Shades of Green

June 2009

Dear Friends:

I am pleased to present to you the *Shades of Green* report, a local labor market study of green jobs.

"What is a green job," you may ask? For months, we have been conducting research and asking the businesses and residents of Michigan that same question. The answers we got back included jobs in agriculture, natural resource conservation, transportation and alternative fuels, energy efficiency, environmental clean-up, and renewable energy production. And we found out that there are a lot of green jobs in Michigan right now.

At the Green Today, Jobs Tomorrow conference in May, I spoke to more than 1,400 people who are passionate about helping Michigan go green. Again and again, I heard exciting stories of schools, businesses, and private citizens who are growing the new, green economy in Lansing and throughout Michigan.

Stories like that of Roland Cook, who lost his auto manufacturing job and is now studying alternative energy at Lansing Community College thanks to the No Worker Left Behind program; and United Solar Ovonic, which brought hundreds of jobs to Greenville to manufacture solar cells.

While we have a way to go to become the center of green business, I am confident that in the next phase of Michigan's history, we will be the state that leads the green industrial revolution.

Sincerely yours,

Jennifer M. Granholm
Governor

Highlights

The green economy in the capital area supports 4,500 jobs: 4,000 direct green jobs and 500 in support jobs, accounting for about three percent of wage and salary jobs in the area for 2008.

- The green economy in the capital area boasts jobs in manufacturing, construction, professional and technical services and utilities.
- Manufacturing accounts for over one-third of the region's green collar economy, more than 1,400 jobs. Why? The emphasis on producing more fuel-efficient vehicles as well as manufacturing's diversification into making parts for alternative energy devices and other green products.
- The professional and technical services industry is the next largest segment. In this industry, direct jobs number almost 800, or about one-fifth of all green jobs. Companies in engineering, design, science, building inspection and environmental consulting make up a significant part of this sector.
- "Blue collar work" is the largest concentration of green work by occupation. This occupational area exceeds 30 percent of the employment (direct green jobs). Production jobs in manufacturing (16 percent) and construction-related jobs (9 percent) are major areas of employment.
- One-fifth of the direct green jobs in the capital area are in engineering occupations.
- Twelve of the 15 largest green industry employment sectors pay above the overall industry average of approximately $37,000 annually. Six of these industries pay in excess of $52,000 per year.
- Engineers and electricians are the top-paying green occupations, ranging from $30 to $37 per hour in 2008.
- Employers report unique skill sets are required of green workers; 68 percent require formal training at the community college and other postsecondary educational institutions.
- The capital area possesses unique assets to support growth in the green sector, including intellectual capital in the research labs at Michigan State University and state government, with its huge role in energy and the environment. The region also boasts access to 85 percent of automotive R&D within 90 miles.

This report is printed on 100 percent recycled paper utilizing soy-based inks.

The Lansing Board of Water & Light operates the state's largest solar array—a 432-panel installation that furnishes enough electricity to power 40 homes. Its goal is to have seven percent of electric retail sales come from renewable energy sources by the end of 2016.

Lansing has been working since 1992 to separate some 203 miles of combined storm water and sewage pipes that can cause sewage to overflow into rivers during times of heavy rainfall. The city's Michigan Avenue Rain Gardens are just one part of this Combined Sewer Overflow project.

Christman Company's headquarters in downtown Lansing's former Mutual Building is the first building in the world to receive two platinum certifications from the U.S. Green Building Council's Leadership in Energy and Environment Design (LEED) program. The energy-efficient headquarters will save the company an estimated $40,000 a year in energy costs.

The Capital Area Transportation Authority (CATA) was the first transit system in Michigan to add full-sized hybrid diesel-electric buses to their fleet. Today, CATA has 10 hybrids in its fleet.

What is "green"? It's a challenge.

Focus on the green economy is extensive. Many believe millions of green collar jobs will be created over the next several years as the United States concentrates on energy efficiency, alternative energy, conservation and other facets of green. The key questions for us here in the capital area are: *What impact will there be locally? What and where are the green jobs? How many exist? How many people need to be trained or retrained?*

The first question, though, is: *What is the green economy?* It may be somewhat easy to define green jobs at a very high level of analysis, but it quickly becomes more difficult as we move down to specific types of industries and occupations. Here we need more rigorous definitions so we may classify and count employment in economic terms.

The problem is "green" is not an economic term. It is a media term, a philosophy, an activity, a popularized term. It is very broad and is most often used in a general way rather than a specific way. In addition, there are many shades of green. For these reasons, a definition of green defies precision as it changes with each situation for which it is used.

Most people would agree , however, that "green" is concerned with the following:

- Energy
  - Efficient use
  - Clean, nonpolluting
  - Renewable/alternative (solar, wind, geothermal, water/hydro, thermoelectric, etc.)
- Environment
  - Waste management with recycling as a major component and including "sustainable manufacturing" where renewable materials replace petroleum-based and other nonrenewable products
  - Conservation, especially water
- Construction
  - Energy-saving and renewable materials and systems for buildings
- Transportation
  - Moving people more efficiently with less use of fossil-based fuels

This report draws heavily from the "*Michigan Green Jobs Report, Occupations & Employment in the New Green Economy*" by the *Michigan Department of Energy, Labor and Economic Growth* to produce an employment profile of green jobs in the capital area.

Definition: The green economy comprises businesses that offer products or services related to renewable energy, increased energy efficiency, clean transportation and fuels, agriculture and natural resource conservation and pollution prevention or environmental cleanup. Green jobs include primary occupations engaged in the production of green-related products or services and support jobs created by green-related revenue.

Companies were asked to classify their employment into the following green "core areas":

- Agriculture and natural resource conservation
- Clean transportation and fuels
- Increasing energy efficiency
- Pollution prevention and environmental cleanup
- Renewable energy production

Capital area boasts 4,500 green jobs in the private sector

The capital area green economy employs almost 4,500 workers. Nearly 4,000 workers hold green jobs directly and another 500 are employed in support jobs across the private sector locally, meaning, the green sector accounts for 2.9 percent of employment locally. This compares to the statewide share of 3.4 percent.

Direct green jobs in the capital area may be classified into five core areas. Of the nearly 4,000 direct green jobs, 41 percent are in the clean transportation and fuels area. The next largest share of employment — nearly one-quarter — is in the energy efficiency category. Agriculture and natural resources and pollution prevention and environmental clean-up account for about 12 to 13 percent each. Renewable energy production produces almost 10 percent of the local direct green jobs.

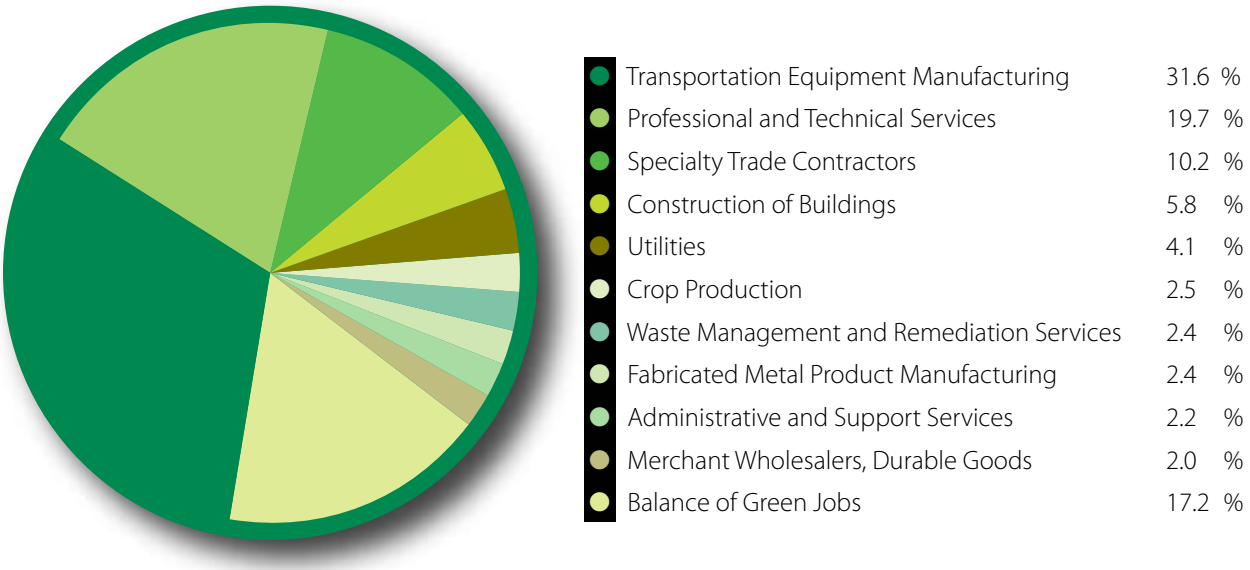
The 500 support jobs cover a wide range of employment in companies directly involved with the green economy. These range from office support to transportation. These jobs gain green recognition because of the firms' green business activity.

Green jobs are present in multiple sectors of the economy, ranging from manufacturing and construction to utilities and agriculture to trade and services. The transportation manufacturing (i.e., auto) sector shows up as the largest single industry sector and accounts for more than three out of every 10 green jobs. The focus on more fuel-efficient cars and the industry's significant presence here explains the industry's top billing. Another manufacturing industry — fabricated metal manufacturing — appears on the list with over two percent of green jobs. With these two components of manufacturing, the sector's share equals over a third of all green jobs with employment exceeding 1,400.

"Green jobs are good jobs."

Andy Levin
Michigan Department of Labor, Energy and Economic Growth
Green Today, Jobs Tomorrow Conference
May 11, 2009

Distribution of Green Jobs by Industry Sector



Note: Third quarter, 2008; private sector but includes public utilities; direct green jobs.

The professional and technical services category is the next largest sector, accounting for one-fifth of all jobs. The number of jobs here approaches 800 as various professional, scientific and technical specialty services are green collar. This industry category encompasses firms in legal services, accounting and a wide range of consulting services, however, it also includes services in engineering, architecture, drafting, industrial design, building inspection and environmental consulting, all vital to the green economy.

The next two largest industries are in construction. Specialty trade contractors and building construction together account for 600+ jobs, or 16 percent of the total green sector. Energy efficient construction, green building materials and remodeling with a slant toward environment-friendly materials and a reduction in energy usage are a few of the activities pushing construction into the forefront of the green economy.

The utilities sector is a key part of the emerging green sector, with energy audits and movement to wind, solar and other means of renewable energy boosting its role. This industry accounts for more than 150 green jobs, or about four percent of the total.

Rounding out the sectors with at least 100 jobs is crop production. Agriculture stands to be a major component of the green economy. Renewable fuels and new materials in many cases will be bio-based and, hence, come from the farm and agricultural products and by-products. As with many of the green industries, the growth potential in agriculture is significant.

Capital Area Green Jobs Span Several Private Industries

Industry	Direct Green Jobs	Percent of Total Green Jobs
Total Green	**3,961**	**100.0%**
Transportation Equipment Manufacturing	1,251	31.6%
Professional and Technical Services	780	19.7%
Specialty Trade Contractors	403	10.2%
Construction of Buildings	223	5.6%
Utilities	163	4.1%
Crop Production	101	2.5%
Waste Management and Remediation Service	97	2.4%
Fabricated Metal Product Manufacturing	94	2.4%
Administrative and Support Services	88	2.2%
Merchant Wholesalers, Durable Goods	78	2.0%
Balance of Green Jobs	683	17.2%

Note: Third quarter, 2008; private jobs but includes public utilities; direct green jobs.

Largest green occupations are in engineering, production and construction

The green economy covers work in a great variety of settings. Engineers, production workers, construction occupations and environmental scientists are just of the few job categories included. The top 22 green occupations for which information is available account for 56 percent of the 4,000 direct jobs in the local green sector. More than 30 percent of the jobs are in the general area of "blue collar" employment because of the importance of production, construction and general labor in the green economy.

Indicating the importance of design, construction and manufacturing activity, slightly more than one-fifth are in engineering occupations. Mechanical engineers are the largest group within engineering. Others include electrical and environmental engineers and a very broad "all other" engineers group. Engineering occupations approach 850 in employment.

Production-related jobs are the next largest concentration. These primarily manufacturing-related jobs account for 16 percent of the total and number around 650. Included are inspectors, various production workers, machine operators and tool and die makers. Plant system operators working in waste and water treatment are also included, as are supervisors of production workers. Assemblers and production workers are the largest categories of workers. General maintenance and repair is also included in the group.

Construction-related occupations are the next largest group, accounting for nine percent of the 4,000 green jobs. Heating, ventilation and air conditioning (HVAC) jobs are the largest segment at approximately 1,430 jobs. Carpenters, electricians and laborers are part of this group, as are construction managers.

The balance of green occupations in the capital area is diverse and accounts for 11 percent of the total. Included are:

- Environmental scientists
- Sales representatives
- Farm workers/laborers
- Landscaping/groundskeeping workers

ETM Enterprises, Inc. of Grand Ledge makes parts for wind turbines for Siemens AG, one of the worlds largest makers of wind turbines.

Major Occupations in the Capital Area Green Economy

Occupational Title	Direct Green Jobs	Share of Total Green Jobs
Engineers, All Other	467	11.8%
Mechanical Engineers	277	7.0%
Assemblers and Fabricators, All Other	162	4.1%
Heating, Air Conditioning and Refrigeration Mechanics and Installer	143	3.6%
Farmworkers and Laborers, Crop, Nursery and Greenhouse	135	3.4%
Production Workers, All Other	123	3.1%
Landscaping and Groundskeeping Workers	91	2.3%
Maintenance and Repair Workers, General	75	1.9%
Electricians	71	1.8%
Electrical Engineers	63	1.6%
Environmental Scientists & Specialists	63	1.6%
Machinists	63	1.6%
Sales Representatives, Services, All Other	59	1.5%
Construction Laborers	59	1.5%
Water and Liquid Waste Treatment Plant and System Operators	51	1.3%
Construction Manager	48	1.2%
Carpenters	48	1.2%
First-Line Supervisors/Managers of Production and Operating Works	48	1.2%
Cutting, Punching, and Press Machine Setters, Operators and Tenders	48	1.2%
Tool and Die Makers	44	1.1%
Inspectors, Testers, Sorters, Samplers and Weighers	44	1.1%
Environmental Engineers	40	1.0%

Note: May 2008.

"We see the beginning of a green recovery in Michigan. The recovery is early. The shoots are just starting to poke through, but it's growing."

Van Jones
White House Special Advisor for Green Jobs
Author, "The Green Collar Economy"

Lansing Community College is one of the first colleges in the nation to incorporate alternative energy into its curricula and to offer an Associate's Degree in Alternative Energy Technology. Its students work on hybrid vehicles and have built an internal combustion engine powered by a fuel cell.

The Bio-Manufacturing Alliance of Mid-Michigan works with companies, such as KTM Industries, a manufacturer of bio-based and biodegradable foam for packaging and other business products. The alliance, an outgrowth of a feasibility study by the Center for Community and Econommic Development at Michigan State University, works to identify opportunities that will advance the development of bio-products and bio-manufacturing in the region.

Capital area green collar economy pays well

Green economy workers are in high-paying industries and occupations. Twelve of the 15 top-employment, green-related sectors show above-average pay. The industry concentration of green work is the reason. These workers are in the manufacturing, construction and utilities industries, which traditionally are higher-paying sectors. In addition, some green industries employ highly educated workers. For example, the professional and technical services industry employs a large number of engineers, scientists and a variety of consultants. These occupations require a college education for employment and are, therefore, above the average in earnings.

Six of the top-employment sectors pay in excess of $1,000 per week. The overall industry pay average for the private sector is $713 weekly.

There are low-paying sectors of the green economy as well. The two lowest paying are crop production and administrative services, paying $382 and $458 weekly, respectively.

Most Green-Related Industries Pay above the All-Industry Average

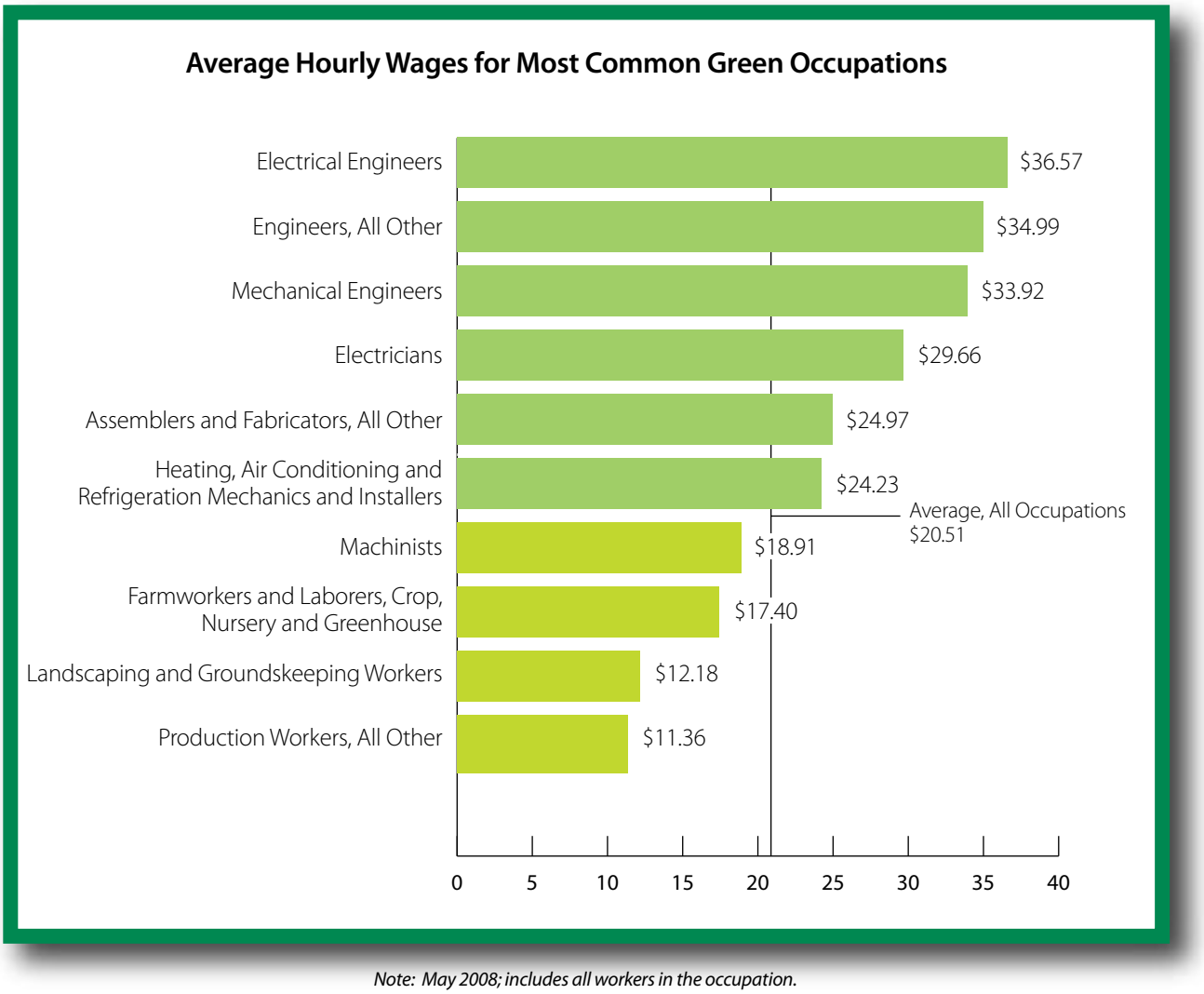
Industry Title	Average Weekly Wages	Direct Green Jobs
Total Private, All Industries	$731	3,961
Transportation Equipment Manufacturing	$1,450	1,251
Professional and Technical Services	$1,116	780
Specialty Trade Contractors	$906	403
Construction of Buildings	$944	223
Utilities	$1,255	163
Crop Production	$382	101
Waste Management and Remediation Services	$866	97
Fabricated Metal Product Manufacturing	$877	94
Administrative and Support Services	$458	88
Merchant Wholesalers, Durable Goods	$909	78
Heavy and Civil Engineering Construction	$1,022	46
Wood Product Manufacturing	$667	40
Chemical Manufacturing	$1,086	38
Machinery Manufacturing	$973	31
Nonmetallic Mineral Product Manufacturing	$1,019	27

Note: Third quarter, 2008; average weekly wages are for the industry and not just for the direct green jobs; includes public utilities.

Top 10 green occupations high paying

Among the occupations employing the most green workers in the capital area, six of the top 10 earn above-average pay. Engineers dominate the list, averaging between $34 and $37 per hour. The average hourly pay in the region is $20.51 per hour.

Electricians and HVAC technicians are also on the list, averaging approximately $29 and $24 per hour, respectively. The only lower-skilled occupation on the high-paying list is the assembler category, where pay approaches $25 per hour. This reflects the higher earnings in manufacturing firms. Lower-than-average pay is for machinists, farm workers/laborers, landscaping/groundskeepers and all other production workers.



Note: May 2008; includes all workers in the occupation.

"You are here at ground zero of the economic recovery that will define America."

Van Jones
White House Special Advisor for Green Jobs
Author, "The Green Collar Economy"
Green Today, Jobs Tomorrow Conference
May 11, 2009

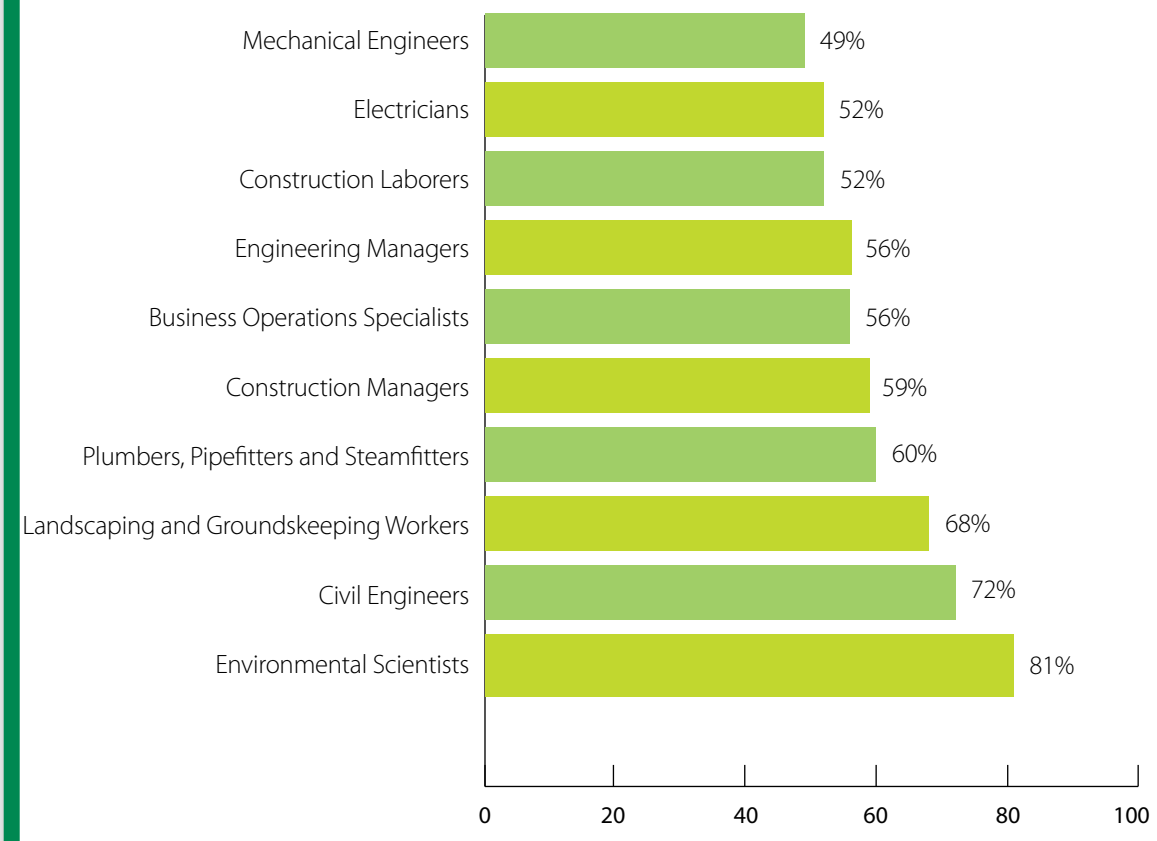
Green economy requires unique skill sets and formal training

To grow the green economy, we need highly skilled workers. Where will these workers come from? What training is needed? Part of the answer is linked to any unique skills required of green collar workers.

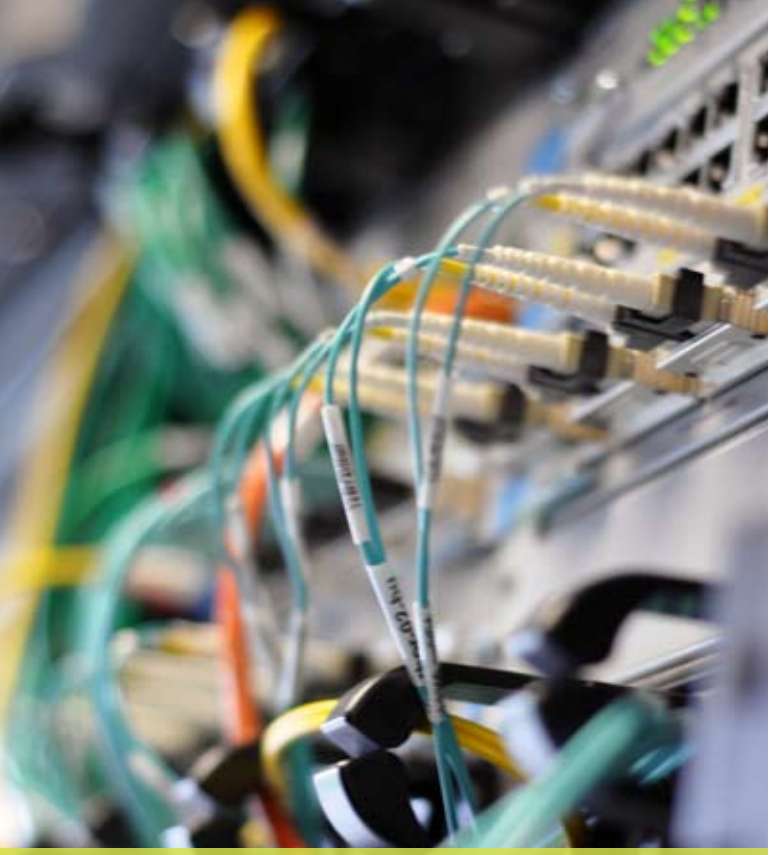
Some occupations require unique skills when working on a green project, according to a survey of Michigan employers. Specialized skill or knowledge is tied to 10 key occupations (see table below), as 50 to 80 percent of employers said unique skills are required in these jobs. The occupational concentrations are:

- Engineering, including civil engineers, mechanical engineers and engineering managers
- Construction and related trades, including electricians, plumbers, construction laborers and construction managers
- Professional specialties such as environmental scientists and business operations specialists
- Landscaping/groundskeeping workers

Share of Occupations Reported as Requiring Unique Skills for Green Projects



Note: Survey of Michigan employers in 2009. "Michigan Green Jobs Report."



Michigan State University's High Performance Computing Center ranks 43rd on the Green 500 List of the world's most energy-efficient supercomputers.

Employer focus groups conducted statewide early in 2009 provide insight into the critical knowledge and skills sets that are in short supply. This information obtained from industry is key to ensuring training programs are responsive to the needs of industry.

Of the 16 knowledge and skill sets identified, most may be classified as "technical" and they are of two types: 1. green technical and 2. traditional technical.

Four necessary skill sets are in the green area. These are: green standards, materials recycling, specialized systems knowledge (e.g. , wind, solar, geothermal) and environmental impact. Employers also identified other non-green key gaps (see chart below).

Which critical knowledge and skill sets are hard to find?

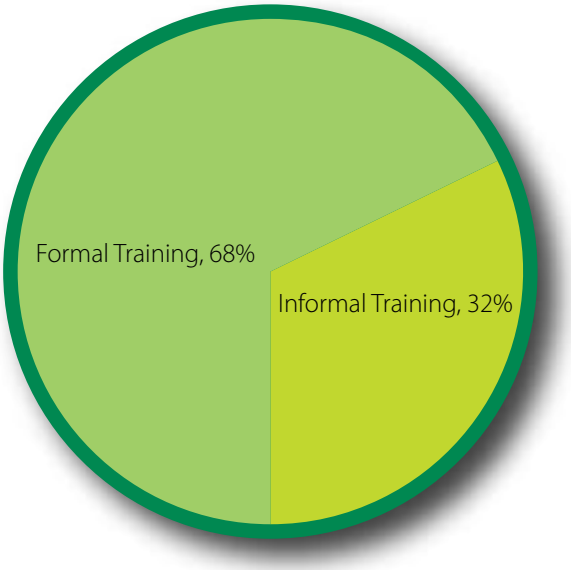
Category	Knowledge and Skills
Green Technical	Green standards Materials recycling Specialized systems knowledge (wind, solar, geothermal, etc.) Environmental impact
Traditional Technical	General workplace safety MIOSHA standards Drafting by hand Machine design skills Blueprint reading
General Workplace and Business Process	Adaptability Communication skills Marketing and general business management ISO 14000 certified
Aptitude/Ability	Mechanical Drafting Visual relationship

Employer focus groups, 2009: "Michigan Green Jobs Report"

Two-thirds of green workers need formal training

Community colleges and other postsecondary educational institutions will be busy training green workers, according to the statewide survey of employers. Asked to indicate where their green workers obtain skills through training, more than two-thirds said community colleges or other training providers were the source. Since only 39 percent of the local population has an associate's degree or higher, green jobs will rely on formal training much more than non-green jobs. The balance of workers will obtain their work skills informally on the job.

Two-Thirds of Green Workers Require Formal Training



Note: Survey of Michigan employers in 2009. "Michigan Green Jobs Report."

"I think of it as a greening of the economy at large. A lot of these jobs are going to be in existing sectors."

K.C. Golden
Climate Solutions
U.S. News and World Report
March 25, 2009

The view from the green roof research program at Michigan State University in the Department of Horticulture. Green roofs involve growing plants on rooftops, thus replacing the vegetated footprint that was destroyed when the building was constructed. Such roofs save storm water runoff and are insulating.

Green jobs outlook: opportunities in various fields

Based on a statewide company survey, employers do anticipate having difficulty filling certain kinds of green-related jobs between now and 2011. Most noteworthy are the engineering-related occupations. Four of the 10 occupations on the list below are in engineering. Mechanical and electrical engineers are in this mix as are engineering managers.

The other occupations expected to be difficult to fill are in diverse categories (see list below). Many, if not most, of these occupations on the list are there probably because of missing skill sets rather than an outright shortage of workers (e.g., plumbers without the latest water conservation knowledge and skill sets and chief executives lacking green economy knowledge):

- Sales representatives in services
- Chief executives
- Plumbers/pipefitters
- First-line supervisors in manufacturing plants
- Landscape/groundskeeping workers and
- Farm workers/laborers

Employer focus groups provided more detailed information about the green economy in terms of specific green job categories (see table below). Twenty-two occupations were identified as hard to fill now. With a few exceptions, these occupations reflect the need for new knowledge or skills for the green economy.

The largest concentration of hard-to-fill occupations is linked to the energy-related field (eight of the 22 occupations). For example, wind technicians and photovoltaic (PV) installers are on the list.

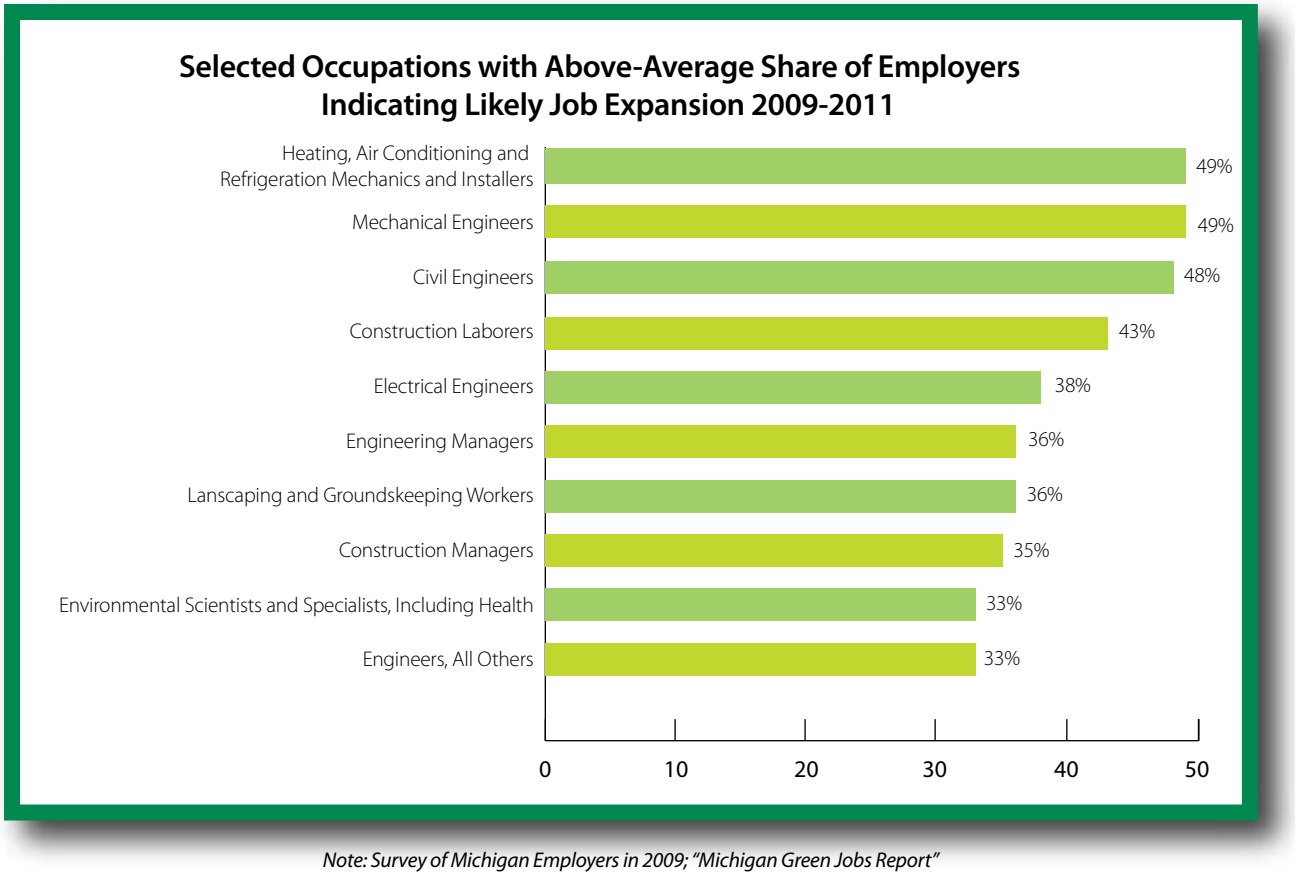
Construction, manufacturing and the agriculture industry job categories are the next most numerous on the hard-to-fill list, with four areas each. The support jobs, professional/managerial and waste management categories each have three or less.

Which green occupations are hard to fill now?

Category	Occupations
Energy-Related	Energy auditors – HERS raters Wind technicians PV installers HVAC (install/adapt for biomass) Designers for PV, wind, solar applications Sales people with green knowledge Vacuum techs AC/DC electrical workers
Construction and Manufacturing	Skill trades (all) Heavy equipment operators Plumbers Qualified tool makers
Agriculture	Agri-Tourism specialists Food safety specialists Aquaculturalists Urban farmers
Support Jobs	Accountants Truckers Purchasing/procurement/product developers
Professional/Managerial	Semiconductor engineers Management – understands government funding and regulations on new technologies
Waste Management	Lead/hazardous materials workers

Employer focus groups, 2009; "Michigan Green Jobs Report"

Employers also were asked to look ahead and indicate what occupations would grow in employment during a two-year period. The companies collectively projected employment gains in several occupations between 2009 and 2011. Five of the 10 occupations are in engineering. Three are construction related. Environmental scientist is on the list, as is landscaping/groundskeeping worker.

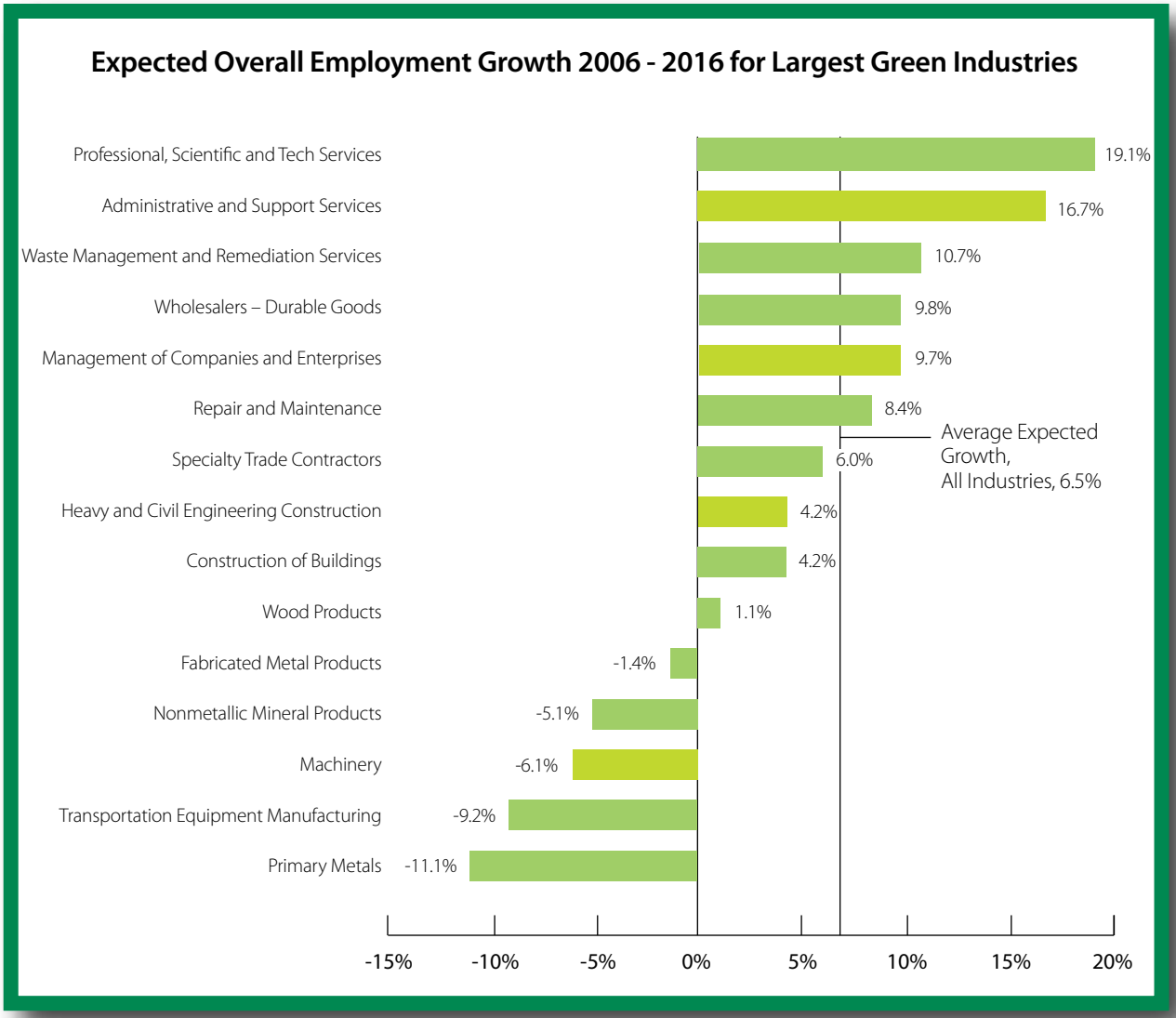


Note: Survey of Michigan Employers in 2009; "Michigan Green Jobs Report"

For the long-term, several industries that are green-related show very positive growth prospects. While all industries are expected to grow by 6.5 percent during the 2006-2016 time period, six of the top 15 green-related industries (includes non-green jobs) will exceed this overall growth rate. The six above-average growth industries are:

- Professional, scientific and technical services
- Administrative and support services
- Waste management
- Wholesalers of durable goods
- Management of companies
- Repair and maintenance services

Four industries show growth but at a below-average rate. Three of the four are construction-related. The other is wood products manufacturing. The five declining industries are all in the manufacturing sector.



Note: total industry growth.

The Granger Recycling Center boasts a public recycling drop-off center that is open 24 hours a day, seven days a week. The entire facility processes 50 to 70 tons of recyclable materials daily.

United States Secretary of Labor Hilda L. Solis visited green companies in the state before speaking about the Department of Labor's take on green jobs at the Green Today, Jobs Tomorrow Conference

Businesses provide insight into green jobs

A group of private businesses, educators, economic developers and workforce experts that came together to provide input on green jobs in the capital area had the following insights into the emerging green economy:

• Much of what is classified as green is not new. Solar and wind energy have been with us for a while, as have many energy efficiency activities. The same can be said for conservation. Thus, there is very little problem with defining skills and training programs to prepare workers for most of the jobs in the green economy.

• There are very few new occupations. A machinist making wind turbine parts needs little if any "green" training. Weatherization is not new, nor is solar panel installation.

• Many training issues revolve around "half-training" as characterized by industry panel members: Existing workers can do green with just a little bit of training and skill acquisition. As one member stated: "We have the people who possess the core skills. They just need some specialized knowledge and perhaps skills." Some of this training will be provided in-house and some of it at technical schools like community colleges. "In-house" includes training from product producers and distributors that often require certification training to become "authorized dealers" or certified installers.

• Few shortages exist for the green economy currently. The economic slowdown has created an excess of workers and hiring in general is slow. Skill shortages and not worker shortages will begin to emerge first as the economy begins to grow and the demand for green advances. Industry will have to send signals to training institutions on when to ramp up training.

In many cases, existing workers are performing work in the green collar economy and are known by traditional job titles. New titles will emerge, however. Electricians and construction laborers currently install solar panels. The use of the term "solar panel installer" is emerging but is not yet in widespread use locally. Eventually, laborers may be called solar panel installers, but an electrician will still be involved. As more solar panels are installed, the job title of solar panel installer will grow in usage and replace the title of laborer. In some cases, certification will be required by dealers and also by organizations providing certification training, such as the North American Board of Energy Practitioners (NABCEP). Over time, this certification process will grow. This job title evolution and certification progression is not just limited to solar technology.

Knowledge might be more important than skills with the green economy at such an immature stage. If green is to advance, we need more people and workers with more knowledge of the technology of green. It is impossible to grow solar, geothermal, wind and other areas of green if only a few of us have knowledge of the various specialties. Most of this need for knowledge will be at the upper end of the skill ladder ranging from sales representatives to managers to chief executives. The need will be especially great in occupations where science, technology and innovation converge, such as engineers and various technicians. Some examples of occupations requiring green-related knowledge include:

Hybrid power train development engineer • Hydrogen fuel cell engineer • Geothermal electrical engineer • Thermoelectric energy engineer • Battery engineer for electric vehicles • Electron mechanical wind turbine technician • Wind field technician • Lithium-Ion battery engineer • Smart grid engineer • Nuclear waste engineer • Carbon sequestration engineer • LEED project administrator • Green building and retrofit architect • Solar thermoelectric plant manager • Commercial solar sales consultant • Certified energy manager • Carbon emissions specialist • Greenhouse emissions permitting consultant • Wind turbine technician • Director of wind development • Hydrogen plant operations manager • Biofuel plant field technician

Conclusions

The capital area already possesses a significant green economy, with 4,500 direct and support jobs in the green sector. The key element of this jobs base is its heavy reliance on manufacturing, where more than a third of the direct green jobs exist. Unlike most sectors of the economy, which support income-generating activities confined to the local region, manufacturing is wealth building through its export of products outside the region. The green concentration now is a result of the auto production predominance and the push for more efficient vehicles. In addition, firms are diversifying into wind turbine components and bio-based products. This is a strength, however, the degree to which local manufacturing companies diversify and produce products for the green economy (wind, solar, pollution abatement equipment, etc.) will determine the additional employment impacts for the region.

Agricultural production is a potential source of wealth for the area as well. A shift to bio-based feed stocks to produce materials, fuels and energy is undway. The size of this shift and the speed with which it occurs will determine whether we see a significant impact from this sector and when. One sign of progress is the recent formation of the Bio-Manufacturing Alliance of Mid-Michigan. The presence of Michigan State University (MSU) and its research laboratories is definitely a positive factor here. The new IBM Center and the F-RIB create opportunities to showcase the region as a center of innovation, entreprenuership and the green economy.

The construction industry has shown reach outside of the region also and there are leaders in the "green building" industry present here. Therefore, this industry has potential for significant job creation linked to green if green construction grows significantly.

There is also a "knowledge base" facet to our green economy. One-fifth of our direct green jobs in the private sector are in professional, scientific and technical services. Engineers, scientists, technicians and a variety of green-related consultants, therefore, are already here in considerable numbers. MSU, with its vast research labs, and state government, with its huge role in energy and the environment, contribute to this concentration of local green intellectual capital. This sector is another area of potential economic growth.

The green economy is incredibly vast as well as difficult to define and measure. So for the foreseeable future, we will be limited in our ability to measure its impact and track job creation as a green industry. There is no question it is growing and growing very quickly. However, it is also a small portion of the economy.

There is a short-term boost for green now underway. Public policy is fueling it in two ways:

• Mandates/regulations: in the form of such things as fuel efficiency standards and renewable portfolio standards to replace traditional energy sources with alternative energy.

• Incentives: tax incentives and vouchers directed to energy, fuel efficiency and other areas.

The big driver for the green economy will come in the form of pricing and a likely associated crisis. Significantly higher prices for transportation fuels and for energy for homes will jumpstart green because consumers will be pressed into action to reduce expenses. Businesses will be forced into action also as higher energy prices substantially increase the cost of business. Only then will green truly shift from a buzzword or philosophy to a recognized economic driver.

The "Be Spartan Green" campaign, along with the construction of the new $13.3 million recycling and reuse facility, propelled Michigan State University to the top of the list of green universities.

Notes

1. *Shades of Green* makes extensive use of the *Michigan Green Jobs Report, Occupations & Employment in the New Green Economy* by the Michigan Department of Energy, Labor and Economic Growth. Readers of this report interested in more detailed information about the green economy in Michigan should obtain the *Michigan Green Jobs Report*. The following is a list of how information from the state report was used to develop this report.
    a. The definition of "green" was used. To generate industry employment numbers for the capital area – that is an estimate of green jobs – statewide survey data on green industries was applied to local industry employment from the Quarterly Census of Employment and Wages (QCEW) for the third quarter of 2008 from the Michigan Department of Energy, Labor and Economic Growth (DELEG). To generate an estimate of support jobs locally, the relationship between direct and support jobs statewide was used. Likewise, to generate estimates of occupational employment, the statewide share of employment in an occupation was applied to local occupational employment from the Occupational Employment Statistics (OES) program.
    b. The number of local jobs by core area: the statewide share was applied to the local estimate of direct jobs by industry.
    c. Statewide data from the DELEG employer survey and focus groups are taken directly from the *Michigan Green Jobs Report*. This includes the data on unique skills, critical knowledge and skill sets, formal/informal training, occupations difficult to recruit, critical occupation hard to fill and occupations with job expansion from 2009 to 2011.
2. Average weekly wages by industry are from the Quarterly Census of Employment and Wages for the third quarter of 2008.
3. Average hourly wages by occupation come from the Occupational Employment Statistics program, May 2008.
4. The projections to 2016 for the largest green-related industries come from the industry employment forecasts produced by DELEG, Bureau of Labor Market Information & Strategic Initiatives.
5. All data for *Shades of Green* was developed and provided by staff from the Bureau of Labor Market Information & Strategic Initiatives, Michigan Department of Energy, Labor and Economic Growth.
6. The *Green Jobs Guidebook* by the Environmental Defense Fund was used to help develop the list of occupations requiring green-related knowledge. A copy may be obtained at http://www.edf.org/.
7. Automotive research access statistic is according to the Center for Automotive Research.
8. All photos courtesy of Andrea Kerbuski except Lansing Community College photo courtesy of Kevin Fowler.

"We always point to Michigan as being in the foreground of merging energy and workforce development . "

Kate Gordon
Apollo Alliance
Green Today, Jobs Tomorrow Conference
May 11, 2009

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