The St. Louis Region

Green Economy Profile

NEW OPPORTUNITIES AND NEW GROWTH IN THE EMERGING GREEN ECONOMY

July 2010

ST. LOUIS CLIMATE PROSPERITY PROJECT

PREPARED BY
COLLABORATIVE ECONOMICS, INC.

Foreword

By Doug Henton, Chairman and CEO, Collaborative Economics, Inc.

The St. Louis metropolitan region, like most American regions, faces the dual challenge of growing its economy while improving environmental quality. One promising approach is the St. Louis Climate Prosperity Project, the mission of which is to create and sustain regional prosperity by cultivating green savings, green opportunities and green talent.

St. Louis is participating as a pilot region in the National Climate Prosperity Project along with Portland, Denver and Silicon Valley. Each of these regions is developing a climate prosperity strategy based on its unique comparative advantages and implementing it through regional public-private partnerships. In St. Louis, the pilot project is led by the St. Louis Regional Chamber and Growth Association (RCGA).

This St. Louis Region Green Economy Profile was prepared by Collaborative Economics, Inc. (CEI), and is the RCGA's first step in creating a comprehensive "Greenprint" for the region. It provides a solid analytic base of information on trends in the region's green economy, and is based on the methodology CEI employed for The Clean Energy Economy report we prepared for the Pew Charitable Trust. This Profile is a first of its kind regional report describing the "greening" of the St. Louis economy that is occurring as providers of products and services in the "core green economy" are transforming the rest of the regional economy, and as a wide variety of businesses and institutions are pursuing both prosperity and sustainability as parts of the "adaptive green economy."

This Profile highlights the wide range of industry sectors and innovation in the St. Louis core green economy, as well as opportunities for growth in green manufacturing, agricultural and building activities. Overall, employment in the St. Louis core green economy grew 54% from 1995 to 2008, while employment in the overall economy grew by only 4%, resulting in nearly 9,000 core green economy jobs.

By comparison, employment in the core green economy in Silicon Valley grew by 53% from 1995 to 2008, with a total of 14,000 jobs, according to the Index of Silicon Valley prepared by CEI for the Joint Venture Silicon Valley. While the mix of industry segments between St. Louis and Silicon Valley differs, it is important to note that St. Louis has experienced comparable growth in its core green economy.

As the St. Louis region develops its climate prosperity strategy building on its core strengths, the private and public sectors must work together to accelerate the growth of the green economy while enhancing the region's environment. In this way, St. Louis can become one of the national models for economic revitalization and environmental sustainability.

Contents

Executive Summary

The St. Louis Metro Area is home to a growing green economy. Outpacing the region's overall economy, employment in this diverse mix of sectors grew 54 percent, compared to four percent, between 1995 and 2008. The initial findings from the continuing analysis of the St. Louis green economy suggest that the region has areas of specialization that are building on existing strengths. While there are many facets to the emerging green economy, this analysis focuses on the core green economy which is defined as businesses that provide the products and services that harness alternatives to carbon-based energy sources, conserve the use of energy and all natural resources, and reduce pollution and repurpose waste.

Manufacturing activities across the green industry segments is of particular interest. Eighteen percent of the region's total green employment is in establishments with primary activities in manufacturing. This means that the region is manufacturing a variety of products that will serve to reduce negative environmental impacts. Manufacturing jobs in the region are particularly numerous in the following green segments: Energy Efficiency, Energy Generation, Energy Infrastructure, Water & Wastewater, Transportation, Energy Storage and Agriculture.

Related to the actual manufacturing activities in the region, there are some synergistic relationships between some of the fifteen green segments which offer potential for the development of a green manufacturing hub in the St. Louis Area.

- Manufacturing & Industrial Support consists of businesses that provide products and services that help manufacturers improve their resource efficiencies and thereby improve their bottom line and competitive advantage. These products include cogeneration systems for capturing and leveraging waste-heat, resource-efficient packaging, environmentally-sound cleaners, and process management systems.
- Recycling & Waste, with broad, labor-intensive activities, is the largest segment in the region. Repurposing materials is becoming an increasingly developed sector as global demand drives up prices for natural resources and local landfill costs increase. This is particularly meaningful for manufacturers who require natural resources and need to contend with bi-product waste. Entrepreneurs are finding new markets for repurposed materials while at the same time, saving manufacturers landfill disposal costs.

The two fastest-growing green segments in St. Louis are Agricultural Services and Energy Infrastructure, and both appear to be poised for continued growth.

- Clearly a hub for the full spectrum of agricultural activities ranging across R&D, suppliers, and producers, the region is also growing in products and services that assist producers in becoming more resource efficient and environmentally sustainable.
- The region's business establishments in Energy Infrastructure are all primarily manufacturing establishments. These establishments produce energy management systems and materials – materials necessary for modernizing energy management and transmission systems for industry and utilities.

Water & Wastewater grew by 30 percent between 2007 and 2008. This segment relates to municipal water resources as well as agricultural. Deeper research into the specific types of firms in this segment will reveal some of the region's growing areas of specialization.

I. The Green Economy: Key Concepts

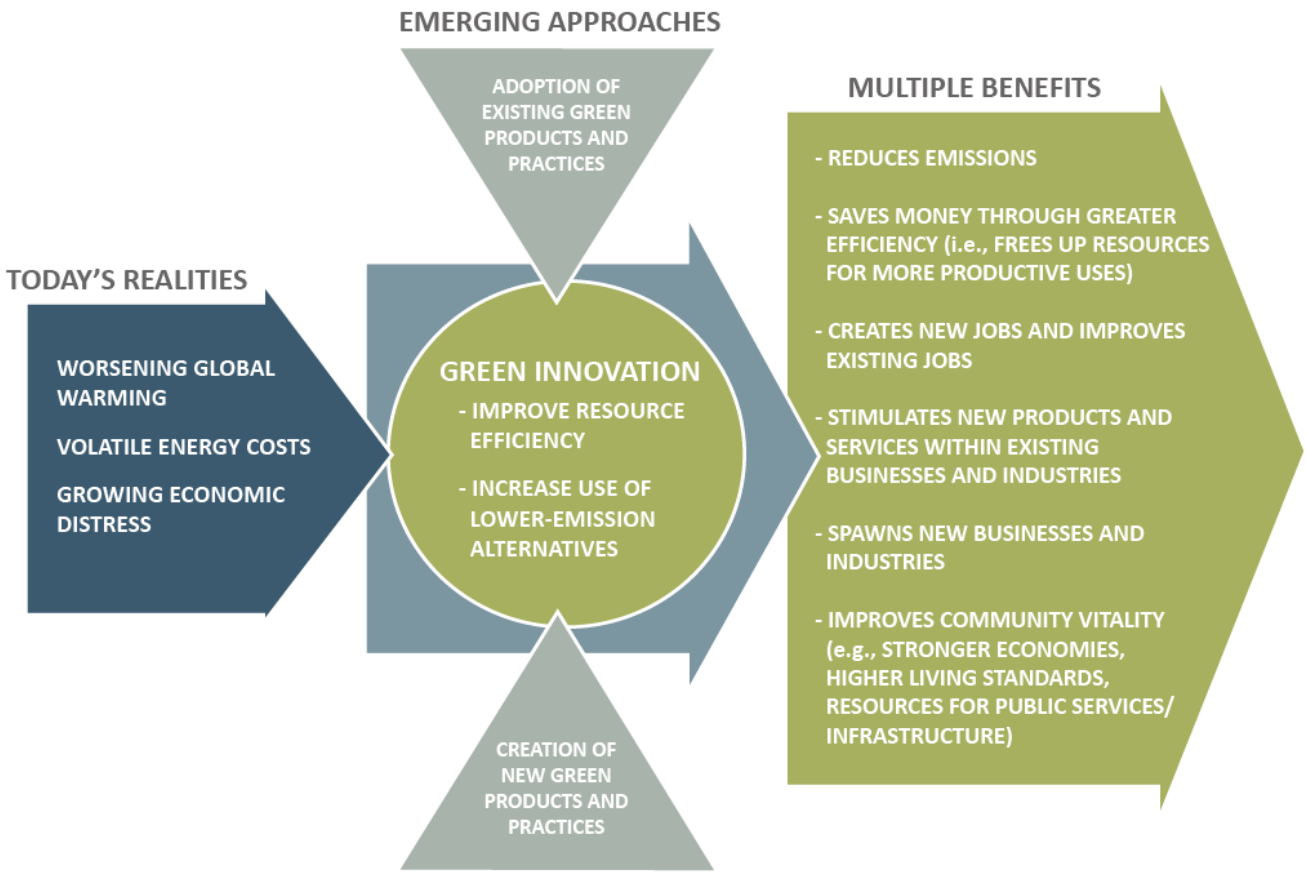
Over the last several years, much has been heard about "green jobs" and the "green economy." Below we explain the key concepts underlying our changing economic context and the analytical approach used for this analysis. This section also describes how this new analysis relates to recent occupational research completed in Missouri on green jobs.

Globally the demand is rising for vital resources, such as energy and fresh water, as the world's population grows and the standard of living in developing countries rises. As a result, people are rethinking the way they do things. For example, the volatility of fuel prices in the recent years has driven consumers – business, households and the public sector alike - to seek out cheaper alternative means of transportation and new methods for fuel conservation. These actions not only reduce overall consumption of scarce resources, they also help stimulate new markets and economic opportunity. In addition, public incentives and new regulations help spur innovation and the growth of new markets by lowering the cost of cleaner alternatives and increasing the cost of harmful fuels, products and practices. Likewise, sustained political commitment and access to project funding will support continued growth.

As the economy shifts away from its dependence on carbon-based energy and toward clean(er) alternatives and improvements in efficiency, new market demand is created for products and services that conserve resources. Households, businesses and the public sector end up saving money otherwise spent on energy which they can invest in purchasing capital upgrades or hiring new employees. This transformation of the economy yields increased environmental and economic resilience which translates into improved competitiveness for a company as well as an economy.

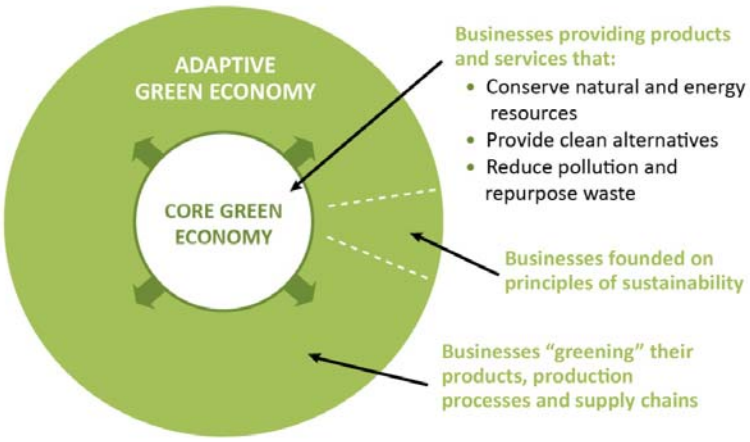
The image below illustrates how green innovation offers a viable strategy for contending with the new set of circumstances we face today as businesses, households and public policymakers. With growing global demand for all natural resources driven primarily by the unprecedented economic growth in Asia, the prices for resources including energy will continue to rise. By adopting products and practices that help conserve natural resources, prevent pollution and manage waste and investing in the development of new green products and practices, our communities stand to reap multiple benefits.

As resource costs rise, markets for alternatives open and present new business and employment opportunities. As the adoption of green products becomes more wide spread, these products improve in quality and price. Also, as these products and practices spread across the economy, businesses and households enjoy the cost-savings that come from improved energy and resource efficiency. This also means that businesses become more cost effective which boosts their competitive advantage and improves the energy and resource productivity of the region as a whole. The region then benefits not only from environmental improvement but also from economic resiliency and energy independence.



There are different aspects to the changes currently taking place in the economy and the new opportunities arising as result. At the core of these developments are the businesses that provide the products and services that enable the green transformation across the entire economy (e.g. other businesses, households, schools, etc.). This is called the "**Core Green Economy**," and it consists of businesses that provide products and services that do the following:

- Provide alternatives to carbon-based energy sources
- Conserve the use of energy and all natural resources
- Reduce pollution (including GHG emissions) and repurpose waste.



In the next level are the companies in the **adaptive green economy**, a discreet subset of the larger overall economy consisting of the "green" activities inside establishments that do not otherwise show up in the core green economy. The adaptive green economy includes companies and organizations that are adapting their processes to improve sustainability, reduce costs or anticipate regulatory changes. These institutions are reexamining their processes and investing in fundamental changes in their operations, as well as encouraging their suppliers to do likewise.

Examples of businesses "greening" their products, production processes and supply chains in the St. Louis Region include:

- The Doe Run Company has developed new processes that significantly reduce land, air and water emissions associated with lead processing.
- Emerson's Global Data Center uses state of the art energy efficiency technologies and renewable energy systems to reduce the energy costs, and environmental impacts, of its data centers.
- Boeing has test-flown aircraft using biofuels as an alternative to fossil fuels.

Also included in the adaptive green economy are new business founded on principles of sustainability by which their products are developed, with consideration for the entire product lifecycle. Examples include Tom's of Maine toothpaste, and Method cleaning products. The success and resiliency of companies in the adaptive green economy will signal to other companies in the overall regional economy to consider their own transformation to sustainable business practices. The jobs in the adaptive green economy are an important addition to the core green economy and are not yet reflected in this report's analysis.

The Core Green Economy is comprised of fifteen green industry segments. The broad scope of these segments reflects the many different factors associated with mitigating the sources and impacts of climate change. These segments were based originally on the cleantech segments

defined by the Cleantech Group; however, while Cleantech's focus is on new technology, the definition of the Core Green Economy is broader in order to encompass all products and services that help reduce the sources and impacts of climate change.

The lack of standardized industry data with information on "green" products, services and occupations has resulted in the development of multiple approaches to defining "green jobs" and the green economy. The definitions vary largely depending upon the underlying data. Some approaches focus on the activities of occupations and are based on job postings or employer surveys. Other approaches focus on businesses that operate in a "green" manner regardless of the end products and services they sell. While the various approaches contribute different perspectives on economic changes under way, the approach presented in this report represents the most comprehensive accounting of businesses and employment in the emerging green economy.

The Fifteen Segments of the Core Green Economy

GREEN SEGMENT	DESCRIPTION	
1. Energy Generation	• Renewable energy generation (all forms of solar, wind, geothermal, biomass, hydro, marine & tidal, hydrogen, co-generation) • Research & Testing in renewable energy	• Renewable energy consulting services • Associated equipment, controls, and other management software and services
2. Energy Efficiency	• Energy conservation consulting and engineering • Building efficiency products and services • Energy efficiency research	• Alternative energy appliances (solar heating, lighting, etc.) • Energy efficiency meters & measuring devices
3. Transportation	• Alternative fuels (biodiesel, hydrogen, feedstock-neutral ethanol infrastructure) • Motor vehicles & equipment (electric, hybrid, and natural gas vehicles, diesel technology)	
4. Energy Storage	• Advanced batteries (e.g. Li-Ion, NiMH) • Battery components & accessories	• Fuel cells
5. Air & Environment	• Environmental consulting (environmental engineering, sustainable business consulting)	• Emissions monitoring & control • Environmental remediation
6. Recycling & Waste	• Consulting services • Recycling (paper, metal, plastics, rubber, bottles, automotive, electronic waste and scrap)	• Recycling machinery manufacturing • Waste treatment
7. Water & Wastewater	• Water conservation (control systems, meters & measuring devices) • Development and manufacturing of pump technology	• Research and testing • Consulting services • Water treatment & purification products/services
8. Agricultural Support	• Sustainable land management and business consulting services	• Sustainable supplies and materials • Sustainable aquaculture
9. Research & Advocacy	• Organizations and research institutes focused on advancing science and public education in the areas of: renewable energy and alternative fuels and transportation.	
10. Business Services	• Environmental law legal services • Green business portals	• Green staffing services • Green marketing and public relations
11. Finance & Investment	• Emission trading and offsets • Venture capital and private equity investment	• Project financing (e.g. solar installations, biomass facilities, etc.)
12. Advanced Materials	• Bioplastics • New materials for improving energy efficiency	
13. Green Building	• Design & construction • Building materials	• Site management • Green real estate & development
14. Manufacturing & Industrial Support	• Advanced packaging • Process management and consulting	• Industrial surface cleaning
15. Energy Infrastructure	• Consulting and management services	• Cable & equipment

Comparison with Recent Missouri Green Jobs Report

The economy consists of a diverse set of actors and elements including whole industries, companies, employees, individual business locations of multi-unit firms, products, customers, supply chains and more. As a result, an economy can be examined from different vantage points (i.e. based on different units of analysis). For instance, by examining the distribution of employment across industries, one can observe how the industry mix in a region (or city, state, or country) has shifted over time. Or, from a different point of view, one can examine the distribution of employment across occupations in order to discern the change in occupational demand in an economy. Both analyses are valid and provide valuable information from two different cross sections of the economy.

It is important to keep in mind that the unit of analysis will in large part influence the definition of "green" utilized for the analysis. As a result, there is no single definition of green. It depends on what the analysis is examining and how detailed the data is. At its essence, "green" is about reducing negative environmental impacts, doing more with less, and leveraging clean alternatives; essentially, "green" products and services help to mitigate the sources and impacts of climate change.

In 2009, the Missouri Economic Research & Information Center (MERIC) completed a report on green jobs in the state that represents an industry and occupational analysis. The MERIC study focused on a subset of industries and surveyed employers about the activities of their employees in order to establish the extent of green-related jobs in these particular industries. This report provides valuable information about changes in the demand for specific skills and occupations as a result of growing economic activity related to conserving natural and energy resources, leveraging clean alternative sources and waste management. The MERIC study also examines farming and public administration.

In contrast, the following green economy analysis of the greater St. Louis area examines business units (i.e. unique locations of single- and multi-unit firms) with primary activities that fit the definition explained above for the Core Green Economy; namely, businesses that provide products and services that leverage renewable energy sources, conserve the use of energy and all natural resources, and reduce pollution and repurpose waste.

While the MERIC study examines occupations across a defined set of industries, this analysis examines the growth of businesses (and employment) that provide the products and services that essentially enable the "greening" of the entire economy. Both provide new information about the far-reaching changes emerging across the economy.

The Economy Can Be Viewed by Occupation or by Industry

II. The St. Louis Core Green Economy

The St. Louis core green economy is growing faster than the region's economy as a whole and consists of a unique mix of green industries. The region's green business activities reveal areas of expertise and potential for future specialization. As the demand for these green products and services grows, the businesses (and their employment) that provide these products and services will also grow.

How does this growing area of activity relate to the region's overall economy? The products and services provided by the region's core green economy serve to improve energy and resource efficiency which will significantly boost the competitive advantage of the region's companies and the overall regional economy. In addition to resulting in new job opportunities, this growing green business activity will result in energy and resource savings for the region's households and businesses that can be reinvested into the region's economy in the form of new job positions and capital investments.

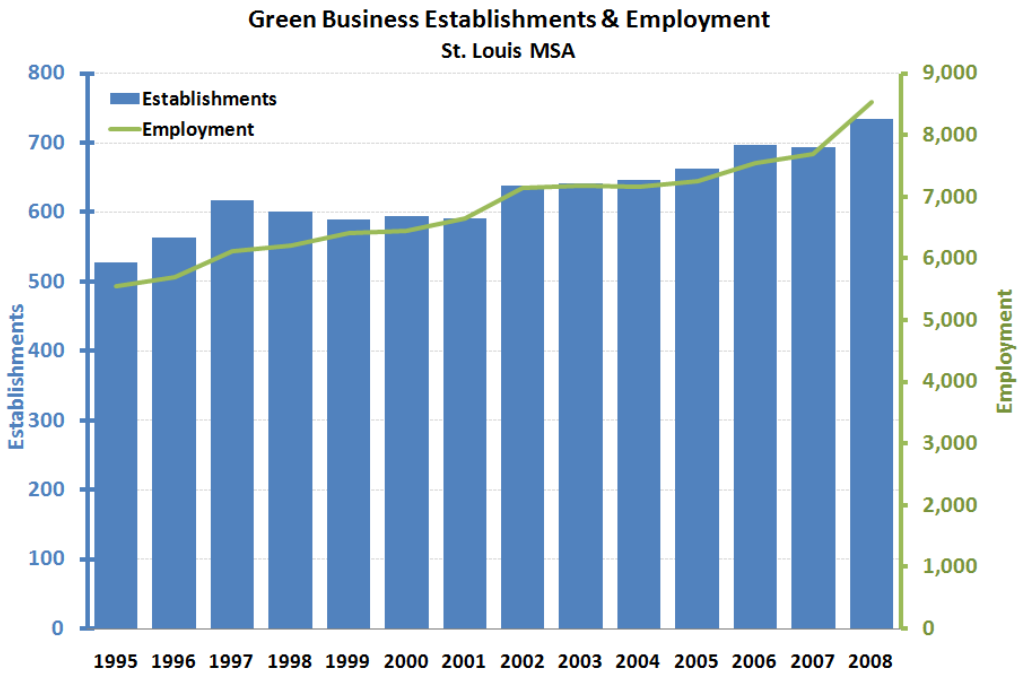
In terms of an economic growth strategy, the region would be well served by supporting the application of green products and services throughout the economy. This will spur demand for the local providers of these green products and services and boost the region's resource efficiency and competitive advantage of the region's companies across all industries. The result will be new job opportunities in the growing green economy as well as across all industries as companies reap the cost savings from efficiency gains.

1. Growth: Green versus Total Employment Growth

The core green economy in the St. Louis metropolitan area is growing at a faster rate than the region's overall economy. Between 1995 and 2008, green business establishments increased by 39 percent while employment in these businesses increased by 54 percent. In contrast, job growth in the economy as a whole was only four percent over the same period. Most recently, between 2007 and 2008, green establishments in the St. Louis area increased by six percent while employment increased by 11 percent. Green establishment growth reflects growth in the economy as a whole over the same period; however, total regional employment decreased by two percent.

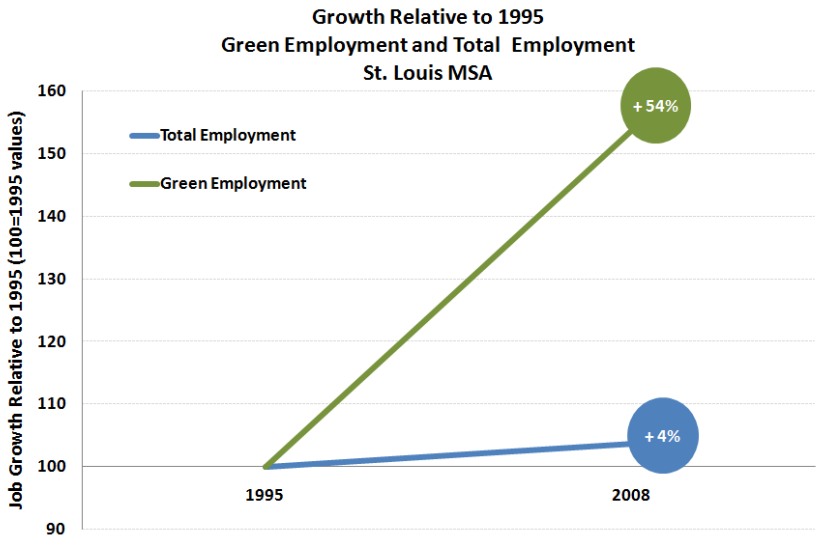
EMPLOYMENT GROWTH ST LOUIS REGION		
	1995-2008	2007-2008
GREEN	+54%	+11%
TOTAL	+4%	-2%

It is important to understand that focusing on this growing area of activity is not as much simply about stimulating growth in this particular area as it is about spurring the application of the products and services provided by this segment of the economy in order to improve efficiencies across the economy (e.g. businesses, utilities, households, public sector) and the competitive advantage of all businesses across all industries. As a result, encouraging the application of products and services from the core green economy will result in the dual benefit of employment growth and efficiency gains which translate into cash savings that can be applied to new hires or new capital for business and more purchasing power for households.



Data Source: Green Establishment Database
Analysis: Collaborative Economics

Nationally and in nearly every state, employment in the green economy has been growing at a faster rate than the overall economy. Typically, business activity in the core green economy builds off of a region's existing industries. For example, in Silicon Valley, the solar industry is highly concentrated because it has grown out of the region's semiconductor industry. Similarly, the region's advanced sensor technologies contribute to its strong standing in environmental controls and detection sensors; and its IT industry in general contribute to its activities related to smart grid. The core green economy is highly concentrated in Silicon Valley mainly due to its extremely diverse technology industry base yet represents 0.9% of the region's total employment. For comparison, the core green economy represents 0.6% of the St. Louis area's total employment. Although, green business activities are not as concentrated in St. Louis, it is important to take a look at the region's particular areas of strength and its broader industry base in order to consider the linkages of green providers and the different types of user industries across the economy.



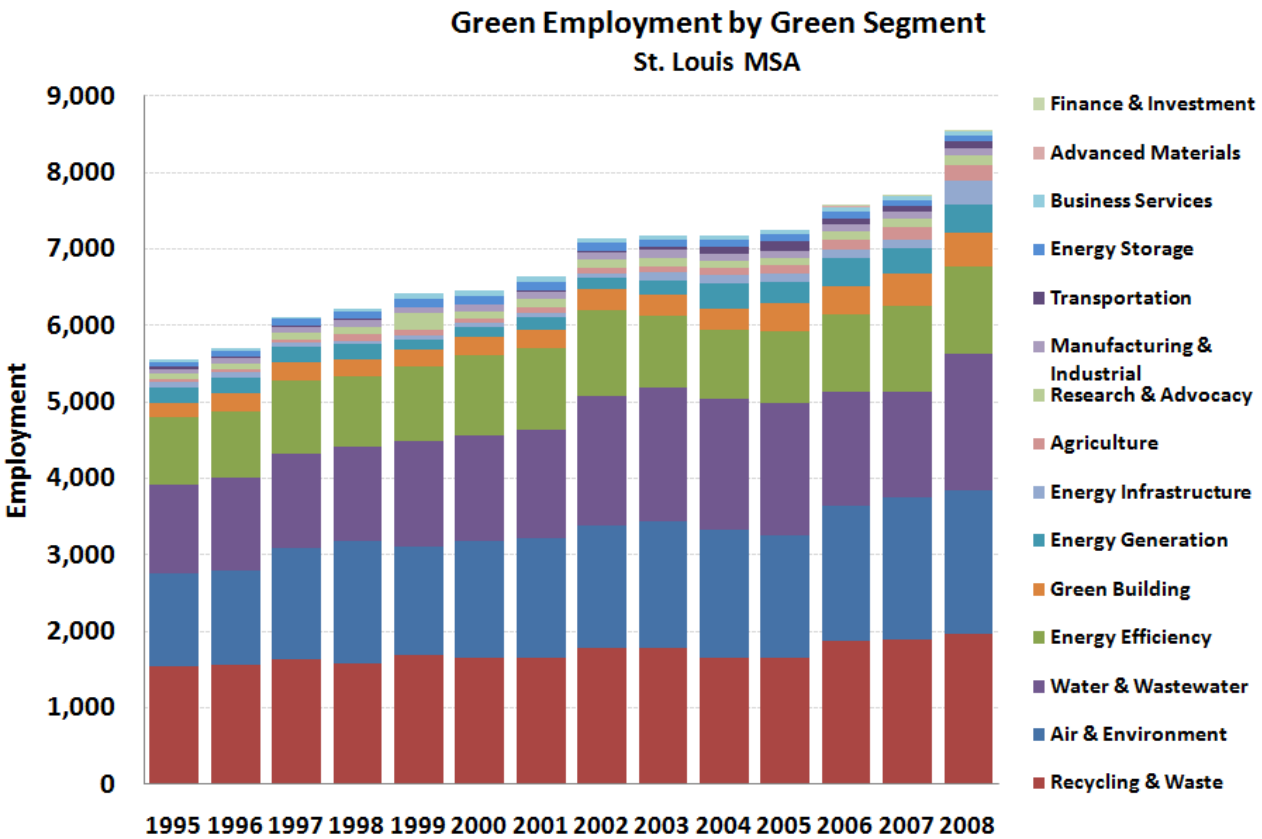
Data Source: Green Establishment Database
Analysis: Collaborative Economics

2. Industry Diversity: Businesses and Employment by Green Segment

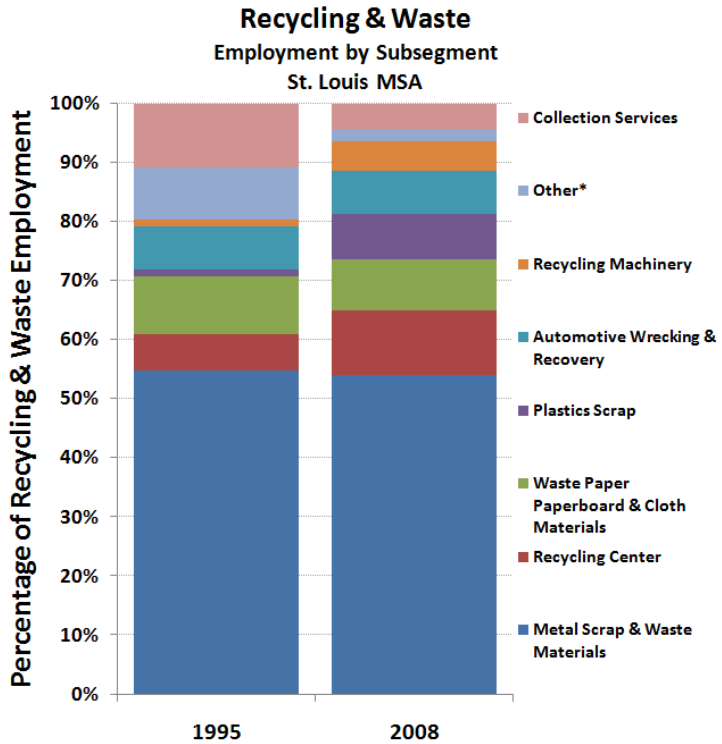
As explained earlier, green business activities are typically growing from a region's existing industries. There is a good portion of the core green economy that has existed a while (e.g. recycling, water management, air filtration, etc.); however, these activities take on new meaning given the new context of increasing resource constraints and the many different sources and impacts of climate change.

The largest green segments in the St. Louis area's core green economy are Recycling & Waste, Air & Environment, Water & Wastewater, and Energy Efficiency. Combined these segments account for nearly 83 percent of green establishments and more than 79 percent of green employment. Recent growth between 2007 and 2008 has been strongest in Energy Infrastructure (206%), though employment growth in Water & Wastewater (30%), Agriculture (21%), and Research & Advocacy (20%) has also been significant.

Employment by Green Segment			
	1995	2008	% Change
Advanced Materials	-	2	NA
Agriculture	35	198	466%
Air & Environment	1,194	1,872	57%
Business Services	30	55	83%
Energy Efficiency	901	1,156	28%
Energy Generation	193	364	89%
Energy Infrastructure	79	315	299%
Energy Storage	65	81	25%
Finance & Investment	-	2	NA
Green Building	178	440	147%
Manufacturing & Industrial	59	97	64%
Recycling & Waste	1,544	1,967	27%
Research & Advocacy	109	133	22%
Transportation	26	82	215%
Water & Wastewater	1,154	1,796	56%
Total	5,567	8,560	54%



Data Source: Green Establishment Database
Analysis: Collaborative Economics



* "Other" includes Rubber Scrap, Glass, Bottles & Cans, Electronic Waste, Aggregates, Waste Treatment, Oil & Lubricants, Consulting, and Tire Recycling
Data Source: Green Establishment Database
Analysis: Collaborative Economics

In 2008, 54 percent of employment in Recycling & Waste was in Metal Scrap & Waste Materials, slightly down from 55 percent in 1995. These Metal Scrap & Waste companies include processors, such as PSC Metals and Southern Metal Processing, and brokers such as Alter Trading and Shapiro Sales. Between 1995 and 2008, employment in Plastics Scrap recycling ballooned from less than 20 to more than 150, increasing in share from one percent to eight percent.

RECYCLING & WASTE

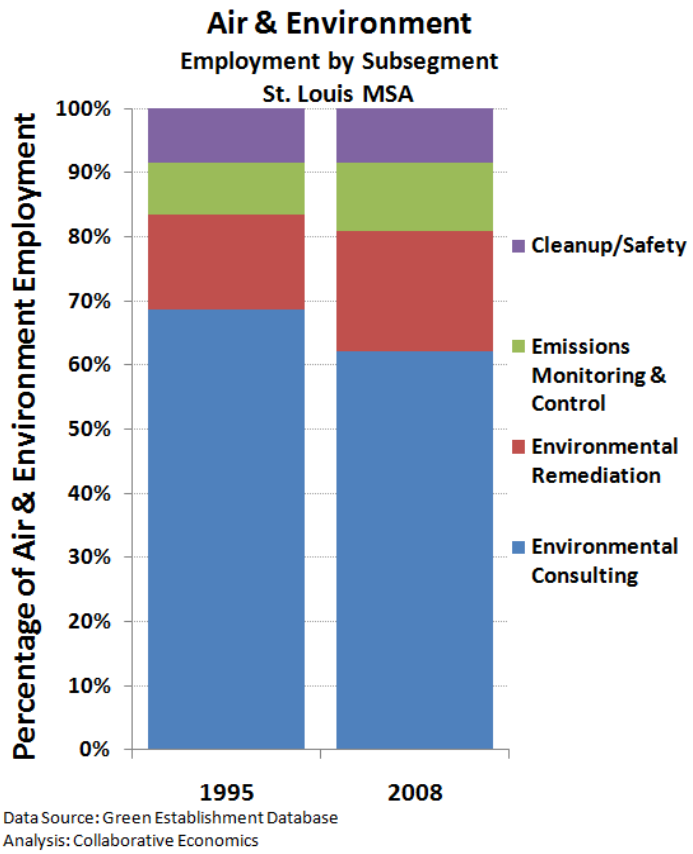
Anheuser-Busch Recycling Corp.

St. Louis, Missouri-based Anheuser-Busch Recycling Corp. (A-BRC) is one of the largest recyclers of aluminum cans. A-BRC recycles 27 billion cans annually - 25 percent more than their parent corporation, Anheuser-Busch, Inc., recycles in a year. In the past three decades, A-BRC has recycled 430 billion cans which would have otherwise been diverted to landfills. As of March, 2010, A-BRC and Wise Metals Group have signed an agreement that will supply 100% of used beverage cans scrap to the can sheet rolling mill Wise operates in Muscle Shoals, Alabama. This same mill will provide aluminum can sheets to Anheuser-Busch InBev (ABI) for use in ABI's can manufacturing.

"Wise Metals Group, LLC Announces Fourth Quarter and Year End Results" Benzinga. Web. April, 6, 2010. March, 30, 2010. http://www.benzinga.com/press-releases/b200993/wise-metals-group-llc-announces-fourth-quarter-and-year-end-results

"Anheuser-Busch Employees Seeing Green" Anheuser-Busch. April 11, 2008. Web. April 6, 2010. http://www.anheuser-busch.com/Press/seeGreen.html

Recycling & Waste Company Examples			
Company	**City**	**Green SubSegment**	**Description**
PSC Metals Inc	St. Louis, MO	Metal Scrap & Waste Materials	Scrap metal processor
Alter Trading Corporation	St. Louis, MO	Metal Scrap & Waste Materials	Leading scrap metal recycler and broker
Shapiro Sales Company (Shapiro Metals)	St. Louis, MO	Metal Scrap & Waste Materials	Metal scrap recycling sercices
Blue Tee Corp (Azcon Corporation)	Alton, IL	Metal Scrap & Waste Materials	Metal scrap processor, broker, and mill-services management company
Hilex Poly Co	St. Louis, MO	Plastics Scrap	Manufacturer and recycler of plastic bag and film products
Grossman Iron & Steel	St. Louis, MO	Metal Scrap & Waste Materials	Buyer/processor of iron and steel scrap
Southern Metal Processing	St. Louis, MO	Metal Scrap & Waste Materials	Scrap metal buyer/processor
Becker Iron & Metal	St. Louis, MO	Metal Scrap & Waste Materials	Scrap metal buyer/processor



Data Source: Green Establishment Database
Analysis: Collaborative Economics

AIR & ENVIRONMENT

Environmental Restoration LLC

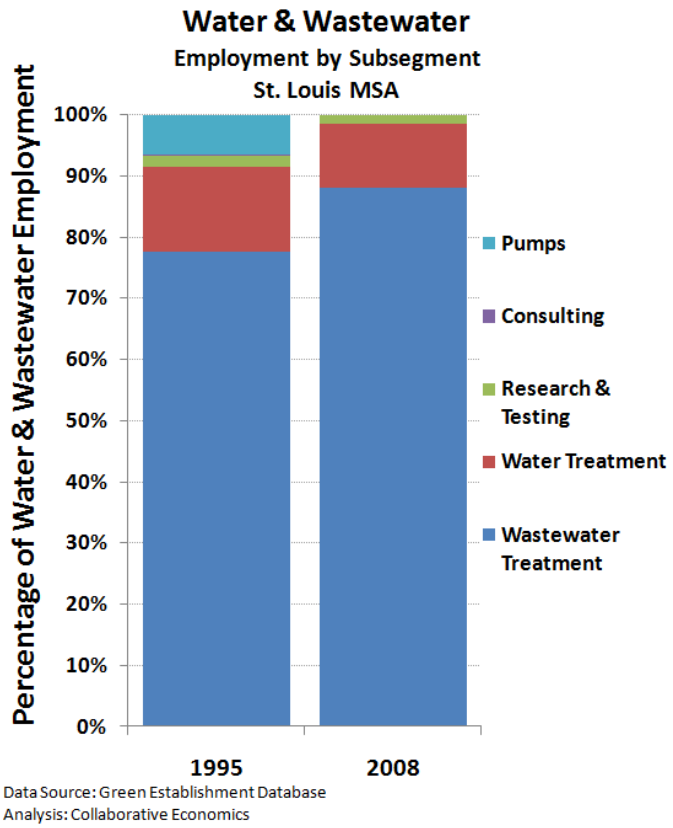
Headquartered in Fenton, Missouri, Environmental Restoration, LLC, a subsidiary of Windswept Environmental Group Inc., provides emergency response, environmental remediation, and hazardous materials removal services for the federal government, state governments, state agencies, and private sector clients. Founded in 1997, Environmental Restoration has become a recognized leader in the field of environmental emergency response, remediation and construction; and grown to include 13 regional offices spread across the entire country.

"Environmental Restoration, LLC" Businessweek. Web. April 6, 2010. http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=4817110

"About Us" Environmental Restoration, LLC. Web. April 6, 2010. http://www.erllc.com/AboutER/Default.shtml

In 2008, 62 percent of employment in Air & Environment was in Environmental Consulting, down from 69 percent in 1995. Employment in Emissions Monitoring & Control doubled between 1995 and 2008, from 98 to 200 jobs.

Air & Environment Company Examples			
Company	**City**	**Green SubSegment**	**Description**
Golder Associates	Saint Charles, MO	Environmental Consulting	Global environmental engineering firm
Schreiber Yonley & Associates	Ellisville, MO	Environmental Consulting	Environmental engineering
SCI Engineering Inc	St. Louis, MO	Environmental Consulting	Environmental engineering
Delta Consultants (Delta Environmental)	Saint Charles, MO	Environmental Consulting	Environmental consulting
Aquaterra Environmental Solution	Fairview Heights, IL	Environmental Consulting	Environmental remediation & engineering
Cemtech International	Hillsboro, MO	Emissions Monitoring & Control	Environmental consulting



In 2008, Wastewater Treatment accounted for 88 percent of jobs in Water & Wastewater, up from 78 percent in 1995. Employment in Wastewater Treatment increased by 76 percent between 1995 and 2008. The majority of Wastewater Treatment jobs are at wastewater treatment facilities, though St. Louis also has a few equipment providers such as Solids Dewatering Systems and Raven Environmental Products.

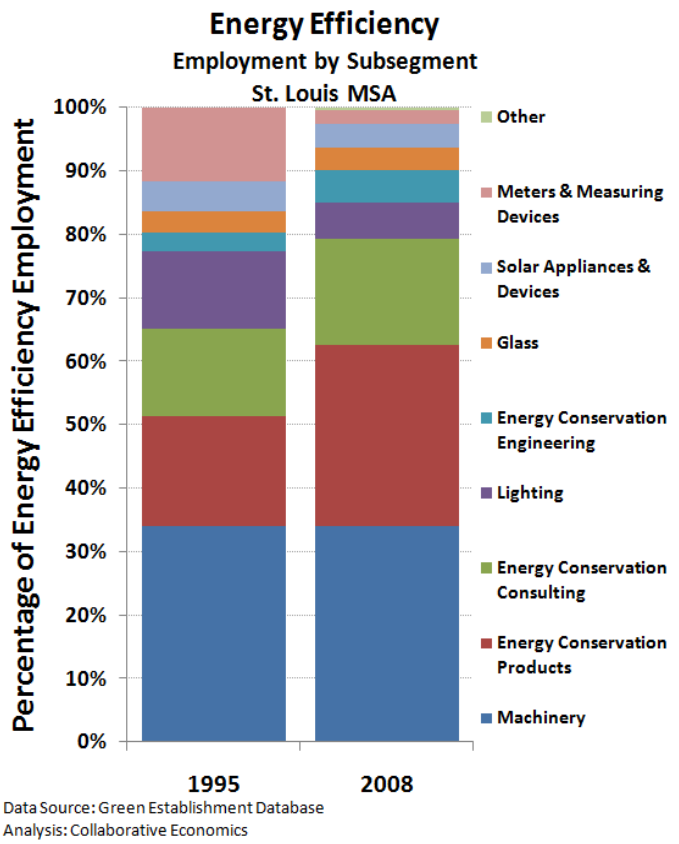
WATER & WASTEWATER

American Water

American Water is a Water and Wastewater provider with subsidiaries in 19 states. American Water, as a Water and Wastewater service company, ensures high-quality water is delivered to the communities it serves while, also, working to recycle and dispose of wastewater is environmentally sound and sustainable ways. Renewing their commitment to the environment, various subsidies of American Water have instituted conservation programs, clean water programs and water source protection awareness campaigns. They have received over 150 awards for superior water quality in the past several years. In particular, the Missouri American Water has received the Pollution Prevention Environmental Excellence Award from the United States Environmental Protection Agency for the company's Environmental Management System, an award that recognizes programs that reduce waste at the source and conserve natural resources.

"About Us". American Water. Web. February 24, 2010 http://www.amwater.com.about-us/accodales.html

Water & Wastewater Company Examples			
Company	**City**	**Green SubSegment**	**Description**
Smith & Loveless Inc	St. Louis, MO	Water Treatment	Water & Wastewater treatment and pumping systems
R.E. Pedrotti	Fenton, MO	Water Treatment	Systems integrator for municipal water & wastewater industries
Wideman Well Drilling	Union, MO	Research & Testing	Water testing laboratory
PDC Laboratories	St. Louis, MO	Research & Testing	Water testing laboratory
Solids Dewatering Systems, Inc	St. Louis, MO	Wastewater Treatment	Manufactures dewaterer systems
Aquial	St. Louis, MO	Water Treatment	Water treatment company developing bio-friendly chemicals
Raven Environmental Products	St. Louis, MO	Wastewater Treatment	Manufacturers and supplies water & wastewater process control instruments



Data Source: Green Establishment Database
Analysis: Collaborative Economics

Employment in both, Energy Conservation Products and Energy Conservation Engineering, more than doubled over the whole period, rising from 25 to 60 and 155 to 329 respectively. At 34 percent in both 1995 and 2008, machinery has consistently accounted for the greatest portion of jobs in Energy Efficiency.

ENERGY EFFICIENCY

Green Fiber

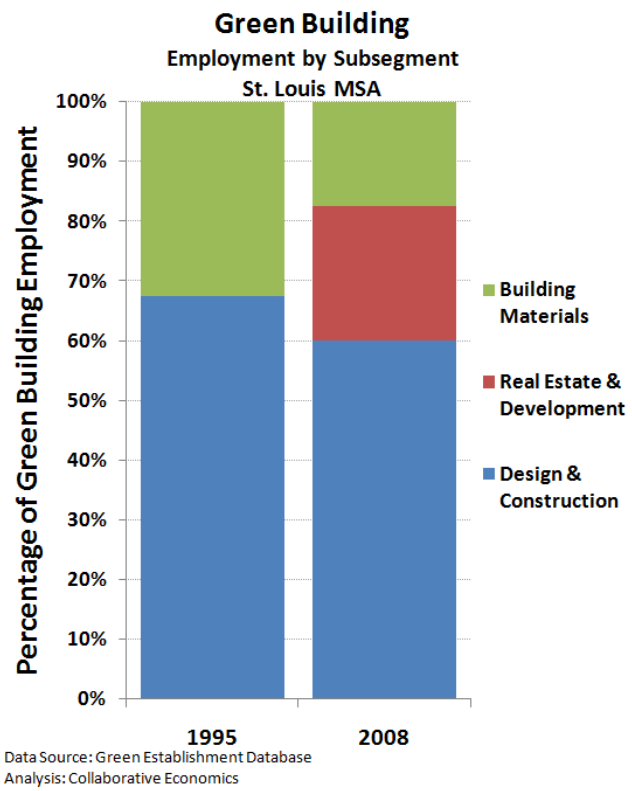
Established in 2000 with headquarters in Charlotte, North Carolina, Green Fiber entered the St. Louis market in 2005 with the acquisition of Blue Sky Insulation of East St. Louis. Green Fiber is the largest manufacturer of natural fiber insulation for residential and commercial usage. Most often found in home improvement stores, Green Fiber's Cocoon Insulation increases the energy efficiency of a home and is made from 85 percent recycled paper fiber. Green Fiber, also, supports community recycling services and diverts 350,000 tons of paper each year away from landfills.

"Corporate". Green Fiber. Web. February 24, 2010 http://greenfiber.com/index.html

"GreenFiber Cocoon Insulation: Energy Efficiency From Recycled Material ". Metaefficient. April 9, 2009. Web. February 24, 2010 http://www.metaefficient.com/architecture-and-building/greenfiber-cocoon-insulation-energy-efficiency-recycled.html

"GreenFiber Acquires Third Company In Eight Months". Green Fiber. February 9, 2006. Web. February 24, 2010

Energy Efficiency Company Examples			
Company	**City**	**Green SubSegment**	**Description**
Aser Inc	Fenton, MO	Energy Conservation Consulting	Energy efficiency building verification; conservation consultants
Aarons Alternative Energy	High Ridge, MO	Solar Appliances & Devices	Passive solar products and stoves
Energy Matters Inc	St. Louis, MO	Energy Conservation Consulting	Energy management program design and implementation
Premier Skylights LLC	Maryland Heights, MO	Energy Conservation Consulting	Daylighting installation company; provider of energy star certified products
Insulite Glass Co	St. Louis, MO	Energy Conservation Products	Energy efficient architectural glass
Super Bright LEDS Inc	Florissant, MO	Lighting	Distributor of energy efficient LEDs
Gridlogix Inc (Johnson Controls)	St. Louis, MO	Meters & Measuring Devices	Provides real-time enterprise energy management tools and solutions



Data Source: Green Establishment Database
Analysis: Collaborative Economics

In 2008, 60 percent of employment in Green Building was in Design & Construction, down from 67 percent in 1995. Despite Design & Construction's decline share as a percentage of Green Building jobs however, total jobs in Design & Construction more than doubled, from 120 to 264.

GREEN BUILDING

Vertegy

Vertegy is a full-service sustainable consultant firm, focused on the construction industry. Founded in 2005 and headquartered in Overland, Missouri, Vertegy provides sustainability consulting services to clients throughout the St. Louis region with an emphasis in the attainment of certification from nationally and internationally recognized bodies, such as the U.S. Green Building Council (USGBC), which provides LEED (Leadership in Energy & Environmental Design) certification. One of Vertegy's early successes was achieving a LEED Platinum rating on Alberici's Corporate Headquarters building as well as four Green Globe certification. As of January, 2010, Vertegy had consulted on 21 buildings that have achieved LEED certification. One of Vertegy's more recent projects, include a world-class student housing complex called Education City in Qatar, an Arab Emirate in Southwest Asia. Vertegy's latest accomplishment is the Benedictine Women of Madison's Holy Wisdom Monastery which received 63 out of 69 total LEED points to become the highest rated LEED Platinum building ever.

"About" Vertegy. Web. April 14, 2010. http://www.vertegyconsultants.com/About.cfm

"Vertegy helps buildings earn LEED certification" Credit Herald. January 18, 2010. Web. April 14, 2010. http://creditherald.com

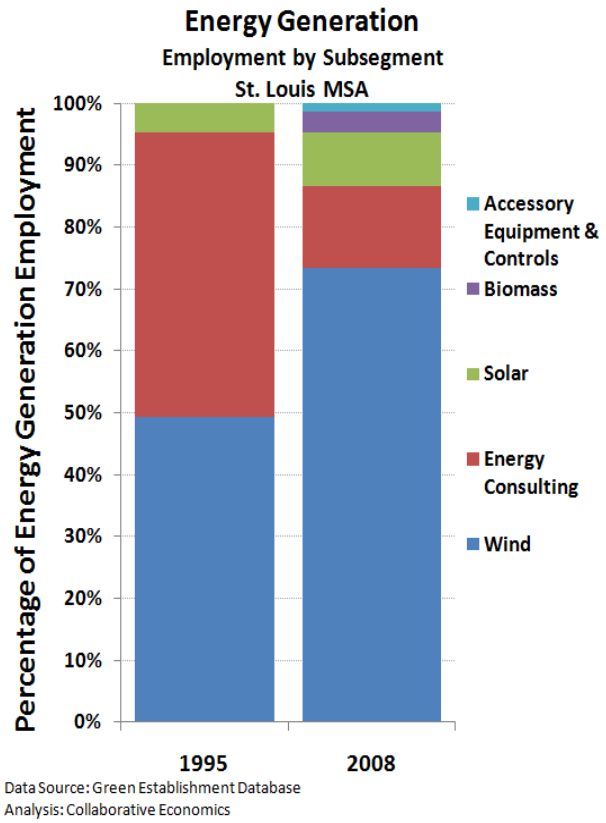
"Grant Lanham joins Vertegy as Operations Specialist" LEED Points. July 1, 2008. Web. April 14, 2010. http://leedpoints.com

"Vertegy's Award-Winning Sustainable Design Services Tapped for World-Class International Project" stltoday.com. January 22, 2008. Web. April 14, 2010.

"Vertegy and Hoffman, LLC Team Up to Deliver One of the Greenest Buildings in the United States" stltoday.com. March 29, 2010. Web. April 14, 2010.

Green Building Company Examples

Company	City	SubSegment	Description
Tarlton Corporation	St. Louis, MO	Design & Construction	General Contractor committed to sustainable construction practices since 2003
R.L. Just Associates	Chesterfield, MO	Design & Construction	Member of the U.S. Green Building Council (USGBC); offers sustainable design services
Plastic Lumber Company of America	St. Louis, MO	Building Materials	Manufacturer of plastic building products from recycled plastics scrap
Hellmuth + Bicknese Architects	St. Louis, MO	Design & Construction	USGBC member, full service architectural design and planning firm dedicated to sustainable development
Blue Brick Renovation & Construction	St. Louis, MO	Design & Construction	Construction company focused on environmentally sustainable practices



Since 2008, total employment in Energy Generation has grown 89 percent from 193 to 364. Wind has been both the largest and fastest growing Subsegment, representing 73 percent of jobs in 2008, an increase of 181 percent from 1995. Conversely, jobs in Energy Consulting decreased 46 percent between 2008 and 1995, from 89 to 48.

ENERGY GENERATION

Wind Capital Group

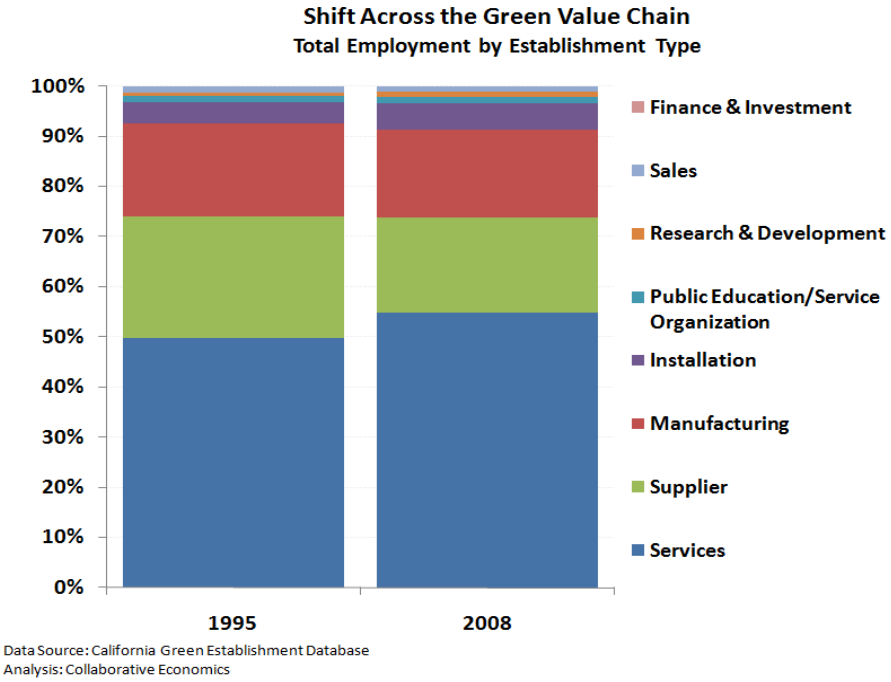
Wind Capital Group builds wind farms across the Midwest. The company has already successfully built seven wind farms, the largest of which generates 400 MW, and has developing projects in 16 states. One of the company's finished projects, The Loess Hills Wind Farm in Rock Port, MO, creates more energy than the nearby town needs, making Rock Port the first 100% wind powered town in America. Wind Capital Group is a subsidiary of Ireland-based "NTL plc", which has invested $150 million into the company and has committed to supply them with 150 megawatts of wind turbines.

Allen, Matt. "Wind Capital, NTR complete transaction,"St. Louis Business Journal. June 17, 2008. Web. January 21, 2010. http://www.bizjournals.com/stlouis/stories/2008/06/16/daily33.html?surround=lfn

"What We Do". Wind Capital Group. Web. January 19, 2010. http://www.windcapitalgroup.com/About/WhatWeDo.aspx

Energy Generation Company Examples			
Company	**City**	**Green SubSegment**	**Description**
Mid-America Advanced Power Solutions (MAAPS)	Swansea, IL	Solar	Renewable energy system installer
G2 Power Solutions (Alt Power LLC)	St. Louis, MO	Solar	Renewable energy system installer
Aura Renewable Energy	St. Louis, MO	Biomass	Waste-to-Energy; uses organic waste to generate biogas
JMS Solar Network & Associates	Alton, IL	Solar	Solar installation
BZ Products	St. Charles, MO	Solar	Distributor of solar controls and meters

3. Opportunity Across the Value Chain



Data Source: California Green Establishment Database
Analysis: Collaborative Economics

In addition to observing the emerging core green economy by the 15 segments, these green business establishments can also be examined by their primary activities along the value chain such as services, manufacturing, suppliers, installation, etc. In the St. Louis area, 55 percent of green employment is in establishments with primary activities in Services. Nineteen percent of employment is with suppliers of components or products. Eighteen percent of green employment in St. Louis is in establishments with primary activities in manufacturing.

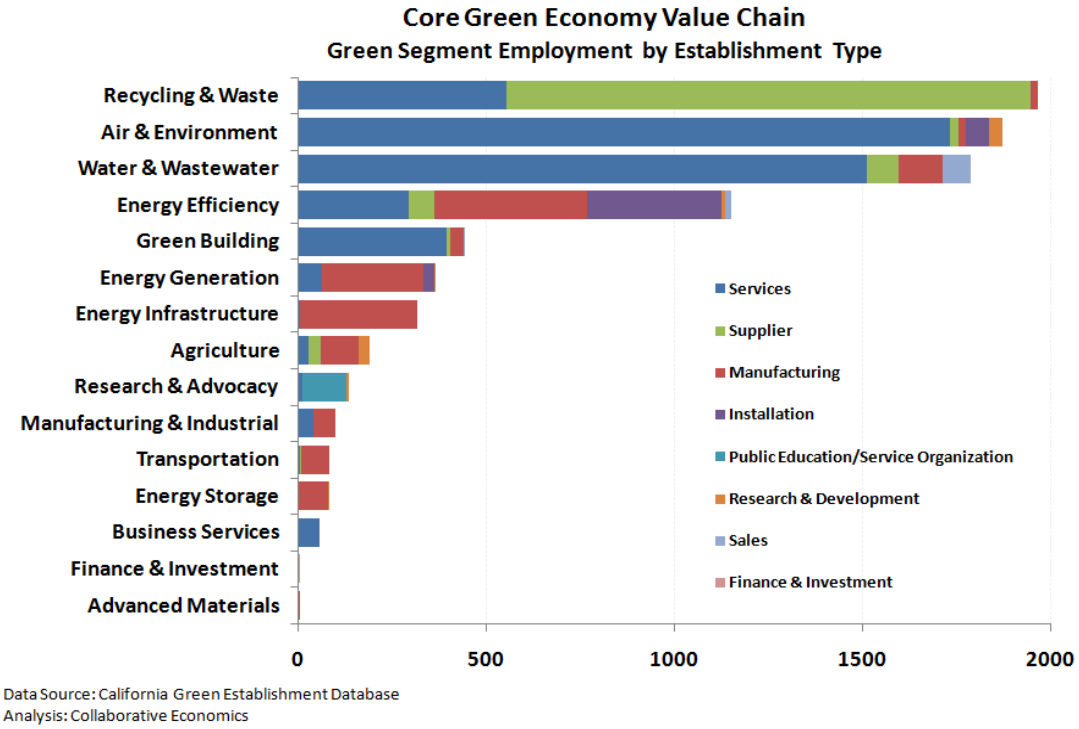
Employment in every part of the value chain has increased since 1995, though growth in Installation (87%) and Services (70%) has been particularly pronounced.

MANUFACTURING/ INDUSTRIAL SERVICES

Halcyon Shades

Halcyon Shades has been manufacturing high-tech solar control shades since 2005 under Solutia, Inc. In 2009, Halcyon was purchased by Habitata Building Products and manufacturing was relocated to the St. Louis area from Mexico. Now headquartered in St. Louis, Halcyon Shades provides solar shades to distributors nationwide. Halcyon Shades, parent company Habitata was honored with the Business of the Year Award (2009) for relocating the manufacturing plant for Halcyon across the border from Mexico and bringing jobs to the St. Louis area.

"About" Halcyon Shades. Web. April 15, 2010. http://www.halcyonshades.com



Data Source: California Green Establishment Database
Analysis: Collaborative Economics

The distribution of the green employment across the value chain varies by green segment:

- 71 percent of Recycling & Waste jobs are at Suppliers, while 28 percent are at Service providers
- Air & Environment is predominately composed of Service jobs (93%)
- 84 percent of Water & Wastewater jobs are in Services and seven percent in manufacturing.
- Energy Efficiency jobs are primarily in Manufacturing (35%), Installation (31%), and Services (25%).

MANUFACTURING/ INDUSTRIAL SERVICES

Zoltek Companies, Inc.

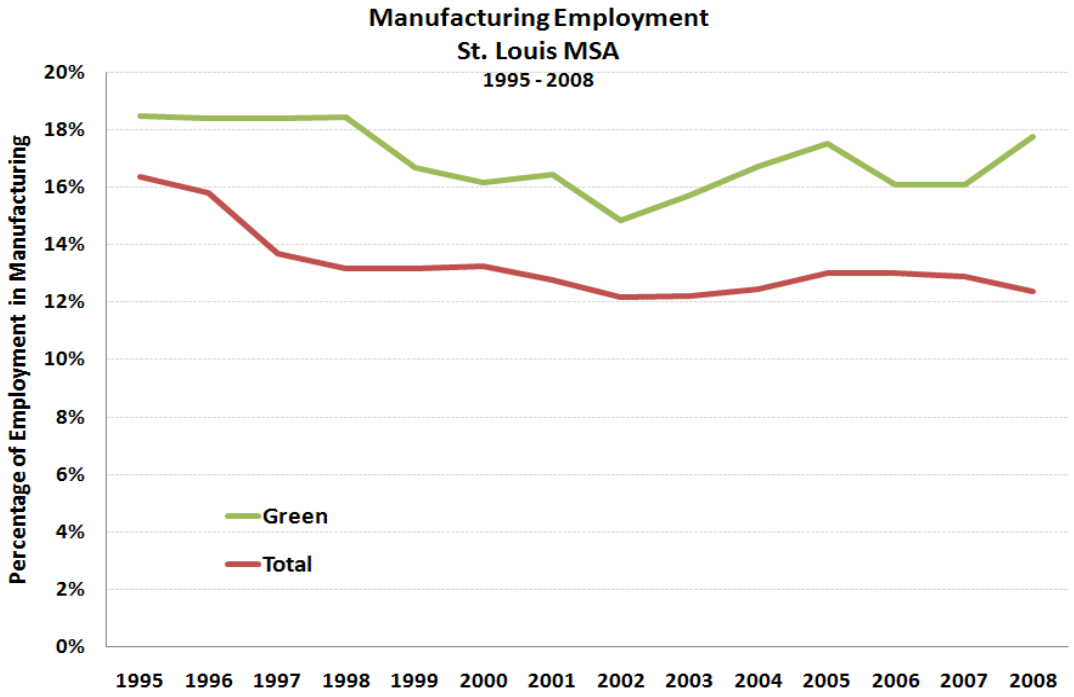
Zoltek has been operating as an applied technology and advanced materials company since 1975 but entered the carbon fiber market through an acquisition in 1988. During Zoltek's infancy in the carbon fiber market, the company focused on the aerospace market but later shifted to producing a lower-cost carbon fiber which is now used in the renewable energy market (i.e. wind tower/turbine manufacturing). Zoltek has a global presence and in 2006 began expansion of its manufacturing plant in Hungary to become the largest carbon fiber plant.

"History" Zoltek Companies. Web. April 15, 2010. http://www.zoltek.com/aboutus/history.php

"Zoltek Companies, Inc." Yahoo Finance. Web April 15, 2010. http://finance.yahoo.com/q/pr?s=zolt

"Zoltek to make Hungarian carbon fibre plant world's largest" Encyclopedia.com. Septermber 1, 2006. Web. April 15, 2010. http://www.encyclopedia.com/doc/1P3-1150886531.html

With 18 percent of green employment in manufacturing establishments, the Core Green Economy offers proportionally more manufacturing jobs than the economy as a whole. This has been the case over the entire period of observation between 1995 and 2008. In the St. Louis Region, 12 percent of employment was in manufacturing in 2008. Manufacturing jobs in the Core Green Economy are particularly numerous in the segments of Energy Efficiency, Energy Generation, Energy Infrastructure, and Water & Wastewater.



Data Source: Green Establishment Database
Analysis: Collaborative Economics

Green Manufacturing Company Examples			
Company	**City**	**Green Segment**	**Description**
InterGlobal Inc	St. Louis, MO	Energy Efficiency	Energy Star Partner; manufacturer of efficient lighting components
Agricycle (AKA St. Louis Composting)	Valley Park, MO	Agriculture	Manufacturer of organic soil supplements
Bitrode Corporation	Fenton, MO	Energy Storage	Manufacturer of battery test equipment
Distribution Control Systems, Inc (DCSI)	St. Louis, MO	Energy Infrastructure	Subsidiary of ESCO; manufacturer of two-way power line communication systems for
Aquial LLC	Chesterfield, MO	Water & Wastewater	Uses renewable resources to produce water treatment chemicals
Plastic Lumber Company of America	St. Louis, MO	Green Building	Manufacturer of plastic building products from recycled plastics scrap
EnviroPAK Corporation	Earth City, MO	Manufacturing & Industrial	Manufacturer of biodegradable molded pulp packaging from recycled sources.

4. Specialization: St. Louis' Strengths in the Green Economy

The 15 segments of St. Louis' Core Green Economy are growing at different rates. In the bubble chart that follows, each "bubble" represents one of the 15 green segments, and its size illustrates the relative employment size. The chart illustrates the absolute employment growth of each of the 15 segments between 1995 and 2008 along the horizontal axis and the more recent growth from 2007 to 2008 along the vertical axis.

While Agricultural Support is one of the smaller green segments by employment, it has grown at the fastest rate, increasing by 466 percent between 1995 and 2008. This segment includes firms that provide equipment and consulting to improve the resource efficiency and sustainable practices of agricultural producers. Similarly, employment in Energy Infrastructure has grown by 299 percent over the long period and 206 percent just between 2007 and 2008. This segment consists of companies that provide consulting and management services for large-scale energy generation and distribution operations.

St. Louis is well poised to take advantage of its strength in manufacturing, and a good approach would be to offer incentives for manufacturers to reassess their processes and supply chains in order to identify areas for improving efficiencies, reducing costs, and boosting competitiveness. For example, sales tax exemptions could be implemented for manufacturers (or any business) on the purchase of products and services that improve the energy and resource efficiency of facilities, leverage clean energy sources, and reduce pollution and waste.

St. Louis could convene its manufacturers along with its green providers to facilitate this discussion. Moving forward, St. Louis could host an annual conference and expo specifically on manufacturing in the new century. In essence, this is all about modernization and boosting competitiveness.

TRANSPORTATION

CleanTech Biofuels

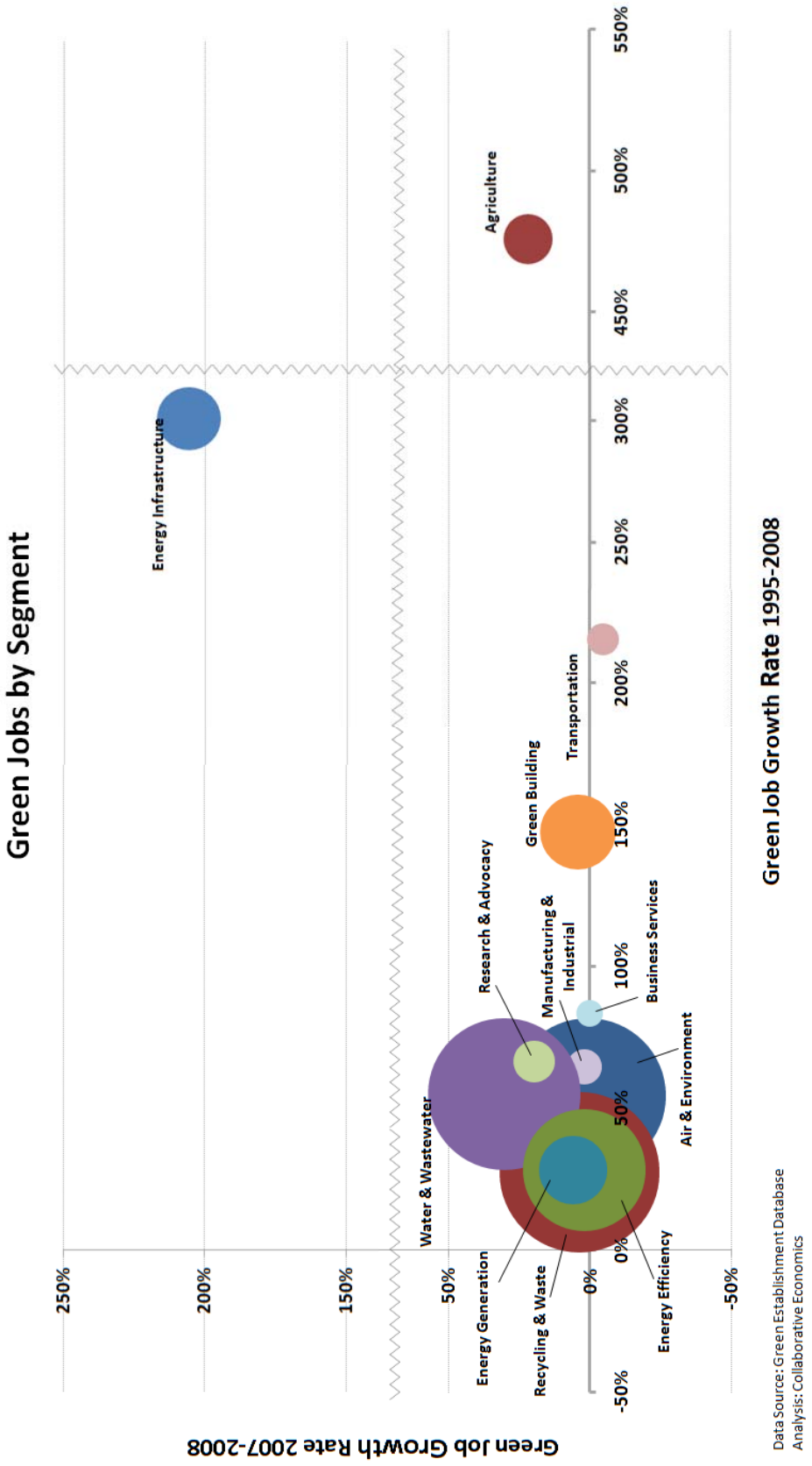
CleanTech Biofuels, Inc. holds exclusive licenses to two methods for converting municipal solid waste to ethanol and is offering cities and landfill operators this technology to convert their municipal solid waste into usable biomass. Cleantech predicts they can reduce waste disposed of in those landfills by as much as 90%. The company expects to be profitable quickly by using existing infrastructure for municipal solid waste collection and disposal, allowing them to operate at a low or possibly negative feedstock cost. This may give CleanTech economic advantages over other alternative energy producers, who have to spend time and money developing infrastructure for their already more expensive feedstocks. So far, CleanTech Biofuels has been selected for implementation at a proposed recycling and biomass recovery facility in Pawnee County, Oklahoma.

*"CleanTech Biofuels, Inc. Biomass Recovery Process Selected for Proposed Waste to Energy Development" The New York Times. December 16, 2009. Web. January 24, 2010.

Midwest Biodiesel

Established in 2006, Midwest Biodiesel Products, Inc. is a Caseyville, Illinois-based fuel company that produces biodiesel using the feedstock soybean oil. The company is focused on producing an environmental-friendly fuel that reduces polluting emissions and the United States' dependence on oil as a fuel source. The biodiesel product produced is renewable and a product of surplus domestic crops.

"Company". Midwest Biodiesel Products, Inc. Web. Feb. 24, 2010. http://www.midwestbiodieselproducts.com/index.aspx?page=11


Green Jobs by Segment
Green Job Growth Rate 2007-2008
Green Job Growth Rate 1995-2008
250%
200%
150%
50%
0%
-50%
-50%
0%
100%
150%
200%
250%
300%
450%
500%
550%
Energy Infrastructure
Agriculture
Transportation
Green Building
Research & Advocacy
Manufacturing & Industrial
Business Services
Water & Wastewater
Air & Environment
Energy Generation
Recycling & Waste
Energy Efficiency
Data Source: Green Establishment Database
Analysis: Collaborative Economics

Growth by Green Segment	Establishments		Employment	
	95-08	07-08	95-08	07-08
Advanced Materials	NA	0%	NA	0%
Agriculture	138%	19%	466%	21%
Air & Environment	66%	4%	57%	1%
Business Services	0%	0%	83%	0%
Energy Efficiency	13%	1%	28%	2%
Energy Generation	111%	58%	89%	6%
Energy Infrastructure	-33%	0%	299%	206%
Energy Storage	0%	0%	25%	11%
Finance & Investment	NA	0%	NA	0%
Green Building	150%	9%	147%	4%
Manufacturing & Industrial	100%	20%	64%	2%
Recycling & Waste	13%	6%	27%	4%
Research & Advocacy	22%	12%	22%	20%
Transportation	450%	0%	215%	-5%
Water & Wastewater	33%	6%	56%	30%
Total	**39%**	**6%**	**54%**	**11%**

Innovation and Specialization in Clean Coal Technology

Peabody Energy, headquartered in St. Louis, is leading the industry push within the United States to make clean coal a reality. In alliance with the U.S Department of Energy, Peabody Energy and other FutureGen alliance members are working to build the state-of-the-art, near-zero emissions coal power plant in Mattoon, Illinois. The FutureGen project will serve as a prototype for a new generation of clean energy power plants and once completed in 2012 will be able to provide 150,000 homes with electricity.

Peabody Energy is also a founding partner of Washington University's Consortium for Clean Coal Utilization. The Consortium was established in 2008 under the International Center for Advanced Renewable Energy and Sustainability and leads clean coal research projects around the world. Coal utilization research conducted under the direction of the Consortium focuses on topics including technology R&D, public policy, air & water quality, health effects, and climate consequences. Current projects range from algal systems for carbon dioxide capture to heavy metals and fine particle emissions control to ash utilization.

II. Innovation and the Growth of the Green Economy

Innovation drives the economic success of a region and is imperative to achieving the combined aim of reducing negative environmental impacts and growing the economy. Advances specifically in green technology create new markets that spur new demand through continued market differentiation and technological development. More than just in technology products, innovation includes advances in business processes and business models. The ability to generate new ideas, products and processes is an important source of regional competitive advantage.

To measure green technology innovation, we examine the venture capital investment in Cleantech and patent registrations in green technology. Additionally, tracking the specific areas of investment and patent activity over time provides valuable insight into the region's areas of expertise and longer-term direction of development.

St. Louis is an important center for plant sciences. Although it may not be directly discernable in the venture capital and patent registration analysis which follows, the region is home to world class research partnerships between the University of Washington, the Donald Danforth Plant Science Center, and the Monsanto Company. Many of the patents registered in the region deal with plant science related to the development of algal and other biofuels as well as carbon capture and sequestration. A significant portion of venture capital investment in the region has been directed to life sciences work with diverse applications in energy storage, biofuels, and agricultural pest management.

FINANCE & INVESTMENT

TeraVista Systems, LLC

Kirkwood, Missouri-based, TeraVista Systems, LLC was founded in 2007. Teravista develops software (ClimateSuite/ClimateVerify) to streamline the carbon credit trading process and provides strategic consulting to environmental organizations, with a focus on Agriculture and the Carbon offset supply chain. ClimateSuite assists providers, aggregators, brokers and registries by providing an automated software system that purchases and manages carbon offset credits. TeraVista, which has raised more than $600,000 in investment capital, currently has contracts with commodity traders such as Kansas City-based FCStone Group Inc., Illinois-based First Capitol Risk Management and the North Dakota Farmers' Union. Televant, an I.T. company, has licensed the ClimateSuite software solution from TeraVista, as well, to provide streamlined carbon offset systems to its client base.

"About". ClimateSuite. Web. February 24, 2010 http://www.climatesuite.com/about

"DTN/The Progressive Farmer Chooses Climate Suite Systems for Carbon Credit Management Offering". Televant. November 20, 2009. Web. February 24, 2010

"TeraVista Systems, LLC". Businessweek. November 20, 2008. Web. February 24, 2010 http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=41315413

"Federal carbon credits would boost TeraVista". St. Louis Business Journal. March 13, 2009. Web. February 24, 2010 http://stlouis.bizjournals.com/stlouis/stories/2009/03/16/story16.html

1. Venture Capital Investment in Clean Technology

Venture capital (VC) is a leading indicator of innovation. Because companies have to meet a high standard for potential success to receive VC funding, the amount of VC invested and the types of firms supported are predictors of future job and revenue growth. While Cleantech VC investment is not particularly strong in the St. Louis area, the region could become a draw for investment if it is able to build on its strengths and establish the region as a hub for specialized activities such as sustainable manufacturing (i.e. a hub for companies that provide products and services that enable manufacturers to become sustainable as well as a hub for sustainable manufacturing in general).

Although the St. Louis region has not attracted large amounts of Cleantech VC funding, overall investment has been rising since 2000 – expanding 552 percent. Over the years, the focus of investment has shifted from Air & Environment and into Energy Storage, Energy Generation, and Agriculture. In 2009, VC investment in Cleantech in the St. Louis Metropolitan Statistical Area (MSA) was $12.1 million - a decrease of four percent from 2008.

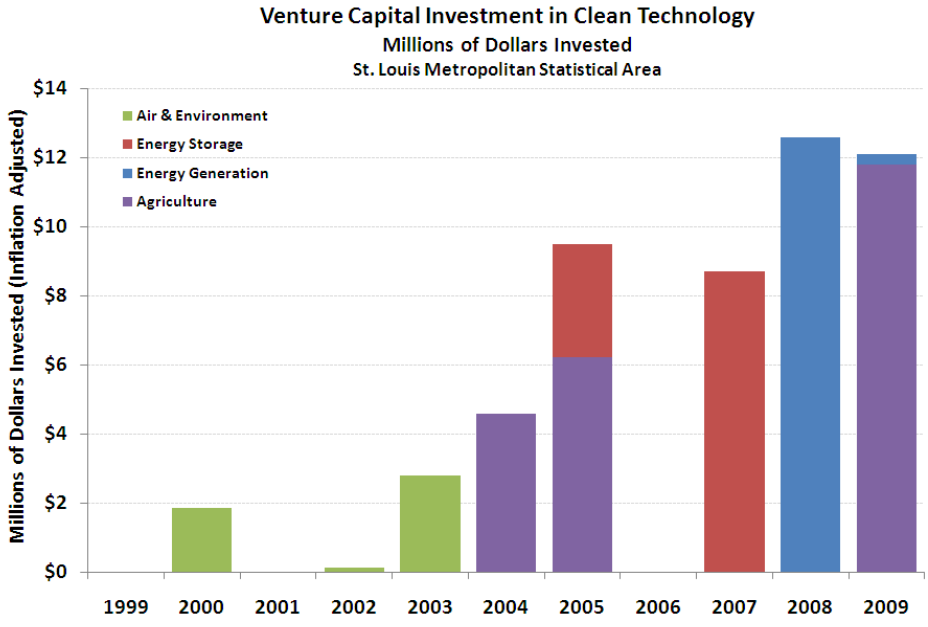
ENERGY GENERATION

Affinity Wind LLC

Affinity wind is a recently-created, independent company focusing on management, ownership and development of wind energy projects. Trey Goede, adjunct professor at St. Louis University, founded Affinity Wind shortly after working on the business concept as an MBA project for a student he was mentoring. The company has recently closed an oversubscribed Series A Stock Offering to further the development of their first project, a 150MW wind farm in western Illinois.

"About Us". Affinity Wind. Web. January 20, 2010 http://www.affinitywind.com/about-us/

Of the seven companies in the region which have attracted venture capital investment over the years, the activities of four are in life sciences with applications for agriculture and for energy storage. Other companies received funding for work in chemical detection and management, crystal silicon, and wind farm development.



Data Source: Cleantech Group™, LLC (www.cleantech.com)
Analysis: Collaborative Economics

2. Green Technology Patents

The region's patenting activity in green technologies provides some indication for areas of strength and growing areas of activity. In general, the ability to generate and protect new ideas, products, and processes is an important source of competitive advantage. Patents reflect the initial discovery and registry of innovative ideas and are often motivated by the desire to protect an innovation that may have commercial potential. The generation of patents is also an indicator for the level of and return on R&D investment.

In the most recent period, 2006-2008, the number of patents registered in the St. Louis area related to green technologies doubled over the prior period of 2003-2005. Batteries and Energy Infrastructure accounted for the largest portion of the total twelve patents. Most recently, the region accounted for two percent of all U.S. patents related to Energy Infrastructure.

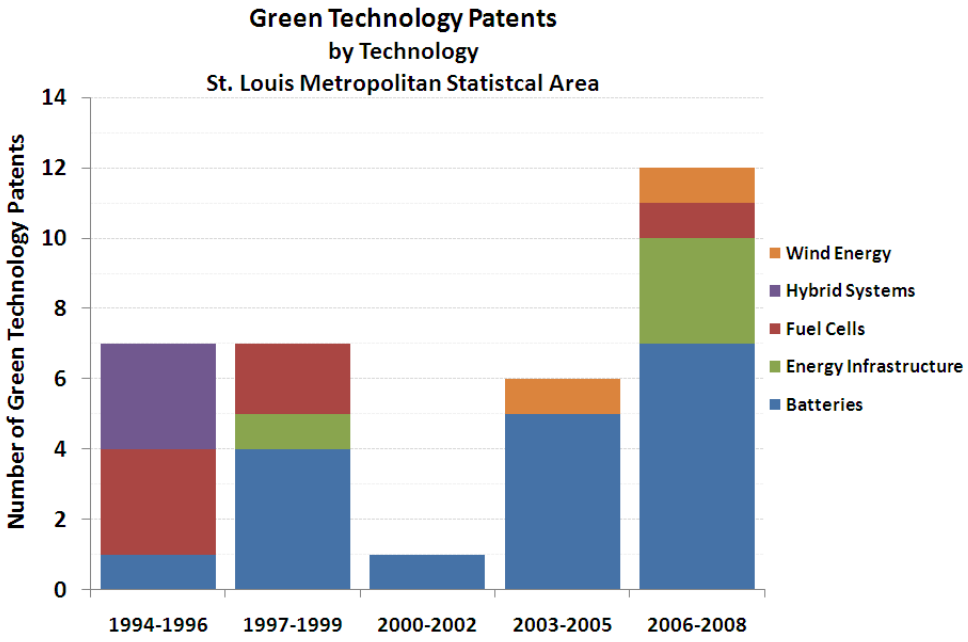
Since the mid 1990s, registrations have been most regular in battery technologies and fuel cells. Since 2003, green technology patent registrations were most numerous in Batteries and Energy Infrastructure and included one patent each in Fuel Cells and Wind Energy.

ENERGY STORAGE

Akermin Inc.

Akermin was formed in 2004 to develop and commercialize portable fuel cells based on a stabilized enzyme technology invented at Saint Louis University. In 2008, Akermin unveiled its prototype of a biofuel cell, which converts renewable organic fuels into electricity and uses stabilized laccase to replace a conventional catalyst's metal catalyst; the development of these fuel cells are mainly for military, wireless sensors, and LED safety lighting purposes. Akermin is currently developing more stabilized enzymes for use in the food processing, biofuel, chemical and pharmaceutical industries as well as a CO_2 capturing system that will use the enzyme carbonic anhydrase.

"Applications & Technology" Akermin. Web. January 20, 2010. http://www.akermin.com/applications/power_systems/



Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File
Analysis: Collaborative Economics

Appendix

Green Business Establishments and Employment by Green Segment and by Establishment Type
The accounting of green business establishments and jobs is based on multiple data sources for the classification of green businesses (such as New Energy Finance, Cleantech Group, LLC and others) and leveraged also a sophisticated internet search process. The National Establishments Time-Series (NETS) database based on Dun & Bradstreet establishment data was sourced to extract business information such as jobs. The operational definition of green is based primarily on the definition of cleantech defined by the Cleantech Network. This sample offers a conservative estimate of the industry in St. Louis.

Venture Capital Investment in Clean Technology
Data provided by Cleantech Group™, LLC. For this analysis, venture capital is defined as disclosed cleantech investment deal totals. The Cleantech Group describes cleantech as new technology and processes, spanning a range of industries that enhance efficiency, reduce or eliminate negative ecological impact, and improve the productive and responsible use of natural resources. All values are inflation-adjusted and reported in first-half 2009 dollars, using the CPI for the U.S. City Average from the Bureau of Labor Statistics. Data are based on ZIP codes located in the St. Louis Metropolitan Statistical Area (MSA).

Green Technology Patents
Data comes from 1790 Analytics, Patent Search by Technology (wind energy generation, energy storage, fuel cells, hybrid systems) using data from the U.S. Patents & Trade Office. Data are based on ZIP codes located in the St. Louis Metropolitan Statistical Area (MSA).