]

Qualifications and Employee Training Requirements

Green jobs in Hawai‘i require employees with a wide variety of qualifications, certifications and educational backgrounds. While more than half of Hawai‘i businesses reporting a green job did not respond to this section of the survey, several noteworthy themes emerge when existing data are categorized into three broad areas: (1) minimum education, (2) formal certifications or licenses, and (3) informal on-the-job training (OJT).

Of those businesses that responded to the *Qualifications and Training* section of the Survey, more than 70 percent indicate some form of minimum education or training requirement. The most frequently cited of these are community colleges and trade schools, which suggest that specialized training is sought for many green jobs (Figure 17). While university education is the second highest-ranked source for fulfilling such requirements, many employers with current or prospective green jobs view a formal degree as neither essential nor an impediment to placement in many of these occupations. Incidentally, only 15 percent of businesses require a bachelor’s degree or higher, and these are likely to be concentrated in scientific, technical or managerial fields.

Photo Courtesy of Kupu Hawai‘i on the Big Island.

When queried specifically on certification or licensure, 64 percent of responding businesses cited it as a requirement. Of these, the most commonly

Figure 17. Formal Green Training

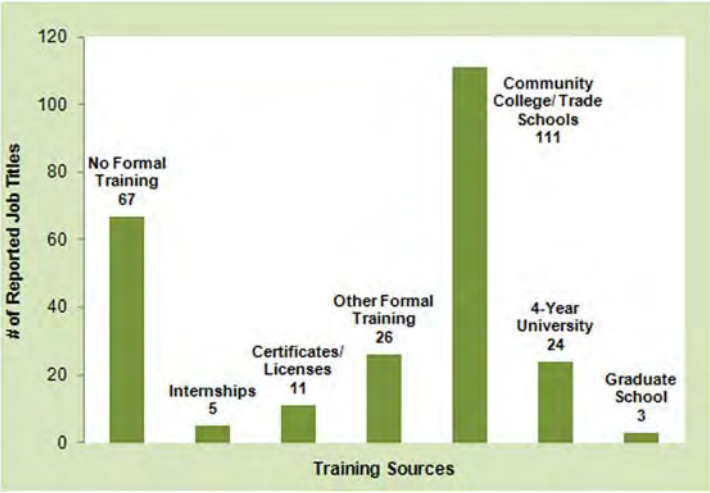
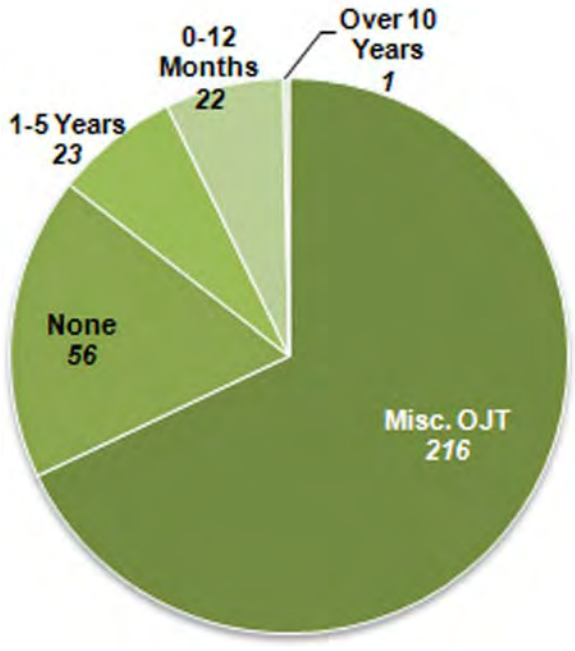


Figure 18. On-the-Job Green Training



cited requirement is the *Leadership in Energy and Environmental Design (LEED)* certification, referred to in 11 percent of responses. Examples of such occupations include architects, civil engineers, construction managers, cost estimators, and electrical engineers. Based on survey data, green jobs generally require some type of license (23 percent) as opposed to certification (16 percent).

The third area of analysis, informal OJT, received 318 responses. Of these, 83 percent indicated OJT as a requirement, with 17 percent indicating no required OJT. The two most cited durations for OJT were 0-12 months and 1-5 years, each of which represents seven percent of the total responses (Figure 22). This suggests that employers view informal training at the workplace as an important component of green workforce development, more so than formal education, certifications or licenses. This is also broadly in line with our findings that green jobs tend to be a greening of existing jobs rather than new jobs requiring altogether new skills.

Leadership in Energy & Environmental Design (LEED)

LEED is an internationally-recognized green building certification system, providing third-party verification that a building or community was designed, built, and maintained using strategies intended to improve performance in metrics such as energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources.

Developed by the *U.S. Green Building Council*, LEED is intended to provide building owners and operators with a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance.

Source: U.S. Green Building Council

Educational Requirements for Green Trades and Professions

Categorizing occupations by education and training requirements yields additional insights (Figure 19). Based on information produced by the BLS, we divide these requirements into three tiers: "high" education/ training includes jobs that require work experience plus a four-year college degree, professional degree or graduate school; "medium" includes jobs that require an associate's degree, work experience in a related occupation, post-secondary vocational training, or extensive OJT; "low" includes occupations that require minimal or moderate OJT.

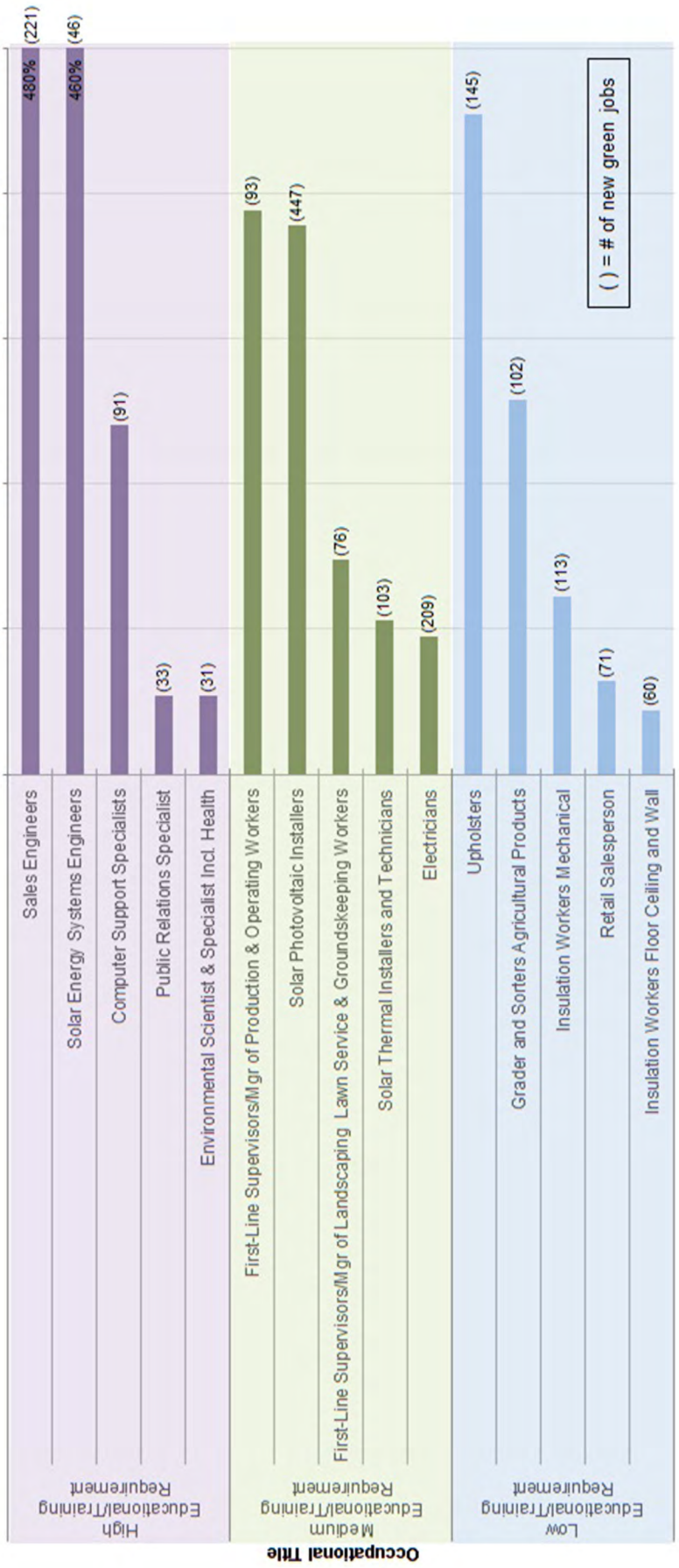
The number of new green jobs in the medium tier is higher than that of either the high- or low-education categories. By 2012, the five highest-ranked occupations in the medium-education category are expected to generate a total of 928 new green jobs. In contrast, the low- and high-education categories will yield 422 and 491 new jobs, respectively. Across all

Photo Courtesy of 21st Century Technologies Hawai'i

three tiers, the top-five occupations are estimated to collectively account for 63 percent of new green jobs by 2012.

Analysis of survey data by occupation shows that *Solar Photovoltaic Installers* are expected to experience the greatest overall increase in green jobs (Figure 19). Based on employer responses, workers in

Figure 19. Projected Growth Rate of the Top 5 Green Occupations by Education, 2010-2012



this job group will need a moderate level of education and training, such as: contractor licenses, specific photovoltaic training, electrician courses, associate's degree, journeyman electrician's license, or significant OJT.

Electricians, also in the middle tier, have similar training requirements and are likewise projected to experience high growth, both in absolute and percentage terms. Requirements include an associate's degree, certificate of achievement, electrical journeyman's license, apprenticeship, work experience in a related occupation, five years of OJT, or some combination thereof. The Honolulu Community College's *Electrical Installation & Maintenance Technology* program, which offers both associate's degrees and certificates of achievement, was specifically mentioned by survey respondents.

Heating & Air Conditioning Mechanics and Installers are the largest projected growth category of insulation-related green jobs, and typically require an associate's degree or certificate of achievement, and less than two years of OJT. Coursework and an apprenticeship in refrigeration, plumbing, air-conditioning, sheet metal, or basic electrical are useful. *North American Technician Excellence* (NATE) and *Environmental Protection Agency 608 Refrigerant* certifications were cited by survey respondents, which include training to protect the ozone layer.

While occupations requiring mid-level education/training are likely to experience the most sizeable growth in new green jobs during the two-year period between 2010 and 2012, the other two tiers also contain jobs with high levels of projected growth.

In the high-education/training category, *Sales Engineers* are expected to experience the largest overall increase, in both absolute and percentage terms. *Computer Support Specialists* are projected to more than double to 91 positions, and these jobs typically require a bachelor's degree and computer certifications. High-level *Solar Energy Systems Engineers* are projected to increase by 46 positions, or 460 percent.

For "green collar" laborers in the low-tier, *Upholsterers*, *Graders and Sorters of Agricultural Products*, and *Insulation Workers* are projected to experience the greatest growth in absolute and percentage terms. Retail Salespersons will also experience job growth. Requirements specific to this occupation include work experience in a related occupation, less than two years of OJT, and occasional certification such as for food handling, vendor products, general sales, or forklifts. In contrast, *Landscaping and Groundskeeping Workers* generally require less than one year of OJT and no certifications. Specific skills, such as training in precision irrigation with pop up multi-directional precision spray nozzles, is considered beneficial.

Survey data confirm the general finding that most future employee training requirements for green jobs will be fulfilled at community colleges and trade schools, supplemented with extensive OJT. Green jobs intersect a wide array of skill and knowledge areas that will require workers who can successfully adapt to the changing needs of today's economy.

Photo Courtesy of Peter Liu, kaiscapes.com

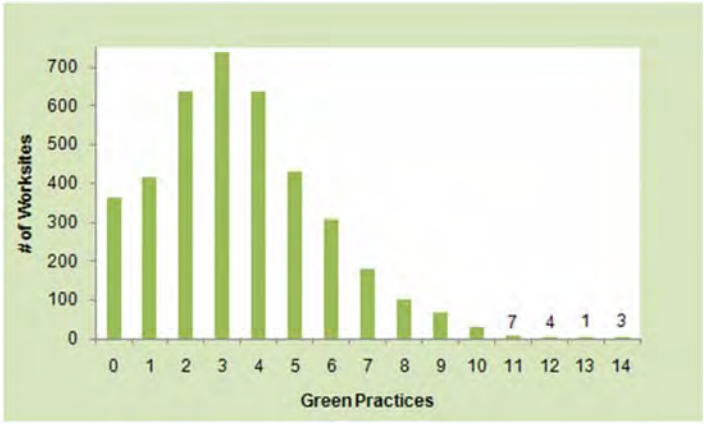
Green Practices

The primary distinction between a green *practice* and a green *job* is that the latter engages in economic activity that is favorable to the environment or energy sustainability *and* central or essential to business operations. It is not necessary for a business to offer green jobs for green practices to be in place. For example, a cleaning company that advertises the routine use of eco-friendly cleaning products could consider employees specifically engaged in such activities as occupants of green jobs. Presumably, these workers are required to make use of green products for which customers pay a nominal premium. If, on the other hand, this business does not advertise or commit itself to the usage of green products on a recurring basis, then its workers would generally be classified as practitioners of green behavior in non-green jobs. While the distinction is not always obvious or clear, it is the guiding definition of this report.

Based on survey data, green practices are common in the State of Hawai'i. Ninety-three percent of respondents report at least one green practice performed at their business worksite; 51 percent report two to four such practices. Overall, the frequency of green practices is normally distributed with an average of 3.5 per business (Figure 20).

Recycling is ubiquitous and by far the most common green practice in Hawai'i, with more than 80 percent

Figure 20. Green Practices per Worksite



Kalāheo Elementary School. Photo Courtesy of Kaua'i Recycling

of businesses recycling and nearly 60 percent using recycled products (Table 19). Such activity is not limited to the recycling of cans, bottles and paper. Worksites report the recycling of an array of products ranging from oil, grease, solvents, tires, plastic buckets, cork, batteries, and electronic equipment. Other examples include the conversion of cooking oil to bio-diesel, and one hotelier reports delivering food waste to contractors for the production of methane gas. Another company cites mercury recycling with a mercury-capture filter, which not only recaptures mercury for future use but also reduces mercury effluent, a major threat to marine habitat, fisheries and human health.[8]

The conservation of energy is also frequently reported by businesses, with over one-half using energy-saving light bulbs and nearly 40 percent making conscious efforts to reduce energy usage. Several worksites have been particularly proactive in this

[8] Refer to http://hawaii.gov/dbedt/info/energy/publications/recycling99.pdf for recycling companies in the State of Hawaii. Mercury pollution information is from the University of Wisconsin-Madison, "Mercury Pollution Threatens Health Worldwide, Scientists Say," *Science Daily*, August 11, 2006.

Table 19. Green Practices by County and Worksite Size, Share of Total

	County					Worksite Size		
Green Practices	O'ahu	Hawai'i	Maui	Kaua'i	Total	Small	Medium	Large
Recycle	82%	82%	84%	86%	**83%**	77%	87%	91%
Use Recycled Products	58	58	59	65	**59**	54	62	64
Energy Saving Bulbs	50	59	56	55	**53**	52	52	58
Reduce Energy Use	38	37	43	39	**38**	33	37	54
Clean w/ Ecofriendly Products	23	33	37	33	**28**	28	28	27
Water Conservation	22	27	32	26	**25**	26	23	26
Telecommute	13	13	13	9	**12**	12	14	11
Carpool	10	13	14	14	**11**	10	13	13
Solar and Photovoltaics	6	12	13	12	**9**	8	8	12
Use Low VOC Paints, Stains, or Sealers	7	10	11	10	**8**	7	9	11
Fuel Efficient and Alternative Fuel Vehicles	6	9	9	8	**7**	7	7	7
Other	6	7	7	7	**6**	5	6	8
Subsidized Bus Pass	9	2	3	2	**6**	3	7	12
Bicycle Commute Program	2	1	3	2	**2**	2	2	2
Average # of Green Practices:	**3.3**	**3.6**	**3.8**	**3.7**		**3.2**	**3.5**	**4.0**

regard, adopting technologies such as timers or other automatic-shutoff systems on high-energy appliances. Indeed, energy conservation measures can range from complex to pragmatic. Survey respondents cite the use of electronic ballasts in fluorescent lighting, variable-frequency drive motors for air-conditioning and booster pumps, and even wind generators.[9] For natural cooling and lighting, some companies report the use of skylights, fans and even black-out drapes. One business reported simply turning off the lights for half the day.

Twenty-eight percent of respondents clean with eco-friendly products, and nearly as much (25 percent) practice water conservation. For example, one company reports the installation of rain sensors on its irrigation systems, while another uses reclaimed water for irrigating a golf course. In the transportation area, telecommuting and carpooling were listed as a green practices by more than 10 percent of responding businesses (Table 19). Several companies reported "walk to work" programs.

Analysis of survey data by county shows that Maui and Kaua'i counties report the largest average number of green practices per worksite (Table 19). Worksites in these two counties report a relatively strong commitment to recycling, use of recycled products, reduced energy consumption, water conservation, and commuting via carpool or bicycle.

Businesses in O'ahu and Kaua'i counties cite close cooperation with local energy companies to moderate energy usage during periods of energy shortages. For example, one company reports participation in the Hawaiian Electric Company's (HECO) *Energy Scouts* program. Members of this initiative allow HECO to control 50-10,000 kW of their energy use on an as-needed basis. If alerted by HECO of a systemic energy shortage, *Energy Scouts* are compensated to cut energy demand by either activating backup generators or decreasing the use of high-energy appliances.[10] Across employer worksite size categories, more than 75 percent recycle, over one-half use energy-saving light bulbs and recycled products, and roughly one-quarter clean with eco-friendly products and conserve water (Table 19). On average, larger businesses are more likely to adopt green practices with a higher

[9] Variable frequency drives (VFD) vary the quantity of air pumped, for example through an air-conditioning unit, depending on system demand.

[10] www1.eere.energy.gov/femp/financing/eip_hi.html

Green Certification

Several organizations certify green products and services. *Green Seal* is a non-profit organization that certifies a broad range of products and services, including cleaning products and hotels; they also partner with large institutional purchasers to develop green purchasing plans. The U.S. Green Building Council (USGBC) certifies construction companies that build according to sustainability requirements. USGBC developed the LEED building requirements, and LEED-certified buildings must be cleaned with products that are either certified by *Green Seal* or compliant with California environmental codes. Several additional entities encourage green practices in the hotel industry. These include the Green Hotels Association, EcoGreen Hotel, Green Globe, and the Tourism Sustainability Council, which provide green guidelines and certify particular hotels as green. *EnergyStar* is a government-sponsored program that certifies appliances as energy-efficient, and *Green Shield* certifies pest control practices and companies.

Sources: *Honolulu Star-Advertiser,* "Check Labels to See What 'Green' Means," October 25, 2010. Other resources include GreenSeal.org, GreenHotels.com, EcoGreenHotel.com, EnergyStar.gov, GreenShieldCertified.org, and *www.cleanlink.com/cp/article.asp?id=2599&keywords=green+cleaning,+certification*.

frequency than their smaller counterparts. Large worksites performed an average of four green practices, compared with 3.5 and 3.2 for medium and small-size worksites, respectively (Table 19). For example, 91 percent of large employers recycle compared with just over three-quarters for small worksites; 54 percent report energy-use reduction compared to about one-third for small and mid-size worksites. Moreover, 12 percent of large businesses provide their employees with subsidized bus passes, compared with just three percent for smaller ones.

Large worksites may provide support for more green practices for a number of reasons, such as the ability to better mobilize employee adherence to green policies and practices. Given the size and number of personnel available at larger businesses, it may also be more likely that at least some segment of the overall workforce prescribes to a green practice. For example, the probability that a worksite with 1,000 employees supports at least one worker who recycles is likely to be higher than that for a small-size business of ten. The high occurrence of green practices at small firms, coupled with the constricted distribution of the average number of green practices across all firms (3.2 to 4), suggests that green practices at even the largest firms are practiced by a large proportion of employees.

Photo Courtesy of Peter Liu, kaiscapes.com

Table 20. Green Practices by Industry, Share of Total

Industry (Average Number of Green Practices)	Recycle	Energy Saving Bulbs	Use Recycled Products	Solar and Photo-voltaics	Telecom-mute	Use Low VOC Paints, Stains, or Seal-ers	Carpool	Clean w/ Eco-friendly Products	Fuel Ef-ficient & Alter-native Fuel Vehicles	Reduce Energy Use	Subsi-dized Bus Pass	Water Conser-vation	Bicycle Com-mute Program	Other
Agriculture, Forestry, Fishing & Hunting (3.1)	64%	47%	46%	18%	8%	8%	7%	26%	3%	28%	0%	38%	1%	17%
Mining (1.0)	44	11	11	11	0	0	0	0	0	22	0	0	0	0
Utilities (3.3)	83	54	54	9	11	14	3	20	11	31	9	23	3	6
Construction (3.4)	81	45	53	16	7	13	16	27	8	35	2	26	1	5
Manufacturing (3.4)	82	54	55	7	10	12	10	32	8	36	1	26	1	9
Wholesale Trade (3.0)	82	40	57	8	13	3	9	25	6	27	2	20	1	7
Retail Trade (3.8)	85	61	65	7	13	5	11	31	6	45	10	26	3	9
Transportation and Warehousing (3.2)	87	47	66	3	18	6	9	18	5	34	4	15	0	5
Information (3.1)	87	40	58	10	12	2	6	19	2	38	6	19	4	4
Finance and Insurance (3.4)	89	52	65	3	10	3	9	14	7	46	29	13	0	2
Real Estate and Rental and Leasing (3.7)	82	63	55	14	14	10	8	29	8	48	8	27	1	3
Professional, Scientific & Technical Services (3.3)	86	48	57	8	23	5	9	20	8	33	8	20	3	4
Management of Companies & Enterprises (3.7)	89	50	64	7	18	9	7	25	7	45	21	27	0	2
Administrative & Support & Waste Mgmt & Remediation Services (3.3)	75	47	55	9	10	4	14	31	9	31	5	28	3	6
Educational Services (3.6)	83	54	61	12	11	10	16	35	6	41	9	19	4	4
Health Care & Social Assistance (3.5)	90	54	61	9	14	8	12	24	6	36	10	17	2	4
Arts, Entertainment & Recreation (4.1)	83	57	58	13	19	12	12	42	12	50	5	35	1	14
Assomodation & Food Services (4.0)	83	69	62	5	7	11	16	35	6	51	2	37	2	11
Other Services (except Public Admin) (3.4)	77	58	58	6	9	14	9	30	6	38	3	30	1	5

Green Practices by Industry

By major industry group, the *Arts, Entertainment, & Recreation* and *Accommodation & Food Services* industries report the highest average number of green practices at 4.1 and 4.0, respectively (Table 20). *Accommodation & Food Services* ranked first in the overall use of energy saving light bulbs (69 percent) and reducing energy usage (51 percent), and second in cleaning with eco-friendly products (35 percent) and water conservation (37 percent). The significance of this finding is that *Accommodation & Food Services* is the largest private industry employer in the State, and these businesses generally require large amounts of energy to operate.

Agriculture is another sector heavily dependent on natural resources, with survey data reporting the highest share for water conservation and usage of solar and photovoltaic systems at 38 percent and 18 percent, respectively. Given the central role that water plays in irrigation systems, there remain significant opportunities for further conservation efforts among the State's farming sector.

Recycling is popular and widely practiced throughout the State, with a majority of industries reporting participation rates in excess of 80 percent. Ninety percent of reporting worksites in the *Health Care & Social Assistance* industry recycle compared to just over 40 percent in *Mining*. Meanwhile, *Transportation & Warehousing* had the highest share of worksites utilizing recycled products (66 percent), which is most likely due to the use of recycled cardboard containers and other moving materials. At least half of the remaining industries used recycled products.

Finance & Insurance and *Management of Companies & Enterprises* lead in the practice of subsidized bus passes at 29 percent and 21 percent, respectively. This relatively high participation rate is likely the result of being located in the urban core. The *Professional, Scientific, and Technical Services* industry reports the highest rate of telecommuting (23 percent), which is likely due to recent technological advances, lower communication costs and the fact that many of these services can be efficiently performed from home offices.

Diversity of Green Practices

In addition to the green practices listed on the survey instrument, businesses were allowed to customize their responses. These diverse and sometimes creative practices include the use of chlorine-free paper from sustainable forests, bio-degradable organic eating utensils and containers made from vegetable matter, rechargeable batteries, LEED-certified buildings, low-sulfur diesel, heat reclamation from refrigeration and air-conditioning for hot water supply, and locally-sourced procurements. Several companies report providing reusable eating implements, including dishes, silverware, water bottles, and coffee cups, all of which eliminate or reduce waste byproducts. Other businesses limit copier and printer use while encouraging electronic communications and record-keeping. Interestingly, one company supports an executive mandate requiring "paperless" meetings. In the agriculture and landscaping sectors, green practices include composting, use of native species to preserve biodiversity, and the venerable practice of "giving food scraps to the pigs."
Opportunities to "go green" are abundant. Initiatives to locate eco-friendly or eco-friendlier alternatives may require creativity, but can be practical and low-cost as well.

Conclusion

The green economy in Hawai‘i is sizable and positioned to grow rapidly. Fueling this trend is consumer demand for goods and services that are carbon-neutral or low impact on the environment. Businesses are responding to this niche market by developing production processes and delivery systems that consider factors beyond profit maximization. While these intentions may be well placed, our knowledge of the environment and the role that humans play in it remains limited and is still evolving. Technologies that can reduce our ecological footprint also require costly research and, in some cases, complex infrastructure. To effectively respond to these challenges, policy makers and community leaders must cultivate an educated and skilled workforce capable of meeting the needs of a clean-energy economy.

Data from the inaugural *Hawai‘i Green Jobs Survey* indicate that green jobs are expected to increase from a 2.4 percent share of total private employment in 2010 to 2.9 percent by 2012. Such growth will bring on line 2,903 new green jobs statewide, a 26 percent increase in just two years. This contrasts with a one percent average increase in total State employment over the same period.[11] Given our findings that green jobs exist in a large array of industries, ranging from traditional sectors such as agriculture and construction to high technology ventures in bio-fuels and hydrothermal, a growth rate differential of this magnitude can have profound social and economic implications

Labor market participants will require the tools and resources to transition to a greener economy. This will include retraining on-the-job or through certification and licensing. Enrollment in formal degree programs may be necessary if workers are to pursue entirely new careers, either by choice or through underemployment

Photo Courtesy of Kaua‘i County Recycling

or unemployment. The associated costs, both direct and indirect, can be significant, particularly during the current period of post-recession economic recovery. Success will require active coordination among all stakeholders. Educators and training providers must provide timely and relevant curricula; policy makers will need to provide support in the form of funding and a strategic plan that can deliver on its ambitious HCEI goals; business leaders should continue to actively incorporate greener practices and processes into their production platforms; and workers or those seeking employment will need to update existing skills and competencies to maintain their competitiveness. This report provides the first comprehensive assessment of Hawaii’s green workforce.

Employment patterns and vacancy trends are analyzed at the state and county levels across all major groups of industries, occupations and worksite sizes. Green is an evolving concept that is better understood when considered within the context of a larger labor market information (LMI) system. Connecting the data collected on green jobs with broader LMI-use dynamics and best practices will be an essential next step. Such efforts are currently underway, and encompass two additional areas:

[11] DLIR Research & Statistics Office, *Long-Term Industry Projections, State, 2008-2018*, 2010. The overall increase is based on first quarter 2010 non-government employment of 467,443 and projected 2012 employment of 476,835.

(1) Detailed projections on green jobs across major industry and occupational groups. Econometric models will be used to generate a near- and long-term assessment of Hawaii's future employment needs based on current trends, conditions, and policies and incentives impacting green investments.

(2) Skills gap analyses that assess the skill and competency requirements of green industries and occupations; demographic characteristics of existing and potential green workers; and, current and prospective educational resources and training capacity. The goal will be to strengthen the linkages between job seekers, employers, and education and training providers.

Establishing a process to standardize the definitions, concepts and technical issues related to green jobs will facilitate the sharing of information across states and regions. This leverages existing data, and helps to develop a more comprehensive understanding of occupation and industry relationships. The US Bureau of Labor Statistics (BLS) has already solicited public feedback and finalized a working definition for green jobs at the national level.[12] Based on this definition, the BLS intends to collect occupational employment and wage data through its existing *Occupational Employment Statistics* survey. Modalities to track emerging green businesses and potential new occupations would also be useful to more formally integrate green sectors with the wider economy. This will require coordination with the *Occupational Information Network* (O*NET) program, and possible changes to the NAICS and SOC.

The State of Hawai'i is making significant progress toward a more energy independent and secure future. While the challenges are numerous, measuring the depth and breadth of the green workforce is a necessary first step. The *Hawai'i Green Jobs Survey* provides the foundation upon which stakeholders across government, business and civil society can build a sustainable, greener economy.

[12] Federal Register, Vol. 75, No. 202.

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Appendix A: Methodological Details

The data presented here is predominantly based on a survey conducted from May to July 2010 of a random sample of 9,146 worksites drawn from the *Quarterly Census of Employment and Wages* (QCEW) database, which contains data on approximately 37,674 private Hawai'i worksites that report to the State's Unemployment Insurance Division.

To ensure a representative sample, the Hawai'i Department of Labor and Industrial Relations (DLIR) mailed the survey to a cross-section (stratified sample) of the QCEW, including samples from all four counties -- O'ahu, Hawai'i, Maui and Kaua'i. It was important to stratify the sample by county to ensure that the uneven distribution of businesses across the state did not adversely skew the sample.[13]

Within each county, a cross-section of worksites was randomly chosen such that small (1-9 employees), medium (10-49 employees), and large worksites (50 or more employees) would be represented. In order to obtain complete data on worksites with potentially very large numbers of green employees, or very small numbers of green employees relative to their total number of employees, all large worksites were sampled. This decreased the variance in the random sample of small and medium-sized worksites, thus increasing the power of the random sample.

The sample was further stratified in order to get a cross-section of industries operating in Hawai'i, including traditional industries and those thought likely to have a large representation of green jobs. By increasing the sample in NAICS codes likely to contain large numbers of green jobs, these high-variance strata were better covered and the power of the overall sample increased.

All 23 private sectors in the *North American Industry Classification System* (NAICS, see inset) were randomly sampled, including: Agriculture, Forestry, Fishing & Hunting (11); Mining (21); Construction (23); Manufacturing (31-33); Wholesale Trade (42); Retail Trade (44-45); Transportation and Warehousing (48-49); Utilities (22); Information (51); Finance and Insurance (52); Real Estate and Rental and Leasing (53); Professional, Scientific & Technical Services (54); Management of Companies and Enterprises (55); Administrative & Support & Waste Management & Remediation Services (56); Education Services (61); Health Care and Social Assistance (62); Arts Entertainment and Recreation (71); Accommodation and Food Services (72); and Other Services (except Public Administration) (81). Public Administration (92) was not sampled, but the public sector will be included in future samples (Table 21).

The initial response to the survey mailing was 2,285 completed surveys (referred to subsequently as Wave 1) which arrived within a 10-day grace period of the June 4th deadline. The initial response rate was thus 24.98 percent. An aggressive follow-up strategy was implemented with non-responders, which yielded an additional 1,723 completed surveys (referred to subsequently as Wave 2). This brought the total response to 4,008 of the original 9,146 sampled worksites, or a response rate of 43.82 percent.

Upon examination of the data, non-response bias was detected between Wave 1 and Wave 2 responders. To address this bias, a logistic regression was used to estimate propensity scores for prediction of likely responders and non-responders within the unsampled data. In the final estimation, the weight of Wave 1 sample data was increased to estimate the number of green jobs for likely responders, and likewise, the weight of Wave 2 sample data was increased to estimate the number of green jobs for likely non-responders. This method yielded an unbiased estimate of total green jobs.

[13] Katalina McGlone contributed to the drafting of this section.

Data

The QCEW database formed the survey universe. The QCEW includes extensive descriptive detail on every employer that reports to Hawai‘i’s Unemployment Insurance (UI) Division. UI coverage is mandatory for most employers. At the time the sample was drawn, the latest available QCEW database was used, which was for the 3rd quarter of 2009. To get the most detailed county data possible, private employer QCEW records at the worksite level were used. Not sampled were employers with zero employees in the 3rd month of the quarter (6,310 in September), or with no specific county designation (1,020 in September). These exclusions yielded a revised survey universe totaling 30,484 records (Figure 2).

While most businesses in Hawai‘i correctly disaggregated their reports by worksite in the QCEW database, a small subset reported for all their Hawai‘i locations at once. We saw no reason to think that systematic bias would result from the foregoing and most businesses have only one worksite. Therefore, we assumed that all businesses reported by worksite. While we use the technical term “worksite” in the report, the data would be nearly identical if based on “businesses” or “employers” as the unit of analysis.

Table 21. Sample Size by Industry

NAICS		# of Work-sites Sampled	Share of Total
11	Agriculture	177	1.9%
21	Mining	16	0.2%
22	Utilities	65	0.7%
23	Construction	1,135	12.4%
31-33	Manufacturing	413	4.5%
42	Wholesale Trade	523	5.7%
44-45	Retail Trade	1,174	12.8%
48-49	Transportation/Warehousing	274	3.0%
51	Information	149	1.6%
52	Finance & Insurance	286	3.1%
53	Real Estate & Rental & Leasing	344	3.8%
54	Professional, Scientific, & Technical Services	1,038	11.3%
55	Management of Companies & Enterprises	118	1.3%
56	Administrative/Support/Waste Mgmt/Remediation Services	715	7.8%
61	Educational Services	241	2.6%
62	Health Care & Social Assistance	678	7.4%
71	Arts, Entertainment, & Recreation	179	2.0%
72	Accomodation & Food Services	836	9.1%
81	Other Services	785	8.6%
	TOTAL	**9,146**	**100.0%**

Sample selection

DLIR chose the sample size based on available resources. Neyman methods and a Monte Carlo simulation to determine the required sample for significance testing showed that a larger sample approaching the universe of data would be optimal. This large sample is preferable given: 1) the strong positive skew of the distribution of the quantity of jobs, 2) the mean of total green jobs in the sample is near 0 at 0.34, and 3) when compared to the mean, the variance is relatively high at 28.55 jobs. The suggested comprehensive survey of green jobs could be obtained with a rolling sample such that all companies were sampled at least once every 3-5 years.

The statistical program SPSS drew a disproportionate stratified random sample, which means businesses were drawn from some strata at a different proportion compared to others. Two principles guided the proportions used to select the sample from various strata:

1) Ensure adequate representation from the smaller counties, businesses, and NAICS codes.

2) Draw more heavily from strata thought to be more likely to contain the main variable of interest -- green jobs (“green” and “green 2-digit NAICS” categories, and larger businesses). This provided more coverage of strata with most of the green jobs.

The stratified random sample, divided by county, size, "green or non-green," and NAICS, required calculation of 312 non-certainty sample cells. Records were randomly sampled *without* replacement. A stratified sample guards against an unrepresentative sample that does not have adequate representation of various important strata (e.g., neighbor island counties and small-size businesses). Furthermore, data generated from a random sample can be generalized from the sample to the larger population.

By giving a larger-than-proportionate sample size in one or more subgroups, a stratified sample ensures that sufficient sample data is obtained to support a separate analysis of any subgroup, such as by county, industry size, and 2-digit NAICS codes. For example, because fewer businesses were in the neighbor island counties than O'ahu, worksites were over-sampled to ensure adequate numbers for meaningful reporting. Also over-sampled were businesses from the green NAICS codes, because they had more chance to contribute to the main variable of interest – green jobs. Worksites with greater than 50 employees were sampled with 100 percent certainty because they were more likely to have some green jobs than were smaller businesses. Oversampling from green NAICS codes mitigated the effects of higher expected variance in these strata.

The sample was primarily from the City and County of Honolulu (*n* = 5,559, 60.8 percent), followed by Hawai'i (*n* = 1,447, 15.8 percent), Maui (*n* = 1,392, 15.2 percent) and Kaua'i (*n* = 748, 8.2 percent). The majority of the worksites had 1 – 9 employees (*n* = 5,044, 55.1 percent). The other size categories were 10 – 49 employees (*n* = 2,445, 26.7 percent) and businesses with 50+ employees; the latter were sampled with certainty, that is, 100 percent were in the sample (*n* = 1,657, 18.1 percent). Businesses from entire 4-digit NAICS industry codes which were more likely to have some green activities at the 6-digit level were considered green (*n* = 4,394, 48 percent). Businesses with non-green NAICS codes comprised 52 percent of the sample (*n* = 4,752). All sample universe worksites in strata with 15 or fewer worksites were selected with certainty. If the strata had fewer than 10 worksites after proportioning, then all were selected from the cell.

Analysts iterated through cell proportion modifications until an optimal mix of overall sample size and individual cell sample coverage was reached. For employment size class 1 (1-9), we sampled 30 percent of green industries on O'ahu and 45 percent from the neighbor islands. For employment size 2, 45 percent of green industries on O'ahu were sampled, compared to 55 percent from the neighbor islands. For size 1, non-green, 15 percent were sampled from all counties. For size 2 non-green, 20 percent were sampled from all counties.

Stratification:

County

The sample was stratified by Hawai'i 's four counties: Honolulu (O'ahu), Hawai'i , Maui, and Kaua'i. It was important to stratify the sample by county to ensure that there was adequate geographic representation in the sample from all four counties. O'ahu has about two-thirds of the QCEW worksites.

Worksite Size

Hawai'i's businesses were categorized by number of employees into three groups: 1-9, 10-49, and 50+. Because there were a disproportionate number of business worksites across employment size categories, it was important to stratify the sample by number of employees. Based on the hypothesis that the larger the firm, the more likely the firm is to have at least one green job, larger firms were sampled with higher probability of being selected. All of the largest firms (50+ employees) were included in the sample, that is they were sampled with 100 percent certainty. Because the smallest firms (1-9 employees) have a smaller probability of having at least one green job, they were sampled at a lower proportion. Thus, even though the smallest businesses comprised about three-quarters of Hawai'i worksites, they were only about one-half of the sample.

Green / Non-green

Because of the limited resources available to conduct a survey, industries with a higher incidence of green jobs were sampled with higher probability. These select green industries were referenced as such in the *State of Hawai'i Workforce Report* produced by the Hawai'i Workforce Development Council, which was guided by the PEW Charitable Trusts report.

After critical review of remaining NAICS by both the Hawai'i Labor Market Research Section and the Hawai'i Green Jobs Initiative Team, several additional industries were designated as green. All told, there were 113 NAICS 4-digit level industry codes that Hawai'i classified as green. However, it should be noted that ALL the remaining non-green industries at the 2-digit NAICS level were sampled, though at a much lower rate than those in the 4-digit NAICS green industries.

For purposes of stratification, "green" means that at least a small number of codes at the 6-digit level in that particular 2-digit NAICS were likely green. The *entire* 4-digit NAICS was categorized green, even though most of the jobs within those codes are likely to be non-green.

Industry (NAICS)

Not including *Public Administration*, there are 23 2-digit NAICS codes that cover 19 industrial sectors. Of these 2-digit NAICS, 16 contained the presence of at least some green 4-digit NAICS codes. Because the remainder of these 16 NAICS are not classified green, it is required that there be two separate sampling cells for each individual 2-digit NAICS, green and non-green. In addition, there were seven 2-digit NAICS that had no "green" 4-digit NAICS. Thus, these individual 2-digit NAICS strata only require one cell, non-green, for purposes of sample selection. For the sample size of each NAICS strata, see Table 21.

Estimation

After random sampling and data collection, the following estimation procedure was followed.

1) Sum across Green job descriptions in the sample data and remove non-unique survey IDs (multiple job descriptions for one employer)

    a. Out of business worksites (OOBs) are counted as 0 jobs for purposes of summing and weighting of green jobs for all categories. For example, if ½ of a sample cell is composed of OOBs, then infer ½ OOBs in the universe cell (0 jobs for half of the cell population).

2) Divide data into Wave 1 (data received prior to June 14) and Wave 2 (data received on or after June 14). The cut-off date, June 14, was chosen because it provided respondents with a ten-day grace period, and coincided with the start of an intensive campaign to improve response using phone calls, emails, postcard reminders, and additional survey mailings to nonrespondents.

3) Make histograms and determine summaries comparing Wave 1 covariates (NAICS, Size, Green, etc) to Wave 2 covariates, and do a Z-test to determine whether systematic bias in Wave 1 and Wave 2 data is likely. The Z-test showed with 90 percent certainty that bias existed between Wave 1 and Wave 2 in terms of size category. This non-response bias will be corrected in estimation of green jobs in the universe below.

4) Load data from QCEW universe

    a. Use file "UNIVERSEEQUI093.csv"

5) Estimate logit model from the sample data stratified between Wave 1 and Wave 2 data to use for the propensity to respond variable (propensity score) in the universe of data. Wave 1 sample data will then be used to infer green jobs in the universe of likely responders, and Wave 2 sample data will be used to infer green jobs in the universe of likely non-responders. This procedure removes any non-response bias that may exist.

    a. Linear model: $logit(y=BX+e)$

    $Logit(Responder = B(Green+C2.NAICS+County+Size)+e)$, where B is a vector of Four coefficients estimated by logistic regression.

    b. The model resulting from the Wave 1 and Wave 2 sample data is used to predict which unsampled observations would have been likely to respond or not respond (given their covariates – Green, NAICS, County, and Size). This is the unsampled worksite's "propensity" to respond. Those with the highest propensity to respond (with cutoff propensity = x) are coded as Responders. The cutoff propensity is determined such that the proportion of responders in the universe of data equals the proportion of responders in the sample,

and such that green jobs for each strata in the universe is estimated with at least 25 percent of the inference resulting from data from each response category (Wave 1 and Wave 2).

6) Stratify both sample and universe data on Green, NAICS, County Code, Size, and Responder status.

    a. Calculate number of companies per bin for both sample and universe of data

    b. Calculate number of green jobs per bin for the sample data

7) Calculate weights per bin, *w_b*, whereby *w_b* multiplied by the number of green jobs in the sample bin will be the best unbiased estimate for the number of green jobs per universe bin.

8) Apply the method above to all jobs data, including current jobs, current vacancies, and jobs projected in 2012.

9) Calculate change in green jobs between 2010 and 2012 per strata as projected green jobs in 2012 minus current green jobs in 2010.

Appendix B: NAICS in Sample

NAICS	2007 NAICS TITLES
111150	Corn Farming
111211	Potato Farming
111219	Other Vegetable (except Potato) and Melon 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
111422	Floriculture Production
111930	Sugarcane Farming
111998	All Other Miscellaneous Crop Farming
112111	Beef Cattle Ranching and Farming
112120	Dairy Cattle and Milk Production
112310	Chicken Egg Production
112420	Goat Farming
112511	Finfish Farming and Fish Hatcheries
112512	Shellfish Farming
112519	Other Aquaculture
112910	Apiculture
112920	Horses and Other Equine Production
113210	Forest Nurseries and Gathering of Forest Products
113310	Logging
114111	Finfish Fishing
114112	Shellfish Fishing
115114	Postharvest Crop Activities (except Cotton Ginning)
115115	Farm Labor Contractors and Crew Leaders
115116	Farm Management Services
115210	Support Activities for Animal Production
115310	Support Activities for Forestry
211111	Crude Petroleum and Natural Gas Extraction
212319	Other Crushed and Broken Stone Mining and Quarrying
212321	Construction Sand and Gravel Mining
212325	Clay and Ceramic and Refractory Minerals Mining
212399	All Other Nonmetallic Mineral Mining
213112	Support Activities for Oil and Gas Operations
221112	Fossil Fuel Electric Power Generation
221119	Other Electric Power Generation
221210	Natural Gas Distribution
221310	Water Supply and Irrigation Systems
221320	Sewage Treatment Facilities
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
238150	Glass and Glazing Contractors
238160	Roofing Contractors
238170	Siding Contractors
238190	Other Foundation, Structure, and Building Exterior Contractors
238210	Electrical Contractors and Other Wiring Installation Contractors

Source: DLIR Research & Statistics Office, *Hawai'i Green Jobs Survey*, 2010.

Appendix B: NAICS in Sample (continued)

238220	Plumbing, Heating, and Air-Conditioning Contractors
238290	Other Building Equipment Contractors
238310	Drywall and Insulation Contractors
238320	Painting and Wall Covering Contractors
238330	Flooring Contractors
238340	Tile and Terrazzo Contractors
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
311212	Rice Milling
311311	Sugarcane Mills
311330	Confectionery Manufacturing from Purchased Chocolate
311340	Nonchocolate Confectionery Manufacturing
311421	Fruit and Vegetable Canning
311423	Dried and Dehydrated Food Manufacturing
311511	Fluid Milk Manufacturing
311513	Cheese Manufacturing
311520	Ice Cream and Frozen Dessert Manufacturing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311711	Seafood Canning
311712	Fresh and Frozen Seafood Processing
311811	Retail Bakeries
311812	Commercial Bakeries
311821	Cookie and Cracker Manufacturing
311823	Dry Pasta 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
311942	Spice and Extract Manufacturing
311991	Perishable Prepared Food Manufacturing
311999	All Other Miscellaneous Food Manufacturing
312111	Soft Drink Manufacturing
312112	Bottled Water Manufacturing
312113	Ice Manufacturing
312120	Breweries
312130	Wineries
312140	Distilleries
313311	Broadwoven Fabric Finishing Mills
313312	Textile and Fabric Finishing (except Broadwoven Fabric) Mills
314121	Curtain and Drapery Mills
314129	Other Household Textile Product Mills
314912	Canvas and Related Product Mills
314999	All Other Miscellaneous Textile Product Mills
315211	Men's and Boys' Cut and Sew Apparel Contractors
315212	Women's, Girls', and Infants' Cut and Sew Apparel Contractors
315222	Men's and Boys' Cut and Sew Suit, Coat, and Overcoat Manufacturing
315223	Men's and Boys' Cut and Sew Shirt (except Work Shirt) Manufacturing
315225	Men's and Boys' Cut and Sew Work Clothing Manufacturing
315232	Women's and Girls' Cut and Sew Blouse and Shirt Manufacturing
315233	Women's and Girls' Cut and Sew Dress Manufacturing
315239	Women's and Girls' Cut and Sew Other Outerwear Manufacturing
315291	Infants' Cut and Sew Apparel Manufacturing
315999	Other Apparel Accessories and Other Apparel Manufacturing
321113	Sawmills
321114	Wood Preservation
321214	Truss Manufacturing
321911	Wood Window and Door Manufacturing
321918	Other Millwork (including Flooring)
321999	All Other Miscellaneous Wood Product Manufacturing
322299	All Other Converted Paper Product Manufacturing
323110	Commercial Lithographic Printing
323112	Commercial Flexographic Printing
323113	Commercial Screen Printing
323114	Quick Printing
323115	Digital Printing
323119	Other Commercial Printing
324110	Petroleum Refineries
324121	Asphalt Paving Mixture and Block Manufacturing

325120	Industrial Gas Manufacturing
325188	All Other Basic Inorganic Chemical Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325611	Soap and Other Detergent Manufacturing
325620	Toilet Preparation Manufacturing
326111	Plastics Bag and Pouch Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326160	Plastics Bottle Manufacturing
326199	All Other Plastics Product Manufacturing
326212	Tire Retreading
327112	Vitreous China, Fine Earthenware, and Other Pottery Product Manufacturing
327122	Ceramic Wall and Floor Tile Manufacturing
327212	Other Pressed and Blown Glass and Glassware Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
327320	Ready-Mix Concrete Manufacturing
327331	Concrete Block and Brick Manufacturing
327332	Concrete Pipe Manufacturing
327390	Other Concrete Product Manufacturing
327991	Cut Stone and Stone Product Manufacturing
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
332311	Prefabricated Metal Building and Component Manufacturing
332313	Plate Work Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332431	Metal Can Manufacturing
332510	Hardware Manufacturing
332710	Machine Shops
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
333111	Farm Machinery and Equipment Manufacturing
333314	Optical Instrument and Lens Manufacturing
333319	Other Commercial and Service Industry Machinery Manufacturing
334413	Semiconductor and Related Device Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing
335991	Carbon and Graphite Product Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336611	Ship Building and Repairing
336612	Boat Building
337110	Wood Kitchen Cabinet and Countertop Manufacturing
337122	Nonupholstered Wood Household Furniture Manufacturing
337125	Household Furniture (except Wood and Metal) Manufacturing
337211	Wood Office Furniture Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339116	Dental Laboratories
339911	Jewelry (except Costume) Manufacturing
339914	Costume Jewelry and Novelty Manufacturing
339920	Sporting and Athletic Goods Manufacturing
339950	Sign Manufacturing
339992	Musical Instrument Manufacturing
339999	All Other Miscellaneous Manufacturing
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
423410	Photographic Equipment and Supplies Merchant Wholesalers

Appendix B: NAICS in Sample (continued)

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 Wholesalers
423620	Electrical and Electronic Appliance, Television, and Radio Set Merchant Wholesalers
423690	Other Electronic Parts and Equipment Merchant Wholesalers
423710	Hardware 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
423910	Sporting and Recreational Goods and Supplies Merchant Wholesalers
423920	Toy and Hobby Goods and Supplies Merchant Wholesalers
423930	Recyclable Material Merchant Wholesalers
423940	Jewelry, Watch, Precious Stone, and Precious Metal 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
424320	Men's and Boys' Clothing and Furnishings Merchant Wholesalers
424330	Women's, Children's, and Infants' Clothing and Accessories Merchant Wholesalers
424340	Footwear Merchant Wholesalers
424410	General Line Grocery Merchant Wholesalers
424420	Packaged Frozen Food Merchant Wholesalers
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
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
425120	Wholesale Trade Agents and Brokers
441110	New Car Dealers
441120	Used Car Dealers
441221	Motorcycle, ATV, and Personal Watercraft Dealers
441222	Boat Dealers
441310	Automotive Parts and Accessories Stores
441320	Tire Dealers
442110	Furniture Stores
442210	Floor Covering Stores
442291	Window Treatment Stores
442299	All Other Home Furnishings Stores
443111	Household Appliance Stores
443112	Radio, Television, and Other Electronics Stores
443120	Computer and Software Stores
443130	Camera and Photographic Supplies Stores
444110	Home Centers
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
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
446130	Optical Goods Stores
446191	Food (Health) Supplement Stores
446199	All Other Health and Personal Care Stores
447110	Gasoline Stations with Convenience Stores
447190	Other Gasoline Stations
448110	Men's Clothing Stores
448120	Women's Clothing Stores
448130	Children's and Infants' Clothing Stores
448140	Family Clothing Stores
448150	Clothing Accessories Stores
448190	Other Clothing Stores
448210	Shoe Stores
448310	Jewelry Stores
448320	Luggage and Leather Goods Stores
451110	Sporting Goods Stores
451120	Hobby, Toy, and Game Stores
451130	Sewing, Needlework, and Piece Goods Stores
451140	Musical Instrument and Supplies 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
453220	Gift, Novelty, and Souvenir Stores
453310	Used Merchandise Stores
453910	Pet and Pet Supplies Stores
453920	Art Dealers
453991	Tobacco Stores
453998	All Other Miscellaneous Store Retailers (except Tobacco Stores)
454111	Electronic Shopping
454113	Mail-Order Houses
454210	Vending Machine Operators
454311	Heating Oil Dealers
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers
454390	Other Direct Selling Establishments
481111	Scheduled Passenger Air Transportation
481112	Scheduled Freight Air Transportation
481211	Nonscheduled Chartered Passenger Air Transportation
481212	Nonscheduled Chartered Freight Air Transportation
483113	Coastal and Great Lakes Freight Transportation

Appendix B: NAICS in Sample (continued)

483114	Coastal and Great Lakes Passenger Transportation
484110	General Freight Trucking, Local
484122	General Freight Trucking, Long-Distance, Less Than Truckload
484210	Used Household and Office Goods Moving
484220	Specialized Freight (except Used Goods) Trucking, Local
485310	Taxi Service
485320	Limousine Service
485410	School and Employee Bus Transportation
485991	Special Needs Transportation
485999	All Other Transit and Ground Passenger Transportation
487110	Scenic and Sightseeing Transportation, Land
487210	Scenic and Sightseeing Transportation, Water
487990	Scenic and Sightseeing Transportation, Other
488119	Other Airport Operations
488190	Other Support Activities for Air Transportation
488320	Marine Cargo Handling
488390	Other Support Activities for Water Transportation
488410	Motor Vehicle Towing
488490	Other Support Activities for Road Transportation
488510	Freight Transportation Arrangement
488991	Packing and Crating
488999	All Other Support Activities for Transportation
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
493190	Other Warehousing and Storage
511110	Newspaper Publishers
511120	Periodical Publishers
511130	Book Publishers
511140	Directory and Mailing List Publishers
511191	Greeting Card Publishers
511210	Software Publishers
512110	Motion Picture and Video Production
512131	Motion Picture Theaters (except Drive-Ins)
512191	Teleproduction and Other Postproduction Services
512210	Record Production
512240	Sound Recording Studios
515111	Radio Networks
515112	Radio Stations
515120	Television Broadcasting
515210	Cable and Other Subscription Programming
517110	Wired Telecommunications Carriers
517210	Wireless Telecommunications Carriers (except Satellite)
517911	Telecommunications Resellers
517919	All Other Telecommunications
518210	Data Processing, Hosting, and Related Services
519120	Libraries and Archives
519130	Internet Publishing and Broadcasting and Web Search Portals
522110	Commercial Banking
522120	Savings Institutions
522130	Credit Unions
522220	Sales Financing
522291	Consumer Lending
522292	Real Estate Credit
522298	All Other Nondepository Credit Intermediation
522310	Mortgage and Nonmortgage Loan Brokers
522390	Other Activities Related to Credit Intermediation
523110	Investment Banking and Securities Dealing
523120	Securities Brokerage
523130	Commodity Contracts Dealing
523910	Miscellaneous Intermediation
523920	Portfolio Management
523930	Investment Advice
523999	Miscellaneous Financial Investment Activities
524113	Direct Life Insurance Carriers
524114	Direct Health and Medical Insurance Carriers
524126	Direct Property and Casualty Insurance Carriers
524127	Direct Title Insurance Carriers
524128	Other Direct Insurance (except Life, Health, and Medical) Carriers
524210	Insurance Agencies and Brokerages
524291	Claims Adjusting
524292	Third Party Administration of Insurance and Pension Funds
524298	All Other Insurance Related Activities
525920	Trusts, Estates, and Agency Accounts
525990	Other Financial Vehicles
531110	Lessors of Residential Buildings and Dwellings

531120	Lessors of Nonresidential Buildings (except Miniwarehouses)
531130	Lessors of Miniwarehouses and Self-Storage Units
531190	Lessors of Other Real Estate Property
531210	Offices of Real Estate Agents and Brokers
531311	Residential Property Managers
531312	Nonresidential Property Managers
531320	Offices of Real Estate Appraisers
531390	Other Activities Related to Real Estate
532111	Passenger Car Rental
532120	Truck, Utility Trailer, and RV (Recreational Vehicle) Rental and Leasing
532210	Consumer Electronics and Appliances Rental
532220	Formal Wear and Costume Rental
532230	Video Tape and Disc Rental
532291	Home Health Equipment Rental
532292	Recreational Goods Rental
532299	All Other Consumer Goods Rental
532411	Commercial Air, Rail, and Water Transportation Equipment Rental and Leasing
532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing
532490	Other Commercial and Industrial Machinery and Equipment Rental and Leasing
533110	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
541110	Offices of Lawyers
541191	Title Abstract and Settlement Offices
541199	All Other Legal Services
541211	Offices of Certified Public Accountants
541213	Tax Preparation Services
541214	Payroll Services
541219	Other Accounting Services
541310	Architectural Services
541320	Landscape Architectural Services
541330	Engineering Services
541340	Drafting Services
541350	Building Inspection Services
541360	Geophysical Surveying and Mapping Services
541370	Surveying and Mapping (except Geophysical) Services
541380	Testing Laboratories
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	Reseach 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
541830	Media Buying Agencies
541840	Media Representatives
541850	Display Advertising
541890	Other Services Related to Advertising
541910	Marketing Research and Public Opinion Polling
541921	Photography Studios, Portrait
541922	Commercial Photography
541930	Translation and Interpretation Services
541940	Veterinary Services
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
561312	Executive Search Services
561320	Temporary Help Services
561330	Professional Employer Organizations

Appendix B: NAICS in Sample (continued)

561410	Document Preparation Services
561422	Telemarketing Bureaus and Other Contact Centers
561431	Private Mail Centers
561439	Other Business Service Centers (including Copy Shops)
561440	Collection Agencies
561492	Court Reporting and Stenotype Services
561499	All Other Business Support Services
561510	Travel Agencies
561520	Tour Operators
561591	Convention and Visitors Bureaus
561599	All Other Travel Arrangement and Reservation Services
561611	Investigation Services
561612	Security Guards and Patrol Services
561613	Armored Car Services
561621	Security Systems Services (except Locksmiths)
561622	Locksmiths
561710	Exterminating and Pest Control Services
561720	Janitorial Services
561730	Landscaping Services
561740	Carpet and Upholstery Cleaning Services
561790	Other Services to Buildings and Dwellings
561920	Convention and Trade Show Organizers
561990	All Other Support Services
562111	Solid Waste Collection
562119	Other Waste Collection
562211	Hazardous Waste Treatment and Disposal
562212	Solid Waste Landfill
562213	Solid Waste Combustors and Incinerators
562910	Remediation Services
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
611420	Computer Training
611430	Professional and Management Development Training
611511	Cosmetology and Barber Schools
611512	Flight Training
611513	Apprenticeship Training
611519	Other Technical and Trade Schools
611610	Fine Arts Schools
611620	Sports and Recreation Instruction
611630	Language Schools
611691	Exam Preparation and Tutoring
611699	All Other Miscellaneous Schools and Instruction
611710	Educational Support Services
621111	Offices of Physicians (except Mental Health Specialists)
621112	Offices of Physicians, Mental Health Specialists
621210	Offices of Dentists
621310	Offices of Chiropractors
621320	Offices of Optometrists
621330	Offices of Mental Health Practitioners (except Physicians)
621340	Offices of Physical, Occupational and Speech Therapists, and Audiologists
621391	Offices of Podiatrists
621399	Offices of All Other Miscellaneous Health Practitioners
621410	Family Planning Centers
621420	Outpatient Mental Health and Substance Abuse Centers
621491	HMO Medical Centers
621492	Kidney Dialysis Centers
621493	Freestanding Ambulatory Surgical and Emergency Centers
621498	All Other Outpatient Care Centers
621511	Medical Laboratories
621610	Home Health Care Services
621910	Ambulance Services
621991	Blood and Organ Banks
621999	All Other Miscellaneous Ambulatory Health Care Services
622110	General Medical and Surgical Hospitals
622210	Psychiatric and Substance Abuse Hospitals
622310	Specialty (except Psychiatric and Substance Abuse) Hospitals
623110	Nursing Care Facilities
623210	Residential Mental Retardation Facilities
623220	Residential Mental Health and Substance Abuse Facilities
623311	Continuing Care Retirement Communities

623312	Homes for the Elderly
623990	Other Residential Care Facilities
624110	Child and Youth Services
624120	Services for the Elderly and Persons with Disabilities
624190	Other Individual and Family Services
624210	Community Food Services
624221	Temporary Shelters
624229	Other Community Housing Services
624230	Emergency and Other Relief Services
624310	Vocational Rehabilitation Services
624410	Child Day Care Services
711110	Theater Companies and Dinner Theaters
711120	Dance Companies
711130	Musical Groups and Artists
711190	Other Performing Arts Companies
711219	Other Spectator Sports
711310	Promoters of Performing Arts, Sports, and Similar Events with Facilities
711320	Promoters of Performing Arts, Sports, and Similar Events without Facilities
711510	Independent Artists, Writers, and Performers
712110	Museums
712120	Historical Sites
712130	Zoos and Botanical Gardens
712190	Nature Parks and Other Similar Institutions
713110	Amusement and Theme Parks
713120	Amusement Arcades
713910	Golf Courses and Country Clubs
713930	Marinas
713940	Fitness and Recreational Sports Centers
713950	Bowling Centers
713990	All Other Amusement and Recreation Industries
721110	Hotels (except Casino Hotels) and Motels
721191	Bed-and-Breakfast Inns
721199	All Other Traveler Accommodation
721214	Recreational and Vacation Camps (except Campgrounds)
721310	Rooming and Boarding Houses
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
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
811122	Automotive Glass Replacement Shops
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
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
811420	Reupholstery and Furniture Repair
811490	Other Personal and Household Goods Repair and Maintenance
812111	Barber Shops
812112	Beauty Salons
812113	Nail Salons
812191	Diet and Weight Reducing Centers
812199	Other Personal Care Services
812210	Funeral Homes and Funeral Services
812310	Coin-Operated Laundries and Drycleaners
812320	Drycleaning and Laundry Services (except Coin-Operated)
812331	Linen Supply
812332	Industrial Launderers
812910	Pet Care (except Veterinary) Services
812921	Photofinishing Laboratories (except One-Hour)
812922	One-Hour Photofinishing
812930	Parking Lots and Garages
812990	All Other Personal Services
813110	Religious Organizations
813211	Grantmaking Foundations
813212	Voluntary Health Organizations

Appendix B: NAICS in Sample (continued)

813219	Other Grantmaking and Giving Services
813311	Human Rights Organizations
813312	Environment, Conservation and Wildlife Organizations
813319	Other Social Advocacy Organizations
813410	Civic and Social Organizations
813910	Business Associations
813920	Professional Organizations
813930	Labor Unions and Similar Labor Organizations
813990	Other Similar Organizations (except Business, Professional, Labor, and Political Organizations)
814110	Private Households

Appendix C: Green Job Occupations

SOC Code	OCCUPATIONAL TITLE	GREEN JOBS
37-2011.00	Janitors and Cleaners Except Maids and Housekeeping Cleaners	1,197
19-4093.00	Forest and Conservation Technicians	601
33-9032.00	Security Guards	552
47-2111.00	Electricians	438
49-9021.01	Heating and Air Conditioning Mechanics and Installers	348
47-2031.01	Construction Carpenters	306
47-2131.00	Insulation Workers Floor Ceiling and Wall	277
37-3011.00	Landscaping and Groundskeeping Workers	276
47-4099.01	Solar Photovoltaic Installers	237
41-2031.00	Retail Salespersons	219
19-4091.00	Environmental Science and Protection Technicians Including Health	196
51-9199.01	Recycling and Reclamation Workers	194
47-4099.02	Solar Thermal Installers and Technicians	194
53-7062.00	Laborers and Freight Stock and Material Movers Hand	191
47-2132.00	Insulation Workers Mechanical	184
47-2061.00	Construction Laborers	173
47-1011.00	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	167
47-2152.02	Plumbers	167
47-4041.00	Hazardous Materials Removal Workers	160
49-9042.00	Maintenance and Repair Workers General	159
17-2051.00	Civil Engineers	152
17-2071.00	Electrical Engineers	140
41-3099.00	Sales Representatives Services All Other	126
53-6099.00	Transportation Workers, All Other	121
27-3031.00	Public Relations Specialists	121
51-9061.00	Inspectors Testers Sorters Samplers and Weighers	117
19-2041.00	Environmental Scientists and Specialists Including Health	114
49-9099.00	Installation Maintenance and Repair Workers All Other	114
45-2092.02	Farmworkers and Laborers Crop	106
37-1012.00	First-Line Supervisors/Managers of Landscaping Lawn Service and Groundskeeping Worke	103
41-2011.00	Cashiers	103
49-3023.02	Automotive Specialty Technicians	95
41-1011.00	First-Line Supervisors/Managers of Retail Sales Workers	89
53-3032.00	Truck Drivers Heavy and Tractor-Trailer	84
45-4011.00	Forest and Conservation Workers	82
41-4011.00	Sales Representatives Wholesale and Manufacturing Technical and Scientific Products	80
45-2041.00	Graders and Sorters Agricultural Products	79
15-1041.00	Computer Support Specialists	76
11-9012.00	Farmers and Ranchers	75
43-3031.00	Bookkeeping Accounting and Auditing Clerks	73
27-1025.00	Interior Designers	69
11-1021.00	General and Operations Managers	69
41-9041.00	Telemarketers	66
47-2044.00	Tile and Marble Setters	64
51-6093.00	Upholsterers	64
17-1011.00	Architects Except Landscape and Naval	62
49-1011.00	First-Line Supervisors/Managers of Mechanics Installers and Repairers	61
13-1199.05	Sustainability Specialists	61
43-9061.00	Office Clerks General	58
17-2141.00	Mechanical Engineers	57

Source: DLIR Research & Statistics Office, *Hawai'i Green Jobs Survey*, 2010.

Appendix C: Green Job Occupations (continued)

13-1023.00	Purchasing Agents Except Wholesale Retail and Farm Products	55
47-4021.00	Elevator Installers and Repairers	54
47-2041.00	Carpet Installers	54
47-2073.00	Operating Engineers and Other Construction Equipment Operators	53
17-2199.03	Energy Engineers	53
41-4012.00	Sales Representatives Wholesale and Manufacturing Except Technical and Scientific Pr	53
11-9041.00	Engineering Managers	48
51-1011.00	First-Line Supervisors/Managers of Production and Operating Workers	48
41-9031.00	Sales Engineers	46
49-9092.00	Commercial Divers	45
37-3013.00	Tree Trimmers and Pruners	42
37-2021.00	Pest Control Workers	42
53-3033.00	Truck Drivers Light or Delivery Services	42
51-9023.00	Mixing and Blending Machine Setters Operators and Tenders	37
13-1051.00	Cost Estimators	37
45-2092.01	Nursery Workers	37
45-2093.00	Farmworkers Farm and Ranch Animals	36
49-2092.00	Electric Motor Power Tool and Related Repairers	36
51-7011.00	Cabinetmakers and Bench Carpenters	35
51-8013.00	Power Plant Operators	34
49-9098.00	Helpers--Installation Maintenance and Repair Workers	34
51-5023.00	Printing Machine Operators	34
41-4011.07	Solar Sales Representatives and Assessors	33
47-1011.03	Solar Energy Installation Managers	32
39-6021.00	Tour Guides and Escorts	29
29-9011.00	Occupational Health and Safety Specialists	29
47-4099.03	Weatherization Installers and Technicians	28
51-9121.00	Coating Painting and Spraying Machine Setters Operators and Tenders	28
19-3051.00	Urban and Regional Planners	27
51-9199.00	Production Workers, All Other	27
11-9151.00	Social and Community Service Managers	26
15-1099.11	Information Technology Project Managers	26
11-1011.00	Chief Executives	26
41-2021.00	Counter and Rental Clerks	25
47-5021.00	Earth Drillers Except Oil and Gas	25
47-2141.00	Painters Construction and Maintenance	24
51-9032.00	Cutting and Slicing Machine Setters Operators and Tenders	24
47-2211.00	Sheet Metal Workers	23
25-3099.00	Teachers and Instructors All Other	22
51-9197.00	Tire Builders	22
19-1031.01	Soil and Water Conservationists	22
43-5021.00	Couriers and Messengers	21
23-1011.00	Lawyers	20
19-4011.01	Agricultural Technicians	19
53-7061.00	Cleaners of Vehicles and Equipment	19
11-9021.00	Construction Managers	19
17-2081.00	Environmental Engineers	19
51-6052.00	Tailors Dressmakers and Custom Sewers	19
51-4121.06	Welders Cutters and Welder Fitters	18
43-6011.00	Executive Secretaries and Administrative Assistants	17
11-2021.00	Marketing Managers	17
13-1073.00	Training and Development Specialists	16
25-2032.00	Vocational Education Teachers Secondary School	16
19-2042.00	Geoscientists Except Hydrologists and Geographers	15

39-1021.00	Firstline Supervisors/Personal Service Workers	15
17-3022.00	Civil Engineering Technicians	14
11-9199.11	Brownfield Redevelopment Specialists and Site Managers	14
47-2181.00	Roofers	13
17-3027.00	Mechanical Engineering Technicians	13
17-3012.02	Electrical Drafters	13
19-2031.00	Chemists	13
19-4099.01	Quality Control Analysts	12
51-5022.00	Prepress Technicians and Workers	12
11-3051.04	Biomass Production Managers	11
47-4099.00	Construction and Related Workers All Other	11
43-5081.03	Stock Clerks- Stockroom Warehouse or Storage Yard	11
43-1011.00	First-Line Supervisors/Managers of Office and Administrative Support Workers	10
13-1199.01	Energy Auditors	10
45-1011.07	First-Line Supervisors/Managers of Agricultural Crop and Horticultural Workers	10
17-2199.11	Solar Energy Systems Engineers	10
17-1012.00	Landscape Architects	10
51-3092.00	Food Batchmakers	8
51-9021.00	Crushing Grinding and Polishing Machine Setters Operators and Tenders	8
27-1011.00	Art Directors	8
13-1041.01	Environmental Compliance Inspectors	8
43-6014.00	Secretaries Except Legal Medical and Executive	7
43-4171.00	Receptionists and Information Clerks	7
11-2022.00	Sales Managers	7
49-9094.00	Locksmiths and Safe Repairers	7
15-1099.02	Computer Systems Engineers/ Architects	7
11-3021.00	Computer and Information Systems Managers	6
11-3051.01	Quality Control Systems Managers	6
49-9041.00	Industrial Machinery Mechanics	6
11-3071.02	Storage and Distribution Managers	6
51-3022.00	Meat Poultry and Fish Cutters and Trimmers	6
53-7064.00	Packers and Packagers Hand	6
17-1021.00	Cartographers and Photogrammetrists	6
19-2041.02	Environmental Restoration Planners	6
19-3091.02	Archeologists	6
13-1111.00	Management Analysts	5
49-9044.00	Millwrights	5
53-5021.01	Ship and Boat Captains	5
11-3031.01	Treasurers and Controllers	5
21-1099.00	Community and Social Service Specialists All Other	5
51-6011.00	Laundry and Dry-Cleaning Workers	5
17-3026.00	Industrial Engineering Technicians	5
21-1093.00	Social and Human Service Assistants	5
31-1012.00	Nursing Aides Orderlies and Attendants	5
17-3023.03	Electrical Engineering Technicians	4
35-9011.00	Dining Room and Cafeteria Attendants and Bartender Helpers	4
37-1011.00	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	4
27-1019.00	Artists and Related Workers All Other	4
49-3031.00	Bus and Truck Mechanics and Diesel Engine Specialists	4
11-9032.00	Education Administrators Elementary and Secondary School	4
27-1027.00	Set and Exhibit Designers	4
17-3029.00	Engineering Technicians, Except Drafter, All Other	4
19-1032.00	Foresters	4

Appendix C: Green Job Occupations (continued)

17-2021.00	Agricultural Engineers	4
25-9021.00	Farm and Home Management Advisors	4
11-3040.00	Human Resources Managers	4
45-2091.00	Agricultural Equipment Operators	4
19-1031.00	Conservation Scientists	4
19-1031.02	Range Managers	4
41-1012.00	First-Line Supervisors/Managers of Non-Retail Sales Workers	4
11-1011.03	Chief Sustainability Officers	3
15-1032.00	Computer Software Engineers Systems Software	3
47-2021.00	Brickmasons and Blockmasons	3
51-8099.00	Plant and System Operators All Other	3
49-3042.00	Mobile Heavy Equipment Mechanics Except Engines	3
23-2011.00	Paralegals and Legal Assistants	3
43-5071.00	Shipping Receiving and Traffic Clerks	3
11-9199.00	Managers All Other	3
51-8031.00	Water and Liquid Waste Treatment Plant and System Operators	3
27-1021.00	Commercial and Industrial Designers	3
13-1072.00	Compensation Benefits and Job Analysis Specialists	3
13-2011.01	Accountants	3
15-1099.10	Business Intelligence Analysts	3
43-4051.00	Customer Service Representatives	3
25-1194.00	Vocational Education Teachers Postsecondary	3
27-1024.00	Graphic Designers	3
51-9198.00	Helpers--Production Workers	3
37-2012.00	Maids and Housekeeping Cleaners	3
47-2071.00	Paving Surfacing and Tamping Equipment Operators	3
51-9195.03	Stone Cutters and Carvers Manufacturing	3
53-1021.01	Recycling Coordinators	3
11-9199.10	Wind Energy Project Managers	3
11-3042.00	Training and Development Managers	2
11-3051.03	Biofuels Production Managers	2
11-9041.01	Biofuels/Biodiesel Technology and Product Development Managers	2
13-1199.00	Business Operations Specialists, All Other	2
13-2099.00	Financial Specialists, All Other	2
15-1031.00	Computer Software Engineers, Applications	2
17-2111.01	Industrial Safety and Health Engineers	2
25-1041.00	Agricultural Science Teachers, Postsecondary	2
49-2094.00	Electrical and Electronics Repairers Commercial and Industrial Equipment	2
49-9021.02	Refrigeration Mechanics and Installers	2
51-8012.00	Power Distributors and Dispatchers	2
53-7051.00	Industrial Truck and Tractor Operators	2
11-2011.01	Green Marketers	1
19-1023.00	Zoologists and Wildlife Biologists	1
25-9031.00	Instructional Coordinators	1
39-2021.00	Nonfarm Animal Caretakers	1
43-4161.00	Human Resources Assistants Except Payroll and Timekeeping	1

Appendix D: Survey Instrument

HAWAI'I GREEN JOBS SURVEY

Hawai'i recognizes it is overly dependent on imported oil to meet its energy needs. Recently, the State has taken steps to become more energy self-reliant and to preserve its natural resources for future generations. "Green" jobs may help to halt unemployment during the current economic downturn and contribute to needed economic growth for years to come. The federal American Recovery and Reinvestment Act of 2009 (ARRA) has further fueled this interest by funding this survey and workforce retraining for green jobs in Hawai'i.

To support Hawai'i's efforts to develop a green economy and workforce that can compete for green jobs, we are conducting a survey of Hawai'i businesses. **The purpose of this survey is to:**

- estimate the number of jobs where environmental protection or preservation is central,
- identify the occupations involved with the emerging green economy,
- identify the training needs of a green workforce.

What is a green job?
A green job makes a positive impact on the environment or energy sustainability.
This survey covers **five core areas**:

Generate clean, renewable, sustainable energy
Reduce pollution and waste; conserve natural resources
Energy efficiency
Education, training and support of a green workforce
Natural, environmentally-friendly production

Three ways to complete this survey:
1 **Online:** www.GreenJobsHawaii.org 2 **Mail:** Return the survey in the enclosed envelope 3 **Fax:** (808) 586-9022

**** Please respond within 15 days of the date on the cover letter.***

Report only for the worksite shown on the label on the back page.

We suggest your Operations or Human Resources Manager complete this form.
Your responses will be kept confidential.

1. **Number of employees at this location** (count full and part-time workers equally) _____

2. **Check ☑ the green practices your company performs at this location:**

- ☐ Recycle (paper, toner cartridge, cans)
- ☐ Use of recycled products (office paper, etc.)
- ☐ Telecommute
- ☐ Carpool
- ☐ Fuel efficient and alternative fuel vehicles
- ☐ Subsidized bus pass
- ☐ Bicycle commute program
- ☐ Energy-saving light bulbs
- ☐ Solar and photovoltaics
- ☐ Use low VOC paints, stains or sealers
- ☐ Clean with "eco-friendly" products
- ☐ Reduce energy use (A/C timer, motion sensor, etc.)
- ☐ Water conservation
- ☐ Other (please describe)

3. **Does your company work to <u>PROVIDE goods or services</u> in any of the five core GREEN areas? For more information and examples about these areas, see the back page.**
   - ☐ **YES** ➔ Please complete all sections of this survey.
   - ☐ **NO** ➔ Please complete this page and continue directly to the back page.

Job Titles & Descriptions	Current # of Employees in GREEN Areas				
Job title(s) of workers you employed* in jobs in GREEN areas at this location from January to March 2010	**G**enerate Clean, Renewable, Sustainable Energy	**R**educe Pollution and Waste; Conserve Natural Resources, Recycle	**E**nergy Efficiency	**E**ducation, Training and Support of Green Workforce	**N**atural, Environmentally-Friendly Production
Describe and explain how the position is GREEN. *ONLY include jobs where green activities were essential to the job. Please PRINT*	**Estimate the current number of employees in each GREEN area** **Refer to back page for more information and examples.** Count full and part-time workers equally. **Choose only ONE category per employee.** (If employees work in more than one, choose the area that takes most of their time or is their primary job function.)				
Job Title: *Wind Turbine Technician -* Description: *Installs and repairs wind turbines*		3 Example			
Job Title: Description:					
Job Title: Description:					
Job Title: Description:					
Job Title: Description:					
Job Title: Description:					
Job Title: Description:					

* *Exclude consultants, outside contractors, vendors, and others not considered employees.*

If you need more space, please attach another sheet.

Job Vacancies		Qualifications & Employee Training Requirements			
# of Current Vacancies for this Job	Total # of Workers You Expect in this Position in 2012	Minimum Education and Training Qualifications	Formal Training by Community College or Other External Provider	Certifications or Licenses	Informal on-the-job training
		Select one code (**See 1 - 11 below)	**List and describe specific types of training** (exclusive of a degree program) and **certifications and licences** required for your green workers		
1	10	6	*Electrician course; Wind turbine technology*	None	None

** 1 = Professional degree
2 = Doctoral degree
3 = Master's degree
4 = Bachelor's or higher degree plus work experience
5 = Bachelor's degree
6 = Associate's degree
7 = Postsecondary vocational award
8 = Work experience in a related occupation
9 = More than 1 year on-the-job training
10 = 1 to 12 months on-the-job training
11 = Less than 1 month on-job training

5. Contact person

_____

Name

_____

Title

_____

Telephone

_____

Email

Generate Clean, Renewable, Sustainable Energy
Produce, transmit, and store clean, renewable power in a safe and sustainable manner from solar, wind, hydro, geothermal, ocean, and small-scale biopower sources.
Example: electricians, electrical engineers and plumbers install solar energy systems.

Reduce and Mitigate Pollution and Waste and Conserve Our Natural Resources, Recycle
Manage water and other natural resources. Prevent and control emissions and pollution. Treat water and remediate waste. *Examples: trained workers safely remediate hazardous materials; air quality monitoring.*

Energy Efficiency
Reduce energy use. Produce or install energy-efficient products. Provide energy-efficiency services. Retrofit, weatherize, or improve efficiency of buildings. Improve energy distribution (smart grid) and transportation. *Examples: engineers develop lighting and other products that curb and monitor energy use while electricians and others install them.*

Education, Training and Support of Green Workforce
Provide services to the other four green areas. Help develop our green workforce.
Examples: teachers train workers for the clean energy economy; legal services; environmental consultants.

Natural, Sustainable, Environmentally-Friendly Production
Mitigate harmful environmental impacts of products and processes and use less energy by improving or developing alternative products and methods, including use of natural or recycled materials.
Examples: construction workers install green building materials; plumbers and technicians install smart irrigation systems; organic farmers; chemists or product designers and engineers who produce less caustic cleaning products and biodegradable products.

These descriptions and examples are NOT comprehensive.

Mahalo. Your participation helps Hawai'i go green!

Need assistance? Contact us:

Labor Market Information (LMI) Green Jobs Initiative
Research & Statistics Office • Hawai'i Department of Labor & Industrial Relations
830 Punchbowl Street, Room 304 • Honolulu, HI 96813
Tel: 808-586-9097 • Fax: 808-586-9022
Email: DLIR.RS.GreenJobsHawaii@hawaii.gov • Website: **www.GreenJobsHawaii.org**

The cover art depicts, from left to right: 1) the Kahuku wind energy project, 2) workers in Kona installing photovoltaic panels, 3) youth in a green jobs training program on the Big Island, 4) and taro plants. Taro is grown primarily for the Hawaiian staple of poi. The National Agricultural Statistics Service estimates Hawai‘i’s taro production at 4.4 million pounds in 2008, mostly on the island of Kaua‘i. Photos courtesy of First Wind, Sunetric, Kupu Hawai‘i, NorthShoreKauai.com, and Harold Herradura.

hawaii
green
jobs
initiative

Department of Labor and Industrial Relations