

JOBS CREATION IN THE ENVIRONMENTAL INDUSTRY IN CONNECTICUT AND THE UNITED STATES

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This report is a project of the Jobs and Environment Initiative, a pilot program of research, policy analysis and public education. The Connecticut report is part of a series of state-based and national reports on current jobs creation in the environmental industry, including in manufacturing, and further jobs potential inherent in environmental management and stewardship. Other reports completed examine jobs creation and the environmental industry in Florida, Michigan, Minnesota, North Carolina, Ohio, and Wisconsin and are available on the above websites.

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EXECUTIVE SUMMARY

Objective of the Report

The objective of this report is to examine and describe the environmental industry and its jobs impact and jobs creation potential in the state of Connecticut, and to provide national context on the U.S. environmental industry as a whole.

The relationship between jobs and the environment is important to examine, in view of the size of the environmental industry and because the jobs impact of environmental management has been at times controversial. The report aims to examine the “trade-off” between jobs and environmental protection and highlight specific examples of how the environmental industry in Connecticut and nationally has had, and could have, jobs benefits. Therefore, this report:

- Assesses the current size of the environmental industry and related jobs in the U.S. and the prospects for the future
- Analyzes the concept and definition of an “environmental job”
- Estimates the size and the industrial sector composition of the environmental industry in Connecticut in 2004
- Estimates the jobs created in Connecticut in 2004 by environmental protection and their importance to the state economy
- Estimates the occupation and skill levels of these jobs
- Identifies a sample of typical environmental companies in Connecticut, the products and services they provide, their geographic location, and the number of jobs they create
- Identifies state government initiatives and policies that could facilitate further development of environmental industries in Connecticut
- Discusses how encouraging environmental and related industries in Connecticut could form an integral part of state economic development strategy
- Presents findings and conclusions

Findings -- The National Context

MISI has extensive experience analyzing the environmental industry. We have found that, over the past four decades, protection of the environment has grown rapidly to become a major sales-generating, profit-making, job-creating U.S. industry. Yet, we have also found that the importance of the environmental industry to the U.S. economy is still not fully understood by policy makers or the public at large.

MISI estimates that in 2004 protecting the environment generated \$320 billion in total industry sales, \$21 billion in corporate profits, 5.1 million jobs, and \$46 billion in Federal, state, and local government tax revenues. Moreover, the industry transcends traditional understanding of “green jobs,” often wrongly assumed to be jobs for people to plant trees or clean up toxic waste sites or pollution accidents. (All estimates of the size of the environmental industry and jobs impact rely upon definitions used. MISI estimates rely upon the definitions in Chapter III).

The environmental industry will continue to grow for the foreseeable future. MISI forecasts that in the U.S. real expenditures (2004 dollars) will increase from \$320 billion in 2004 to \$397 billion in 2010, \$439 billion in 2015, and \$486 billion in 2020; environmental employment will increase from 5.1 million jobs in 2004 to 5.9 million jobs in 2010, 6.2 million jobs in 2015, and 6.9 million jobs in 2020.

Environmental protection created over five million jobs in the U.S. in 2004, and these were distributed widely throughout all states and regions in the U.S. The vast majority of the jobs created by environmental protection are standard jobs for accountants, engineers, computer analysts, clerks, factory workers, truck drivers, mechanics, etc., and most of the persons employed in these jobs may not even realize that they owe their livelihood to protecting the environment.

Environmental protection is a large and growing industry in Connecticut, and MISI estimates that in 2004:

- Sales generated by the environmental industries in Connecticut totaled \$5.8 billion.
- The number of environment-related jobs totaled 66,000.
- The environmental industry in Connecticut comprised over three percent of gross state product.
- Connecticut environmental industries accounted for about two percent of the sales of the U.S. environmental industry.

- With 1.2 percent of the nation's population, employment earnings in the Connecticut manufacturing sector account for 1.8 percent of manufacturing earnings nationally.
- Environment-related jobs comprised four percent of Connecticut employment.
- Environment-related jobs in Connecticut comprised 1.3 percent of the total number of environment-related jobs in the U.S.
- Environment-related employment in the state has been increasing in recent years between one and two percent annually.

Most of the environmental jobs in Connecticut are in the private sector, and these are heavily concentrated in several sectors, including manufacturing, professional, scientific, and technical services, and educational services.

Types of Environmental Jobs in Connecticut

Environmental jobs in Connecticut are widely distributed through all occupations and skill levels, and requirements for virtually all occupations are generated by environmental expenditures. Thus, in Connecticut as in the U.S. generally, the vast majority of the jobs created by environmental protection are standard jobs for all occupations.

Nevertheless, we found that, in Connecticut, the importance of environmental expenditures for jobs in some occupations is greater than for others. For some occupations, such as environmental scientists and specialists, environmental engineers, hazardous materials workers, water and liquid waste treatment plant operators, environmental science protection technicians, refuse and recyclable material collectors, and environmental engineering technicians, virtually all of the demand in Connecticut is created by environmental protection activities.

However, in occupations not traditionally identified as environment-related, a significant share of the jobs is also generated by environmental protection. While, on average, environment-related employment in Connecticut comprises only four percent of total employment, in 2004 environmental protection generated jobs for a larger than average share of many professional, scientific, high-tech, and skilled workers in the state.

Our survey of existing environmental companies in Connecticut revealed a wide range of firms, and they are located throughout the state, in major urban centers, suburbs, small towns, and rural areas; they range in size from small firms of 30 employees to large firms employing thousands; they are engaged in a wide variety of activities, including manufacturing, remediation, engineering, testing, monitoring, analysis, etc.; and they include some of the most sophisticated, high-tech firms in the

state. Many of these firms have created significant numbers of new jobs over the past six months, at a time when Connecticut has been concerned about jobs, especially for highly skilled, well-paid, technical and professional workers

Salience of the Jobs-Environment Link in Connecticut at the Policy Level

We identified a number of existing state initiatives and interventions that could be used to assist the environmental industry and create jobs.

Key Points

First, contrary to common perception, most of the jobs created by environmental protection – both nationwide and in Connecticut -- are *not* for “environmental specialists.” The vast majority of the jobs created by environmental protection are standard jobs for a wide variety of occupations.

Second, as noted above, environmental jobs in Connecticut are concentrated within a number of sectors, including manufacturing and professional, scientific, and technical services. This is significant because Connecticut is seeking to modernize and expand its high-tech industrial and manufacturing base. Environmental protection offers a means of doing this, and investments in the environment can aid in this objective.

Third, since the late 1960s, protection of the environment has grown rapidly to become a major U.S. industry. Protection of the environment and remediation of environmental problems will continue to be a growing and profitable industry in the U.S., and astute business and labor leaders, government officials, and policymakers in Connecticut – and in other states – should be cognizant of this.

Fourth, all regions and states benefit substantially from environmental expenditures. Many of the economic and employment benefits flow directly to states – such as Connecticut -- whose policymakers and government officials often see only costs and disadvantages from environmental protection. Yet, these policymakers and the public should welcome information that environmental protection offers substantial opportunities for economic development and job creation.

Fifth, investments in environmental protection will create large numbers of jobs for highly skilled, well-paid, technical workers, including college-educated professionals, many with advanced degrees, requiring advanced training and technical expertise, many of them in the manufacturing sector.

These are the kinds of jobs that states seek to attract and which provide the foundation for entrepreneurship and economic growth. These types of jobs are also a prerequisite for a prosperous, middle class society able to support state and local governments with tax revenues.

Sixth, perhaps most important, this study demonstrates that environmental protection can form an important part of a strategy for Connecticut based on attracting and retaining professional, scientific, technical, high-skilled, well paying jobs, including manufacturing jobs. There is no inherent institutional impediment in Connecticut to using existing state economic assistance policies and incentives to facilitate and encourage development of the environmental industry in the state, especially given that industry's strong pre-existing economic traction.

Contents of the Report

- Chapter II -- History and current status of the U.S. environmental industry; provides industry and job forecasts through 2020
- Chapter III -- Definition of environmental jobs; illustrates the typical composition of occupational employment within environmental companies
- Chapter IV -- The current state of the Connecticut economy and labor market
- Chapter V -- Size, employment, and industrial and occupational composition of the environmental industry in Connecticut
- Chapter VI – Profiles of typical environmental firms in the state
- Chapter VII -- Connecticut Policy Context, Opportunities and Gaps; identifies state programs that could be used to assist environmental firms
- Chapter VIII – Summary of major findings

I. INTRODUCTION

The nexus between jobs and the environment will increase in importance in the future as the U.S. and other nations strive to meet pressing need for employment and income generation, while also confronting the challenges of multi-source pollution, energy waste and inefficiency, traffic congestion, climate change, scarcity of potable and usable water, electric grid reliability, etc. The prevailing view among economic development proponents has been that environmental protection is negative for jobs and employment. However, this view is not supported by empirical evidence. In addition, it is possible to estimate and document the overlooked size of the environmental industry in the U.S. as a whole, and at the state level, and the jobs this industry has protected and created.

The challenge -- and opportunity -- is to begin to shift the debate from “trade-offs” between jobs and environmental protection to a new level of congruent and integrated environmental and economic policy. This report provides information on jobs creation among individual environmentally-related companies as recently as May 2004, and we also note the results of prior research on the environmental industry over time.

Here we:

- Assess the current size of the environmental industry and related jobs in the U.S. and the prospects for the future
- Analyze the concept of an “environmental job”
- Estimate the size and the industrial sector composition of the environmental industry in Connecticut in 2004
- Estimate the jobs created in Connecticut in 2004 by environmental protection and their importance to the state economy
- Estimate the occupation and skill levels of these jobs
- Identify a sample of environmental companies in Connecticut, the products and services they provide, their geographic location, and the number of jobs created
- Identify state government programs that could be used to facilitate development of environmental industries in Connecticut

- Discuss how encouraging environment and related industries in Connecticut could form an integral part of state economic development strategy
- Summarize the major research findings

II. BACKGROUND: THE U.S. ENVIRONMENTAL PROTECTION INDUSTRY AND RELATED JOBS

II.A. Emergence of the Environmental Protection Industry

Contrary to general public perception and public policy understanding, since the late 1960s, protection of the environment has grown rapidly to become a major sales-generating, profit-making, job-creating industry. Expenditures in the U.S. for environmental protection (EP) have grown (in constant 2004 dollars) from \$40 billion per year in 1970 to \$320 billion per year by 2004 -- increasing more rapidly than GDP over the same period. As shown in Table 1:

- In 1970, environmental protection expenditures totaled \$40 billion (2004 dollars).
- In 1980, environmental protection expenditures totaled \$125 billion (2004 dollars).
- In 1990, environmental protection expenditures totaled \$210 billion (2004 dollars).
- In 2004, environmental protection expenditures totaled \$320 billion (2004 dollars).

Table 1
Environmental Protection Expenditures and Jobs
In the U.S. Economy, 1970 - 2020

	Expenditures (billions of 2004 dollars)	Jobs (thousands)
1970	\$40	704
1975	79	1,352
1980	125	2,117
1985	163	2,838
1990	210	3,517
1995	235	4,255
2004	320	5,104
2010	397	5,861
2015	439	6,207
2020	\$486	6,913

Source: Management Information Services, Inc., 2004.

For comparison, it is interesting to note that if "EP" were a corporation, it would rank higher than the top of the Fortune 500. Also, for comparison, MISI's estimate of 2004 EP expenditures (\$320 billion) ranks it higher than the sales of \$259 billion for Wal-Mart, the largest corporation in the U.S.

Many companies, whether they realize it or not, owe their profits -- and in some cases their existence -- to EP expenditures.¹ Many workers, whether they realize it or not, would be unemployed were it not for these expenditures: In 2004 environmental protection created 5.1 million jobs distributed widely throughout the nation. To put this into perspective, the size of environment-related employment is:

- Over ten times larger than employment in the U.S. pharmaceuticals industry
- Nearly six times larger than the apparel industry
- Almost three times larger than the chemical industry
- Fifty percent greater than employment in religious organizations
- Nearly half the employment in hospitals
- Almost one-third the size of the entire construction industry

Further, while MISI forecasts that the rate of growth in expenditures for environmental protection will decline over the next decade, real expenditures will continue to increase substantially.²

Are Environmental Jobs “Productive?”

It is sometimes suggested that investments in environmental protection are "nonproductive," i.e., expenditures lots of money on anything -- for example, building pyramids in the desert -- would stimulate industry and create jobs. However, environmental protection is hardly "make work." EP investments build tangible and intangible long-term assets, not the least among them is a healthier, safer, cleaner, and more livable environment nationwide and in Connecticut -- an important recruiting factor in attracting the new "high tech" firms strongly courted by all states, not to mention residents, tourists, high-visibility events, and investors.

Environmental protection is an exemplary public good, and according to the Harris pollsters this issue has consistently enjoyed wider and stronger public support

¹In this report, "expenditures" refers to all public and private spending in the environmental sector (EP spending) and is used interchangeably with "sales."

²The rate of growth declines because the total size of the industry continues to increase.

than virtually any other issue over the past three decades. Investments in plant and equipment which produce this strongly desired public good are as productive as those that produce automobiles, television sets, golf balls, or defense systems that we are willing to pay for directly in the prices of products or indirectly through the government.

It is also sometimes alleged that environmental standards penalize certain states and regions at the expense of others. While this can be sometimes true, the point has been overused. MISI's research does not support the contention that economic hardship in a given state or region can be blamed on "unreasonable" environmental laws. Further, MISI has found that the overall relationship between state environmental policies and economic/job growth is positive, not negative.

It is significant that many environmental economic and employment benefits flow directly to states whose policymakers and government officials often see only costs and disadvantages from environmental protection.³ Funds expended on pollution abatement and control programs are not wasted, but, rather, investments in environmental protection contribute as much to the well-being and labor markets of the nation and individual states as money spent on other goods competing for scarce private and public funds. All regions and states benefit substantially, and many states benefit at greater than proportionate rates from U.S. EP expenditures.

Over the past three decades protecting the environment has been a major public priority. The legislation enacted has significantly improved the nation's environment and has set in motion ongoing programs that will have significant effects on the nation's environment, economy, and job market well into the 21st century. Importantly, protection of the environment and remediation of environmental problems will continue to be a growing and profitable industry in the U.S. Astute businessmen, labor leaders, government officials, and policymakers should become more cognizant of opportunities inherent in the environmental industry.

II.B. Environmental Protection as a Recession Proof Industry

Expenditures to protect the environment has been one of the most rapidly and consistently growing "recession proof" industries in the economy for the past three decades, and real EP expenditures (2004 dollars) increased from \$40 billion in 1970 to \$320 billion in 2004. This represents nearly an eight-fold increase in expenditures in barely more than three decades -- a sustained real average rate of growth of about

³For example, in 1989 MISI assessed the economic and jobs impacts of acid rain control legislation and found that, contrary to what was then widely believed, such legislation would actually create 5,200 more jobs in Connecticut than it would imperil. See Roger H. Bezdek and Robert M. Wendling, "Acid Rain Abatement Legislation – Costs and Benefits," *International Journal of Management Science*, Vol. 17, No. 3 (1989), pp. 251-261. More recently, in a study of vehicle fuel efficiency standards, MISI found that – contrary to the common perception -- enhanced CAFE standards would create a large number of jobs (4,100) in Connecticut. See Roger H. Bezdek and Robert M. Wendling, "Potential Long-term Impacts of Changes in U.S. Vehicle Fuel Efficiency Standards," *Energy Policy*, Vol. 33, No. 3 (February 2005), pp. 407-419.

eight percent per year over the period. This compares with an average annual rate of growth of GDP that averaged between two and three percent over the same period. That is, since the late 1960s, expenditures for pollution abatement and control has been increasing at a rate nearly three times as large as that of GDP.

As might be expected, this rate of growth has not been consistent. In the early 1970s, EP expenditures were increasing nearly 15 percent per year, by the late 1980s they were increasing at about seven percent annually, and by the late 1990s were increasing at about four percent annually. This is to be anticipated as the industry grew and matured -- but even the most recent growth rates of four percent are higher than the growth rate of GDP. In 1970, EP expenditures accounted for 0.9 percent of GDP, whereas by 2004 the U.S. was devoting about three percent of GDP to pollution control and abatement and related environmental programs.

More interesting, perhaps, is the "recession-proof" nature of this industry:

- In the late 1970s the U.S. economy was reeling from inflationary shocks, record interest rates, energy crises, and anemic economic growth, but between 1975 and 1980 EP expenditures grew nearly 60 percent, from \$79 billion to \$125 billion.
- In the early 1980s the U.S. experienced the most severe economic recession in half a century, with many industries experiencing depression-level problems, but between 1980 and 1985 EP expenditures increased by \$38 billion -- 31 percent.
- During the early 1990s the U.S. experienced a relatively mild recession, with GDP declining one percent and unemployment increasing to 7.5 percent; nevertheless, between 1990 and 1995 EP expenditures increased from \$210 billion to \$242 billion -- 15 percent.
- Between 2000 and 2004, while U.S. economic and job growth was generally anemic, the EP industry expanded continuously, growing to \$320 billion.

However, MISI forecasts that the rate of growth of EP expenditures will gradually decline over the next decade, as the industry grows and matures.

II.C. The Current Size and Structure of the Environmental Industry and Jobs Created

As stated earlier, if "EP" were a corporation, it would rank higher than the top of the Fortune 500:

- MISI estimates that in 2004 EP expenditures totaled \$320 billion.
- In 2003, Wal-Mart, the largest U.S. corporation, had sales of \$259 billion.
- In 2003, the number two U.S. corporation, Exxon Mobil, had sales of \$213 billion, while the third-ranked corporation, General Motors, had sales of \$196 billion.

Clearly, providing the goods and services required for environmental protection has become a major U.S. industry with significant effects on the national economy and labor market and on those of individual states.⁴

MISI estimates that in 2004 protecting the environment generated:

- \$320 billion in total industry sales
- \$21 billion in corporate profits
- 5.1 million jobs
- \$46 billion in Federal, state, and local government tax revenues

II.D. Prospects for the Future

It is likely that the environmental industry will continue to grow for the foreseeable future:

- The environmental industry has grown and matured over the past four decades into a large, viable industry.
- Environmental processes and practices have been incorporated into most manufacturing and service industries.
- Pollution prevention is increasingly being utilized instead of “end of the pipe” pollution abatement remedies, and entire manufacturing processes are being designed to limit environmental degradation from the beginning of the production process.

⁴All estimates of the size of the environmental industry rely critically on the exact definition of the industry. Since there is no official definition, estimates of the size of the environmental industry differ according to the source. In MISI's case, the definition of the industry includes human and environmental sustainability principles, and MISI's estimates thus include a broader range of environmental activities in the economy than some other definitions that have been developed.

- Over the years, a large number of environmental regulations have been enacted at the local, state, and Federal levels and will continue to generate requirements for environmental technology and services well into the future -- even in the unlikely event that no new environmental regulations are enacted.
- Environmental protection and regulation is strongly desired by the public, as verified in numerous public opinion polls conducted over the past 30 years.
- As the U.S. economy continues to grow, environmental problems resulting from urban sprawl, environmental degradation, energy consumption, increasing population, traffic congestion, mobile source pollution, and related problems will continue to increase the demand for environmental remediation.
- The public is increasingly being given the choice of purchasing environmentally benign products and “green” energy, and is responding favorably. Major corporations -- such as, for example, Ford and British Petroleum -- have noted this preference and are reorienting themselves as environmentally friendly companies.
- Problems that the U.S. and the rest of the world face in the future will likely increase the demand for environment-related technology, services, and labor. To cite the most obvious example, global warming presents a long-term challenge that is being addressed by various international and national legislative and mandatory regulatory initiatives such as the Kyoto protocol, the McCain-Lieberman bill in the U.S. Senate, and the Climate Stewardship Act in the U.S. House of Representatives. Also, individual states have begun to establish and institute climate action plans. Thus, mitigating climate change and reducing and managing greenhouse gas emissions will likely create demand for hundreds of billions of dollars of output from the environmental, energy efficiency, and renewable energy industries.

MISI anticipates that the environmental industry will continue to grow slightly faster than U.S. GDP over the coming decade, although this rate of growth will gradually diminish and will approach that of GDP. This is to be expected, since the industry has grown large and matured. Nevertheless, it will likely continue to be relatively “recession proof” because it is largely driven by statutes and regulations that must be complied with irrespective of the state of health of the nation’s economy.

Thus, Table 1 indicates that MISI forecasts EP to continue to be a growing, recession proof industry well into the 21st century, offering unique entrepreneurial, profit, and job opportunities for all types of businesses and workers. **MISI forecasts**

that in the U.S. real expenditures (2004 dollars) will increase from \$320 billion in 2004 to:

- \$397 billion in 2010
- \$439 billion in 2015
- \$486 billion in 2020

Environmental protection expenditures generate large numbers of jobs throughout all sectors of the economy and within many diverse occupations. As shown in Table 1, MISI forecasts that U.S. employment created directly and indirectly by EP expenditures will increase from 5.1 million jobs in 2004 to:

- 5.8 million jobs in 2010
- 6.2 million jobs in 2015
- 6.9 million jobs in 2020

Until the U.S. reaches a level of creating and managing a sustainable environment, the environmental protection industry will continue to outpace most other industries in the U.S. economy. Until then, the environmental industry is projected to grow at a rate 2-3 percent faster than many other industries.

These major economic opportunities have tended to go overlooked by economic development policymakers and government officials. Nevertheless, significant economic opportunities do exist and can be maximized and leveraged for broad social and environmental advantage.

III. DEFINING AND ESTIMATING ENVIRONMENTAL JOBS

III.A. What Constitutes an Environmental Job?

Ambiguities and Questions

As discussed in Chapter II, environmental protection created over five million jobs in the U.S. in 2004, and these were distributed widely throughout all states and regions within the U.S. But how many of these are “environmental jobs” or “green jobs?” More specifically, what constitutes an “environmental job?” While a definitive analysis of this important topic is outside the scope of this report, our review of the literature indicates that there is no rigorous, well-accepted definition of an environmental job. Rather, the definitions used are often loose and contradictory.

Clearly, an ecologist or an environmental engineer working in private industry or for an environmental advocacy organization would constitute an environmental job, as would an employee of the federal or a state environmental protection agency. However, there are ambiguities. For example, most people would agree that the positions in a firm that assembles and installs solar thermal collectors on residences and commercial office buildings for solar heating and solar hot water heating would be considered environmental jobs. But what about the jobs involved in producing those solar panels, especially if the factory involved used coal-based energy, one of the most controversial fossil fuels in terms of emissions, especially greenhouse gases? Here these manufacturing jobs are included as jobs created indirectly by environmental expenditures.

Most analysts would consider jobs in a recycling plant to be environmental jobs. But what if the recycling plant itself produces air pollution?

What about a firm in Connecticut that produces emissions control equipment for power plants in Pennsylvania? It seems clear that the jobs in the Connecticut company should be considered green or environmental jobs, even though the user of the equipment in Pennsylvania may cause pollution in Connecticut.

What about environmental engineers and environmental controls specialists working in a coal-fired power plant? What about the workers who produce environmental control equipment for the plant?

There are many manufacturing establishments throughout the United States that produce products for the automotive industry. Should those that produce components for fuel-efficient vehicles be considered part of the environmental industry, but not those that produce components for gas guzzlers? If so, is there any way to accurately distinguish between these? Should all factories producing catalytic converters be considered environmental jobs, even when some of these converters are used on low miles-per-gallon vehicles?

These relevant questions have, in fact, been generated by shifts in environmental policy itself. The early stages of the environmental movement in the 1970s and 1980s focused primarily on "end-of-the pipe" solutions. That is, the remedies and controls focused on cleaning or minimizing air, water, or solid waste pollutants after they had been produced. However, more recently during the 1980s and 1990s, environmental protection has gradually evolved to include entire processes, so, rather than cleaning up at the end of the pipe, the entire manufacturing and servicing processes are being designed to minimize the production of pollutants. Therefore, it is possible that very efficient processes designed to produce relatively little waste output could actually result in a decrease in the number of environmental jobs if these are defined strictly as "end of the pipe" jobs. A widespread program of energy efficiency, energy conservation, and demand-side management could ultimately result in less need for electric power to begin with and could result in the shutting down of a coal-fired electric power plant. While some may view such a shutdown as an environmental plus, many environmental jobs in that power plant involving pollution abatement and control would be in this case lost. Is this jobs loss desirable?

There is also the issue of how to take account of indirect job creation and how broadly or narrowly to define an indirect environmental job. For example, what of ancillary jobs created across the street from a factory producing solar collectors shortly after it opens, such as a doughnut shop, fast food restaurant, dry cleaner, etc. whose customers are primarily the workers at the renewable energy factory. Are these latter jobs also considered to be "indirect" green jobs or environmental jobs? We include such indirect jobs in this report, though we also conclude they are not "as green" as the direct jobs created.

While solid waste abatement and control is a major area of environmental concern, does this imply that all persons engaged in trash collection business are performing environmental jobs?

What part of the tourism industry constitutes "ecotourism," and are all jobs associated with ecotourism green jobs? Are then all the environmental externalities and costs produced by tourists, such as water use or waste, to be forgiven if these tourists are engaged in ecotourism?

Are all land management programs and all forms of alternative energy green industries, with all jobs counting as environmental jobs?

Definitions and Concepts Used in This Report

MISI considers that jobs can be considered to be "green" relative to the way the job was performed previously, i.e., in a production process, a change in technology that reduces waste emissions or energy consumption makes the jobs in that process "greener" than before. Still, can these jobs continue to be counted as environmental

jobs when newer technology makes available ways of furthering green production, e.g., further reducing energy consumption?

Two approaches can be used to address the relativity cited. The first approach targets environmental jobs, which could be new jobs or the greening of existing jobs, and defines a green job as one that emphasizes activities that contribute to environmentally sustainable development. A second approach focuses on the economy as a whole, defining a green economy as an economy that is environmentally sustainable, and environmental jobs as those jobs required to make an economy environmentally sustainable. Similarly, the term “environmental sector” is used to collectively describe companies involved in businesses designed to limit negative environmental impacts. However, this definition of green jobs as employment opportunities arising from expenditures on activities that support environmentally sustainable development, or which reduce negative impacts on the environment, also presents ambiguities.

Therefore, based on extensive research and literature review, MISI considers that environmental jobs are perhaps best understood when viewed in a continuum across a spectrum, with jobs that generate obvious environmental resource degradation or extraction at one end; a range of greener jobs involving clean production measures and technologies to reduce environmental impacts in the center, and the other end of the spectrum where jobs have a positive environmental impact (see Figure 1).

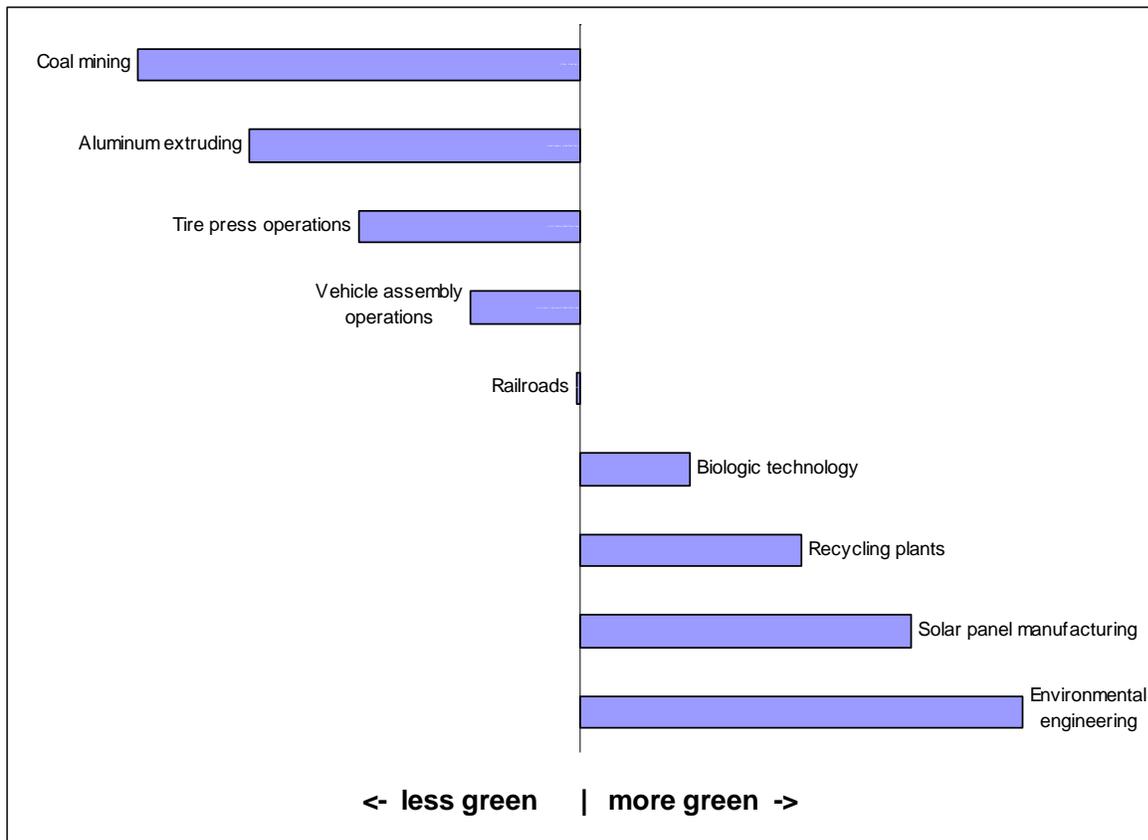
Using the spectrum concept, MISI defines environmental industries and green jobs as those which, as a result of environmental pressures and concerns, have produced the development of numerous products, processes, and services, which specifically target the reduction of environmental impact. Environment-related jobs include those created both directly and indirectly by environmental protection expenditures.

III.B. Types of Jobs Created in the Environmental Industry

There exists relatively little rigorous and comprehensive research addressing the practical relationship between environmental protection and existing jobs or future job creation. Even some research in this area sponsored by environmental organizations is off the mark, in that it has tended to emphasize jobs creation in classically green activities, such as environmental lawyers or workers in recycling plants.

However, while these jobs certainly count as jobs related to the environment, MISI’s data suggests that the classic environmental job constitutes only a small portion of the jobs created by environmental protection. The vast majority of the jobs created by environmental protection are standard jobs for accountants, engineers, computer analysts, clerks, factory workers, truck drivers, mechanics, etc. In fact, most of the persons employed in these jobs may not even realize that they owe their livelihood to protecting the environment.

Figure 1
The Environmental Job Spectrum

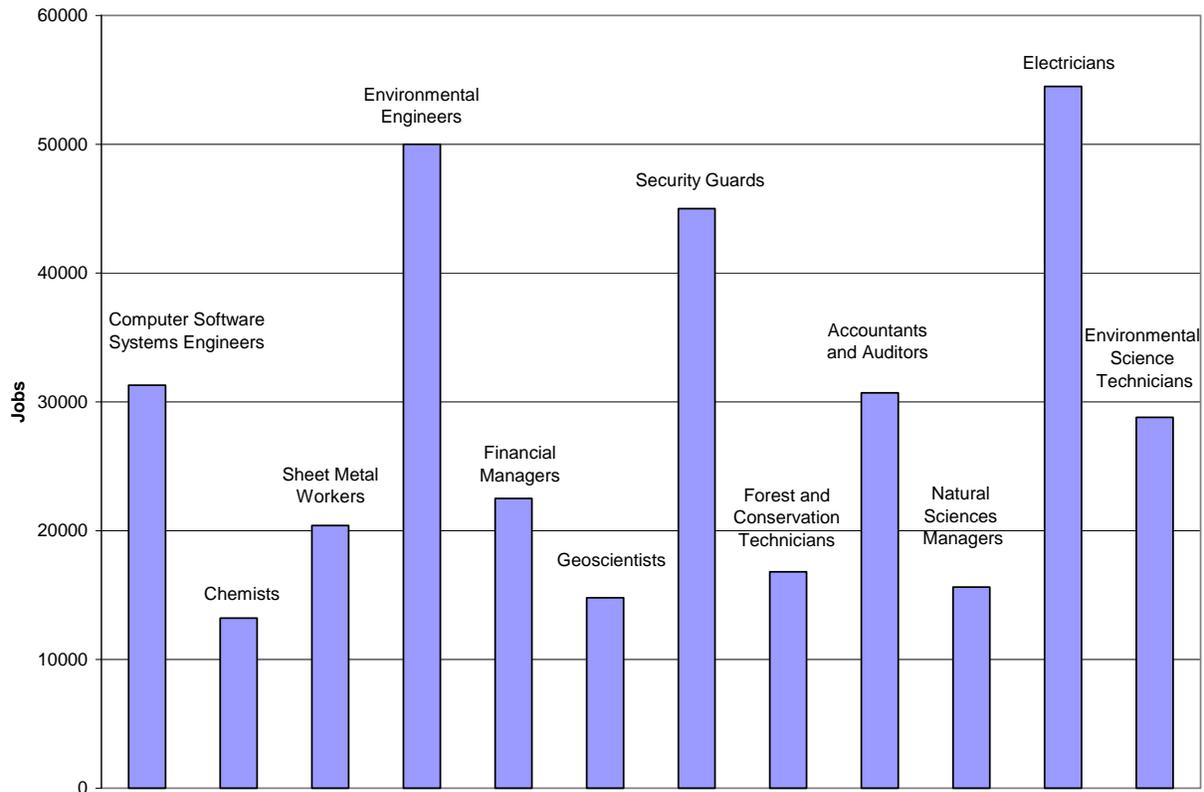


Source: Management Information Services, Inc., 2005.

For example, as illustrated in Figure 2, in the U.S. in 2004, environmental protection created:

- More jobs for electricians (55,000) than for environmental engineers (50,000)
- More jobs for accountants and auditors (31,000) than for geoscientists (15,000)
- More jobs for sheet metal workers (20,000) than for forest and conservation technicians (17,000)
- More jobs for financial managers (23,000) than for chemists (13,000)

Figure 2
Selected U.S. Jobs Created in 2004 by Environmental Expenditures



Source: Management Information Services, Inc., 2005.

- More jobs for computer software systems engineers (31,000) than for natural sciences managers (15,000)
- More jobs for security guards (45,000) than for environmental science technicians (29,000)

More generally, arguments stressing the economic benefits and job creation resulting from environmental protection and clean energy initiatives are not currently being made in a rigorous manner which disaggregates these benefits to a level of detail that is meaningful to policymakers. The level of detail required is at the sector, industry, state, city, and county level, and the jobs created have to be identified by industry, category, skill, and specific occupation at the state and local level. This report provides data at such levels of detail.

III.C. The Jobs Distribution in Typical Environmental Companies

There are many thousands of environmental companies located throughout the United States and they generate jobs for nearly five million workers in virtually every community. These firms:

- Range from the very small one or two person “mom and pop” shops to very large firms employment thousands of workers.
- Employ workers at all levels of skills, from the most basic and rudimentary to the very high skilled technical and professional
- Include environmental service firms and manufacturing firms
- Include those whose market is local, those whose market is state and regional, those who market is national, and those whose market is international.
- Face the same problems, challenges, and opportunities as other companies

Given the wide diversity in the size, function, and technologies of environmental companies, it is impossible to estimate the job profile of the “average” environmental firm. However, it is possible to identify the jobs and earnings profiles of typical types of firms involved in environment-related areas of work. Tables 2 and 3 illustrate this:

- Table 2 shows the 2004 occupational job distribution and employee earnings of a typical environmental remediation services company.
- Table 3 shows the 2004 occupational job distribution and employee earnings of a typical wind turbine manufacturing company.

These tables illustrate the points made above.

First, firms working in the environmental and related areas employ a wide range of workers at all educational and skills levels and at widely differing earnings levels.

Second, in environmental companies, many of the employees are not classified as “environmental specialists.” For example, even in the environmental remediation services firm profiled in Table 2, most of the workers are in occupations such as laborers, clerks, bookkeepers, accountants, maintenance workers, cost estimators, etc. All of these employees owe their jobs and livelihoods to environmental protection, but, in general, they perform the same types of activities at work as employees in firms that have little or nothing to do with the environment.

This is illustrated even more forcefully in Table 3. The occupational job distribution of a typical wind turbine manufacturing company differs relatively little from that of a company that manufactures other products. Thus, the production of wind turbines and wind turbine components requires large numbers of engine assemblers, machinists, machine tool operators, mechanical and industrial engineers, welders, tool and die makers, mechanics, managers, purchasing agents, etc. These are “environmental” workers only because the company they work for is manufacturing a renewable energy product. Importantly, with the current national angst concerning the erosion of the U.S. manufacturing sector and the loss of U.S. manufacturing jobs, it is relevant to note that many environmental and renewable energy technologies are growing rapidly.⁵ In at least some states, these types of firms can help revitalize the manufacturing sector and provide the types of diversified, high-wage jobs that all states seek to attract.

⁵For example, windpower is the most rapidly growing source of electrical power in the world.

Table 2
Typical Employee Profile of a 100-person
Environmental Remediation Services Company, 2004

Occupation	Employees	Earnings
Hazardous Materials Removal Workers	22	\$36,204
Septic Tank Servicers and Sewer Pipe Cleaners	8	30,419
Construction Laborers	7	32,382
First-Line Supervisors/Managers of Construction/Extraction	5	50,673
Truck Drivers, Heavy and Tractor-Trailer	5	33,044
General and Operations Managers	3	86,258
Laborers and Freight, Stock, and Material Movers	2	21,620
Truck Drivers, Light Or Delivery Services	2	27,437
Office Clerks	2	23,384
Refuse and Recyclable Material Collectors	2	26,796
Insulation Workers	2	32,256
Secretaries (except Legal, Medical, and Executive)	2	25,998
Bookkeeping, Accounting, and Auditing Clerks	2	31,217
Plumbers, Pipefitters, and Steamfitters	1	41,202
Executive Secretaries and Administrative Assistants	1	36,729
Maintenance and Repair Workers	1	30,849
Environmental Engineering Technicians	1	36,939
Operating Engineers and Other Const. Equip. Operators	1	40,520
First-Line Supervisors/Managers of Office/Administrative	1	47,576
Chief Executives	1	116,435
Construction Managers	1	73,994
Cleaners of Vehicles and Equipment	1	21,704
Cost Estimators	1	56,753
Janitors and Cleaners	1	25,746
Environmental Engineers	1	69,930
Industrial Truck and Tractor Operators	1	27,741
Carpenters	1	38,588
Construction and Maintenance Painters	1	33,296
Accountants and Auditors	1	53,865
Dispatchers (except Police, Fire, and Ambulance)	1	29,537
Water and Liquid Waste Treatment Plant and System Operators	1	31,049
First-Line Supervisors/Managers of Transportation Operators	1	46,914
Sales Representatives, Wholesale and Manufacturing	1	42,683
Customer Service Representatives	1	30,366
First-Line Supervisors/Managers of Mechanics and Repairers	1	49,088
Environmental Scientists and Specialists	1	62,003
Receptionists and Information Clerks	1	22,775
Environmental Science and Protection Technicians	1	44,867
Other employees	12	47,422
Employee Total	100	\$39,621

Source: Management Information Services, Inc., 2005.

Table 3
Typical Employee Profile of a 250-person
Wind Turbine Manufacturing Company, 2004

Occupation	Employees	Earnings
Engine and Other Machine Assemblers	31	\$33,359
Machinists	27	37,191
Team Assemblers	16	27,668
Computer-Controlled Machine Tool Operators	12	37,254
Mechanical Engineers	10	65,772
First-Line Supervisors/Managers of Production/Operating	10	54,705
Inspectors, Testers, Sorters, Samplers, and Weighers	8	37,202
Lathe and Turning Machine Tool Setters/Operators/Tenders	6	36,729
Drilling and Boring Machine Tool Setters/Operators/Tenders	4	36,509
Welders, Cutters, Solderers, and Brazers	4	36,530
Laborers and Freight, Stock, and Material Movers	4	28,466
Maintenance and Repair Workers	4	41,318
Tool and Die Makers	4	40,047
Grinding/Lapping/Polishing/Buffing Machine Tool Operators	4	31,899
Multiple Machine Tool Setters/Operators/Tenders	4	37,517
Industrial Engineers	3	64,659
Industrial Machinery Mechanics	3	42,315
Engineering Managers	3	99,404
Shipping, Receiving, and Traffic Clerks	3	29,516
General and Operations Managers	3	110,702
Industrial Production Managers	3	85,512
Industrial Truck and Tractor Operators	3	31,416
Purchasing Agents	3	51,702
Cutting/Punching/Press Machine Setters/Operators/Tenders	3	28,907
Production, Planning, and Expediting Clerks	3	41,601
Milling and Planing Machine Setters/Operators/Tenders	3	37,380
Mechanical Drafters	2	44,090
Customer Service Representatives	2	36,036
Bookkeeping, Accounting, and Auditing Clerks	2	32,760
Office Clerks, General	2	27,227
Sales Representatives, Wholesale and Manufacturing	2	50,757
Janitors and Cleaners	2	28,476
Sales Engineers	2	66,591
Accountants and Auditors	2	54,873
Tool Grinders, Filers, and Sharpeners	2	40,520
Executive Secretaries and Administrative Assistants	2	39,638
Mechanical Engineering Technicians	2	46,767
Electricians	2	45,570
Other employees	48	45,969
Employee Total	250	\$42,726

Source: Management Information Services, Inc., 2005.

IV. THE CONNECTICUT ECONOMY IN 2004

The Connecticut economy performed well in 2004, growing at nearly the national rate, and estimated state personal income grew 5.0 percent in 2004, just below the national rate of 5.3 percent. Per capita income increased in 2004 to almost \$44,000, as Connecticut continued to have the highest per capita income level among all states – 35 percent above the U.S. average. Gross state product has steadily increased over the past four years and reached \$181 billion in 2004. However, the state's contribution to national GDP has fallen slightly since 2000, and now accounts for just under 1.6 percent of the national total. Connecticut's population has increased an estimated 2.8 percent since the last decennial census, a rate over a full percentage point lower than the nation's 4.1-percent growth rate. The state's population exceeded 3.5 million in 2004 and Connecticut remained the 29th largest in the U.S., accounting for just over 1.6 percent of the nation's total population.

The labor force receded slightly from 2003 levels, dropping as low as 1,782,000 in April 2004, a level not experienced in the state in over two years. However, state employment gradually expanded during the year, especially in the second half, and reached a three-year high of 1,720,000 by December. With the labor force slightly retracting and the employment growing, the state experienced positive reductions in unemployment with the number dropping an average of around 17,000 to just over 78,000 by December. Connecticut's unemployment rate dropped fairly consistently from 2003, falling to a 4.3 percent of the civilian workforce by December. The state's unemployment rate remained almost a full percentage point below the nation's average throughout the year.

Connecticut derives most of its wealth from manufacturing. However, whereas textiles, silverware, sewing machines, and clocks and watches are among Connecticut's historic manufactures, the state's principal industries currently produce jet engines and parts, electronics and electrical machinery, computer equipment, and helicopters. Much of Connecticut's manufacturing is for the military. Firearms and ammunition, first produced at the time of the American Revolution, are still made, and Groton is a center for submarine building. However, shifts in federal defense spending have adversely affected the state's economy.

Agriculture accounts for only a small share of state income. Many varieties of fish, as well as oysters, lobsters, and other shellfish, are caught in Long Island Sound, but the fishing industry is small and has been hampered by pollution of the waters.

The insurance industry is important in Connecticut and the Hartford metropolitan area is one of the industry's world major insurance centers, containing with the home offices of many insurance companies. Financial, real estate, and service industries are also of major importance. The Foxwoods gambling casino and resort on the Mashantucket Pequot reservation has since its opening in 1992 become one of the largest employers in the state, and the nearby Mohegan Sun casino has joined it in attracting visitors to Connecticut.

Connecticut is home to a number of Fortune 500 manufacturers, including The Stanley Works and The Barnes Group. However, small and medium size manufacturers, which make a diverse mix of products ranging from springs to hardware, from aircraft engine parts to medical instruments, are the backbone of the state's economy. In addition to final products, many manufacturers provide specialized subcontracting services for cutting, polishing, coating, heat treating, and tooling of metals and other component materials. The skills and expertise of Connecticut workers form a network of support which has helped cultivate the growth of the state's manufacturers in the past and which is currently aiding emerging businesses.

The state thus has both relative economic strengths and weaknesses. In terms of strengths, it ranks⁶:

- First in per capita income
- Third in quality of life
- Fourth in technology
- Seventh in workforce productivity
- As the ninth most livable state
- 12th in economic infrastructure

Connecticut consistently ranks near the top among all states in terms of the relative size of its technology employment. Employment in technology occupations exceeds 275,000 and represents 16 percent of total employment in Connecticut, and growth in this area is projected to be 25 percent greater than overall employment growth. Information technology occupations are projected to be the fastest growing in the state and, except for computer programmers, IT occupations will grow at five times the overall rate for the state. IT occupational employment currently accounts for less than two percent of total state employment but will contribute 12 percent of all net new jobs.

In addition, the Northeast market within 500 miles of Connecticut includes 33 percent of the U.S. population and 68 percent of Canadian residents. This market also includes 34 percent of U.S. manufacturing establishments and 67 percent of Canadian establishments.

In terms of weaknesses:

- Connecticut ranks 31st in physical infrastructure

⁶Information obtained from *The MAC Index 2003*, www.macindex.org, and *Most Livable States, 2004*, www.infoplease.com.

- It ranks 15th highest in cost of doing business
- Population and job growth in the Northeast have lagged the U.S. for more than 30 years, and demographic and economic changes have had, and will continue to exert, a strong influence on Connecticut's growth for the foreseeable future.
- State population growth is projected to be below the U.S. average through 2010, and occupational projections reflect this trend.
- A shrinking pool of younger workers, coupled with an aging population, will make it increasingly difficult for businesses to fill vacancies. Connecticut's relative decline in the 18-34 year age group has been the third largest in the nation, and there are 200,000 fewer people in this group in the state than in 1990.

Table 4 shows the earnings by industry of employment in Connecticut and how these compare to the U.S. averages. This table shows that Connecticut ranks relatively low with respect to sectors such as agriculture, mining, and transportation and warehousing. However, this illustrates that the state ranks high with respect to several sectors: Specifically, with 1.2 percent of the nation's population:

- Employment earnings in the Connecticut Finance and Insurance sector account for 3.3 percent of total earnings nationally in that sector.
- Employment earnings in the Connecticut Educational Services sector account for 2.5 percent of total earnings nationally in that sector.
- Employment earnings in the Connecticut Companies and Enterprises Management Sector account for 2.1 percent of total earnings nationally in that sector.
- Employment earnings in the Connecticut Manufacturing Sector account for 1.8 percent of total earnings nationally in that sector.

Table 4
Earnings by Industry of Employment in Connecticut and the U.S. in 2004

	Connecticut (millions)	Connecticut Share of U.S.	Connecticut Share of Earnings	U.S. Share of Earnings	Connecticut Index
Personal Income (including adjustments)	\$158,391	1.6%	-	-	-
Agriculture, Forestry, Fishing and Hunting	262	0.3%	0.2%	1.1%	19
Mining	165	0.3%	0.1%	0.8%	16
Utilities	1,401	1.8%	1.1%	1.0%	110
Construction	7,014	1.5%	5.7%	6.1%	93
Manufacturing	17,733	1.8%	14.5%	13.2%	109
Wholesale Trade	5,917	1.5%	4.8%	5.1%	94
Retail Trade	7,770	1.6%	6.3%	6.7%	95
Transportation and Warehousing	2,200	0.9%	1.8%	3.2%	55
Information	3,895	1.3%	3.2%	3.9%	81
Finance and Insurance	18,792	3.3%	15.3%	7.6%	201
Real Estate and Rental and Leasing	2,515	1.3%	2.1%	2.7%	77
Professional, Scientific, and Technical Services	12,043	1.8%	9.8%	9.1%	108
Management of Companies and Enterprises	3,409	2.1%	2.8%	2.1%	130
Administrative/Support/Waste Management/Remediation Services	3,671	1.3%	3.0%	3.6%	83
Educational Services	2,498	2.5%	2.0%	1.3%	156
Health Care and Social Assistance	12,231	1.7%	10.0%	9.4%	106
Arts, Entertainment, and Recreation	977	1.2%	0.8%	1.1%	74
Accommodation and Food Services	2,369	1.1%	1.9%	2.8%	70
Other Services	3,053	1.4%	2.5%	3.0%	84
Public Administration	14,692	1.2%	12.0%	16.0%	75

Source: Management Information Services, Inc., 2005.

V. THE ENVIRONMENTAL INDUSTRY AND JOBS IN CONNECTICUT

V.A. Summary of the Environmental Industry and Jobs in Connecticut

MISI estimates that in 2004:

- Sales generated by environment-related industries in Connecticut totaled \$5.8 billion.
- The number of environment-related jobs totaled 65,800.
- The environmental industry in Connecticut comprised 3.2 percent of gross state product.
- Connecticut environmental industries accounted for 1.8 percent of the sales of the U.S. environmental industry.
- Environment-related jobs comprised four percent of Connecticut employment.
- Environment-related jobs in Connecticut comprised 1.3 percent of the total number of environment-related jobs in the U.S.
- Environment-related employment in the state has been increasing in recent years between one and two percent annually.

V.B. Environmental Jobs in Connecticut by Industrial Sector

Table 5 shows the industrial distribution of total employment and of environmental employment in Connecticut in 2004.

Comparison of the industrial sector distribution of environment-related jobs in Connecticut with that of total employment in the state is instructive. A significant portion of the environmental jobs is in the public administration sector which, given the public nature of environmental protection, is to be expected. However, most of the environmental jobs in Connecticut are in the private sector, and focusing on these reveals that they are heavily concentrated in several sectors. Of particular note is that the private sector environmental industry in Connecticut is more manufacturing intensive than other average private sector activity in the state:

Table 5
Environmental-Related Jobs in Connecticut in 2004, by Industry

Industry	Establishments	Total Employment	Environmental Employment	Environmental Jobs (percent)
Agriculture, Forestry, Fishing and Hunting	107	500	45	9.0
Mining	75	300	55	18.2
Utilities	150	8,700	2,074	23.8
Construction	9,146	62,000	2,888	4.7
Manufacturing	4,934	196,000	7,819	4.0
Wholesale Trade	4,793	65,500	1,140	1.7
Retail Trade	14,122	193,700	1,602	0.8
Transportation and Warehousing	1,614	39,900	261	0.7
Information	1,755	39,000	1,372	3.5
Finance and Insurance	5,886	123,000	1,493	1.2
Real Estate and Rental and Leasing	3,306	20,300	363	1.8
Professional, Scientific, and Technical Services	9,959	86,800	11,630	13.4
Management of Companies and Enterprises	807	27,600	634	2.3
Administrative/Support/Waste Management/Remediation Services	5,072	78,800	6,129	7.8
Educational Services	1,148	47,800	2,234	4.7
Health Care and Social Assistance	9,818	217,100	1,424	0.7
Arts, Entertainment, and Recreation	1,749	25,700	149	0.6
Accommodation and Food Services	7,437	104,400	946	0.9
Other Services	9,796	63,400	779	1.2
Public Administration	-	244,300	22,765	9.3
State Total	91,674	1,644,800	65,803	4.0

Source: Management Information Services, Inc., 2005.

- 18 percent of private sector jobs in the environmental industry are in manufacturing, compared to 14 percent in manufacturing among all private sector industrial activities in Connecticut.
- 27 percent of private sector environmental jobs are in professional, scientific, and technical services, compared to six percent of all private sector jobs in the state.
- 14 percent of private sector environmental jobs are in administrative, support, and waste management services, compared to six percent of all private sector jobs in the state.

- Five percent of private sector environmental jobs are in educational services, compared to 3.5 percent of all private sector jobs in the state.

Conversely, there are relatively few private sector environmental jobs in other parts of the Connecticut economy:

- Four percent of private sector environmental jobs are in the retail trade sector, compared to 14 percent in retail trade among all private sector jobs in the state.
- Four percent of environmental jobs are in the finance and insurance sector, compared to nine percent among all private sector jobs in the state.
- 3.3 percent of environmental jobs are in the health care and social service sector, compared to 3.4 percent among all private sector jobs in the state.
- 0.6 percent of environmental jobs are in the transportation and warehousing sector, compared to three percent among all private sector jobs in the state.

Assessing the portion of total state employment in each industrial sector accounted for by environmental jobs indicates that the 66,000 environmental jobs account for about four percent of the total 1.6 million jobs in Connecticut. However, this distribution is uneven among industry sectors:

- Nearly 24 percent of employment in the utilities sector consists of environmental jobs, primarily water, waste treatment, sanitation, and related facilities.
- More than nine percent of public administration employment in the state consists of environmental jobs.
- 27 percent of Connecticut jobs in the professional, scientific, and technical services are environmental jobs.
- **Four percent of the state's manufacturing employment is environment-related**
- Only very small portions of total state employment in sectors such as food services, entertainment, real estate, transportation, and retail trade are comprised of environmental jobs.

Key Observations on Jobs Distribution

The concentration of environmental jobs within certain industrial sectors is instructive and interesting.

While accounting for four percent of total state employment, the industrial sector composition of environmental employment is highly skewed in favor of certain sectors. For example, more than 18 percent of private sector environmental jobs are in manufacturing, compared to 14 percent of all private sector employment, and more than one-fourth of private sector environmental jobs are in professional, scientific, and technical services, compared to six percent of all private sector jobs in the state.

This indicates that investments in the environment will provide a greater than proportionate assist to Connecticut's high-tech and manufacturing sectors. As noted in Chapter IV, Connecticut is seeking to modernize and expand its high-tech industrial and manufacturing base. Table 5 indicates that the environmental industry can aid in this objective.

Similarly, **environmental investments generate, proportionately, more than four times as many jobs in professional, scientific, and technical services as the state average.** Jobs in this sector are the high-skilled, high-wage, technical and professional jobs that Connecticut – and other states – seeks to attract and retain. Table 5 indicates that investments in environmental protection can be of considerable assistance here.

V.C. Environmental Jobs in Connecticut by Occupation and Skill

Environmental employment in Connecticut can be disaggregated by specific occupations and skills, and this information for 2004 for selected occupations is given in Table 6. This table illustrates that environmental jobs in Connecticut are widely distributed among all occupations and skill levels and, while the number of jobs created in different occupations differs substantially, employment in virtually all occupations is generated by environmental spending.

As noted in Chapter III, the vast majority of the jobs created by environmental protection are standard jobs for accountants, engineers, computer analysts, clerks, factory workers, truck drivers, mechanics, etc. and most of the persons employed in these jobs may not even realize that they owe their livelihood to protecting the environment. This is borne out in Table 6, which lists the jobs created by environmental protection in Connecticut in 2004 within selected occupations. This table shows that in 2004 environmental protection generated in Connecticut generated:

Table 6
Environmental Jobs Generated in Connecticut in 2004, by Selected Occupations

Occupation	Jobs
Accountants and Auditors	590
Bookkeeping and Accounting Clerks	697
Cashiers	1,218
Chemists	356
Computer Software Engineers	1,071
Conservation Scientists	73
Customer Service Representatives	779
Electricians	235
Electronics Engineers	208
Environmental Engineers	714
Environmental Engineering Technicians	168
Environmental Scientists and Specialists	661
Executive Secretaries and Administrative Assistants	783
Financial Managers	437
Forest and Conservation Workers	243
Geoscientists	84
Graphic Designers	130
Hazardous Material Removal Workers	860
Inspectors, Testers, and Sorters	239
Janitors and Cleaners	822
Laborers	568
Management Analysts	838
Marketing Managers	199
Mechanical Engineers	363
Medical Scientists, Except Epidemiologists	480
Natural Science Managers	246
Office Clerks	1,207
Plumbers, Pipefitters, and Steamfitters	165
Security Guards	394
Septic Tank Servicers and Sewer Pipe Cleaners	157
Sheet Metal Workers	281
Stock Clerks	660
Training and Development Specialists	144
Truck Drivers	816
Water and Liquid Waste Treatment Plant Operators	955
Welders and Solderers	88

Source: Management Information Services, Inc., 2005.

- More jobs for sheet metal workers (281) than for geoscientists (84)
- More jobs for office clerks (1,207) than for environmental engineers (714)
- More jobs for executive secretaries (783) than for forest and conservation workers (243)
- More jobs for janitors (822) than for natural science managers (246)
- More jobs for electricians (235) than for chemists (356)
- More jobs for accountants and auditors (590) than for medical scientists (480)
- More jobs for truck drivers (816) than for septic tank servicers (157)
- More jobs for financial managers (437) than for conservation scientists (73)
- More jobs for management analysts (838) than for environmental engineering technicians (714)
- More jobs for computer software engineers (1,071) than for hazardous material removal workers (860)

Thus, many workers in Connecticut are dependent on environmental protection for their employment, although they often would have no way of recognizing that connection unless it is brought to their attention.

The importance of environmental spending for jobs in some occupations is much greater than in others. For some occupations, such as environmental scientists and specialists, environmental engineers, hazardous materials workers, water and liquid waste treatment plant operators, conservation scientists, environmental science protection technicians, refuse and recyclable material collectors, and environmental engineering technicians, virtually all of the demand in Connecticut is created by environmental protection activities. This is hardly surprising, for most of these jobs are clearly identifiable as “environmental” jobs.

However, in many occupations not traditionally identified as environment-related, a greater than proportionate share of the jobs is also generated by environmental protection. Recalling that, on average, environment-related employment in Connecticut comprises only four percent of total employment, in 2004 environmental protection expenditures generated jobs for a greater than proportionate share – as much as ten percent or more -- of many professional occupations in the state, including:

- Biochemists and biophysicists
- Chemical engineers
- Chemists
- Civil engineers
- Computer software engineers
- Electronics engineers
- Geoscientists
- Landscape architects
- Medical scientists
- Natural sciences managers
- Occupational, health, and safety specialists
- Surveyors

For many other occupations, also not traditionally identified as environment-related, a greater than proportionate share of the jobs is also generated by environmental protection. Again recalling that, on average, environment-related employment in Connecticut comprises only four percent of total employment, in 2004 environmental protection generated jobs for as much as ten percent or more of many highly skilled, technical occupations in the state, including:

- Architectural and civil drafters
- Biological technicians
- Chemical technicians
- Civil engineering technicians
- Control and valve installers and repairers
- Electrical and electronics engineering technicians

- Electrical and electronics equipment assemblers
- Electrical and electronics drafters
- Forest and conservation technicians
- Heating, air conditioning, and refrigeration mechanics and installers
- Industrial engineering technicians
- Sheet metal workers
- Surveying and mapping technicians

The above findings are significant for they indicate that state investments in environmental protection will create jobs in greater than proportionate share in two categories that Connecticut -- and other states -- are eager to attract:

- College-educated professional workers, many with advanced degrees
- Highly skilled, technical workers, with advanced training and technical expertise, many of them in the manufacturing sector

Environmental protection thus generates jobs that are disproportionately for highly skilled, well-paid, technical and professional workers, who in turn underpin and provide foundation for entrepreneurship and economic growth.

Finally, there are many occupations for which requirements in Connecticut generated by environmental protection are close to the average of four percent of total employment; including:

- Accountants and auditors
- Carpenters
- Computer support specialists
- Construction managers
- Customer service representatives
- Database administrators

- Electricians
- Financial managers
- Graphic designers
- Human resource managers
- Industrial engineers
- Industrial production managers
- Interviewers
- Machinists
- Network and Computer systems Administrators
- Payroll clerks
- Plumbers and Pipefitters
- Purchasing agents
- Security guards
- Stock clerks
- Training and development specialists
- Truck drivers
- Welders

V.D. The Environmental Industry as an Economic Driver for Connecticut

This study demonstrates that environmental protection can form an important part of a strategy for Connecticut based on attracting and retaining professional, scientific, technical, high-skilled, well paying jobs, including manufacturing jobs. While a successful strategy must have other components as well, rarely has any state recognized the economic and jobs benefits that could flow from specifically encouraging the development of environmental and environment-related industries as an economic

development initiative. Indeed, usually the opposite is the case: States tend to view environmental economic costs as economically negative.

While designing such a development strategy is outside the scope of this report, there are concrete examples of environment-related initiatives that could create substantial numbers of jobs in Connecticut. For example:

- This study demonstrates that, at present in Connecticut, environmental protection is creating nearly 66,000 jobs, and these are disproportionately high-skilled, professional, scientific, technical, well paying jobs – many of them in manufacturing.
- A 2002 joint study by MISI and 20/20 Vision for the Energy Foundation estimated that an aggressive strengthening of U.S. Federal Corporate Average Fuel Economy (CAFE) standards would create 4,100 jobs in Connecticut. Thus, contrary to what many believe, the production of more fuel-efficient vehicles would create substantial numbers of jobs in Connecticut, not reduce them.⁷
- A 1999 study sponsored by the World Wildlife Fund and the Energy Foundation estimated that a strategy to address global warming in the U.S. would create nearly 9,000 jobs in Connecticut.⁸

Given the multiplier effect of environmental spending and investment, it is likely that substantial numbers of jobs could be created through a systematic program to develop the environmental industry. Our findings show this is especially true in Connecticut, which currently has a thriving, job creating environmental industry, currently generating nearly 66,000 jobs in the state, to a large extent unbeknownst to most state residents and probably to most policymakers. Such a systematic program of investment could have significant positive and potentially transformational impact. It is a matter of more fully linking classic economic development approaches with a better understanding of the role and reach of environmental programs and expenditures as a factor contributing to that development. This finding is consistent with the results derived by the Jobs and Environment Initiative for other states such as Florida, Ohio, Minnesota, North Carolina, Wisconsin, and Michigan.⁹ The Jobs and Environment Initiative is planning a study of the potential for the transition of the Connecticut economy from defense-orientation to environment-related industries.

⁷Management Information Services, Inc. and 20/20 Vision Education Fund, *Fuel Standards and Jobs: Economic, Employment, Energy, and Environmental Impacts of Revised CAFE Standards Through 2030*, Washington, D.C., 2002. See also Bezdek and Wendling "Potential Long-term Impacts of Changes in U.S. Vehicle Fuel Efficiency Standards," op. cit.

⁸Tellus Institute and Stockholm Environment Institute, *America's Global Warming Solutions*, Boston, August 1999.

⁹See www.misi-net.com for those reports.

VI. SUMMARY PROFILES OF SELECTED CONNECTICUT ENVIRONMENTAL COMPANIES

We conducted a survey of existing environmental companies in Connecticut, examining a functional, technological, and geographic mix of companies. Our research revealed a wide range of firms, and they:

- Are located throughout the state, in major urban centers, suburbs, small towns, and rural areas.
- Range in size from small firms of 30 employees to large firms employing thousands
- Are engaged a wide variety of activities, including manufacturing, engineering, remediation, testing, monitoring, analysis, etc.
- Include some of the most sophisticated, innovative, high-tech firms in the state

Summary descriptions of a representative sample of these firms are given in Table 7 and are discussed below. The information presented is current as of December 2004.

VI.A. American Ref-Fuel Company of Southeastern Connecticut

American Ref-Fuel is a waste-to-energy company located in Preston. The firm has more than 300 employees nationwide, including 40 in Connecticut, and its employees include environmental engineers and scientists, technicians, and administrative and support personnel. All of its business is domestic with government agencies.

American Ref-Fuel was founded in 1991 and its primary objective is to develop, own, and operate advanced waste-to-energy facilities that convert municipal solid waste into energy in the form of steam and electricity. It is the largest waste-to-energy company in the northeastern United States and holds a record of converting more than five million tons of municipal solid waste annually into enough energy to meet the needs of 350,000 homes. With five of their facilities, American Ref-Fuel Company was named to the elite Star classification within OSHA's Voluntary Protection Program.

Table 7
Summary of the Select Connecticut Environmental Companies Profiled

Company	Location	Products/Services	Jobs
American Ref-Fuel Company of Southeastern Connecticut	Preston	Waste disposal and waste-to-energy generating services	US: 300 CT: 39
Bkm Energy and Environmental Products	Hartford	Manufacture, sales, and installation of energy recovery systems	US: 650 CT: 600
Clean Harbors Environmental Services	Bristol, Milford	Largest provider of hazardous waste management and disposal services in North America	US: 3,500 CT: 80
Dewberry	New Haven	Planning, design, and environmental compliance	US: 1,600 CT: 30
Environmental Data Resources, Inc.	Milford	Environmental information dissemination, distribution, education, and workshops	US; 200 CT: 40
Environmental Risk, Limited	Bloomfield	Environmental engineering, consulting, and compliance	US: 32 CT: 30
Geologic Services Corporation	Windsor	Environmental consulting and management solutions for the petrochemical, oil, and gas industries	US: 250 CT: 43
Leggette, Brashears & Graham, Inc.	Trumbull	Environmental engineering and soil, groundwater, and remediation services	US: 163 CT: 50
Malcolm Pirnie	Middletown	Environmental services, consulting, compliance, assessment, remediation	US: 1,400 CT; 23
Premier Laboratory, LLC	Dayville	Environmental and potable water testing services	US: 37 CT: 37
Schuco USA, L.P.	Newington	Solar thermal and photovoltaic systems, windows, doors and other products	US: 117 CT: 117
Severn Trent	Shelton	Environmental testing, evaluation, and analytical services	US: 1,000 CT: 46
TRC Solutions	Hartford, Middle Haddam, Moodus, Weston, Winsdor;	Specialized products and services required to achieve environmental compliance	US: 2,200 CT: 85

Source: Management Information Services, Inc., 2005.

American Ref-Fuel provides waste characterization by trained scientists, transportation, and logistics for all special waste movements, on-site training for customers, and other value-added services. Special waste requires secure destruction or special handling, may include, (but is not limited to), off-specification pharmaceuticals, health and beauty items, oily waste debris, manufacturing waste, tires, bulk liquids, and recalled products. American Ref-Fuel combusts special waste for many of the nation's leading corporations who need reliable, environmentally sound, and assured destruction of their material.

The company is owned by MSW Energy Holdings, LLC. MSW Holdings, LLC is owned by an affiliate of American International Group Inc., and an affiliate of DLJ Merchant Banking Partners III, L.P. and its affiliated co-investors, each managed by Credit Suisse First Boston Private Equity.

VI.B. Bkm Energy and Environmental Products

Bkm Energy and Environmental Products is located in East Hartford and manufactures energy recovery heating, ventilation, and cooling (HVAC) systems. The firm has 650 employees nationwide, including 600 in Connecticut, and has hired 25 new employees within the past six months. Its employees include technical, manufacturing, operations, sales, service, and administrative personnel. Its clientele is 70 percent industrial and 30 percent government. About 98 percent of its total corporate business is domestic, although half of the revenues of its energy systems division results from international sales.

Bkm's business consists primarily of the manufacture, sales, and installation of energy recovery systems, HVAC, environmental consulting, and system design, and it also provides consulting services, site survey, and assessment. The company has been in business for three decades and its major product is the Regent ECO Heat Recovery Ventilator. Regent ECO heat recovery technology provides 75 to 85 percent heat recovery efficiency with 100 percent outside air. Typical heat recovery systems transfer heat from the outgoing air stream directly to the incoming air stream. Instead, Regent ECO stores energy (hot or cold) in a patented bank of aluminum plates for use during the next cycle. A modular design with minimal pressure drop allows the system to be used in new installations or as an addition to existing HVAC systems. The heat storage modules can operate with air temperatures as high as 450°F.

A number of Bkm's units have been installed at the University of Ottawa, where monitoring has shown an average heat recovery efficiency of 92 percent. The firm's installation at the De Celles Auditorium received a Regional 1st Place Award from the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE).

VI.C. Clean Harbors Environmental Services, Inc.

Clean Harbors Environmental Services, Inc. is located in Bristol and Milford and provides environmental and hazardous waste management services. The firm has 3,800 employees nationwide, including 80 in Connecticut, and has hired 5 new employees within the past six months. Its employees include engineers, technicians, plant workers and operators, and various field service personnel. Its clientele is 80 percent industrial, 10 percent government, and 10 percent homeowner. All of the business of its Connecticut operations is domestic.

Clean Harbors is the largest provider of hazardous waste disposal services in North America. The company provides a wide range of environmental and waste management services to a large, diversified customer base including a majority of the Fortune 500 companies, thousands of smaller private entities, and numerous governmental agencies. Within its international footprint, Clean Harbors has service and sales offices located in 40 states, six Canadian provinces, Mexico, and Puerto Rico.

Since its inception in 1980, the Company's strategy has been to develop and maintain an on-going relationship with a select group of customers who have recurring needs for multiple services in managing their environmental exposure. Clean Harbors' network of over 100 service locations interfaces with its diverse customer base, and the service locations perform emergency response, planned on-site work, industrial services, lab-packing services, and hazardous waste disposal, utilizing the waste management facilities. Waste that Clean Harbors treats, disposes, or recycles is handled at one of the over 50 company owned and operated waste management facilities strategically located throughout North America. The firm's headquarters is located in Braintree, Massachusetts.

VI.D. Dewberry

Dewberry is a professional services planning, design, and environmental compliance firm with offices in New Haven. The firm has 1,500 employees nationwide, including 30 in Connecticut, and it has hired one new staff member in the state over the past six months. Its employees include environmental engineers and scientists, surveyors, transportation and planning specialists, architects, technologists, and support personnel. About half of its business is with government agencies and the other half with the private sector – primarily architectural firms and real estate developers; all of its business is domestic.

A privately held firm, Dewberry was established as a small land design and surveying practice in 1956 in Arlington, Virginia, and in 1965, the headquarters office was relocated to Fairfax County, Virginia. The firm provides services in program management, planning, engineering, architecture, surveying, geographic information services, and the environmental sciences, and its clients include government agencies

at all levels, corporations, real estate developers, colleges and universities, school districts, and other commercial and institutional organizations.

Over time, Dewberry expanded upon its civil engineering and surveying expertise and added offices, is currently an *Engineering News-Record* “Top 50” design firm, and ranks in the top 25 in several of ENR’s market categories. Dewberry’s practice encompasses a broad range of services, including:

- Architecture
- Building engineering
- Design-build
- Emergency management
- Environmental sciences & engineering
- Facilities planning & design
- Federal programs support
- Geographic information services
- Land development services
- Municipal infrastructure engineering
- Security and homeland defense
- Surveying
- Telecommunications
- Transportation planning & engineering
- Water resources engineering

VI.E. Environmental Data Resources, Inc.

Environmental Data Resources, Inc. (EDR) is an environmental information dissemination, distribution, and education company headquartered in Milford. It has 200 employees nationwide, including 40 in Connecticut, and has hired ten new staff over the past six months. EDR employees include environmental specialists, technologists, writers, editors, sales, and administrative and support staff. Its business

is divided equally among government, industry, and direct sales customers; nearly all of its business is domestic.

EDR is a national provider of environmental information founded in 1986. It is a one-stop shop offering:

- Current and historical environmental risk management information
- An environmental market newsletter
- Training workshops and seminars
- State-of-the-art online services including interactive mapping

While EDR is headquartered in Milford, it has 20 regional offices located throughout the United States.

EDR is wholly owned by Daily Mail and General Trust, plc (DMGT) subsidiary DMG Information.

VI.F. Environmental Risk, Limited

Environmental Risk, Limited (ERL) is an environmental consulting and engineering firm headquartered in Bloomfield. It has 32 employees nationwide, including 30 in Connecticut, and has hired two new staff over the past six months. ERL employees include environmental engineers, scientists, and specialists, degreed technologists, and support personnel. Most of its business is domestic.

ERL is dedicated to helping its select group of clients make informed business decisions. The company has staff with expertise in key disciplines to provide effective technical solutions and having the business experience to ensure the solutions are workable within the context of the client's goals and financial resources.

Since the company's founding in 1985, ERL has grown at a steady pace, building on its expertise and expanding to include new environmental services. The firm currently offers extensive capabilities in:

- Air quality and wastewater permitting
- Environmental compliance and auditing
- Hazardous waste management
- Environmental due diligence

- Specialized subsurface investigation
- Remediation, risk assessments, and aquatic toxicity testing.

ERL's engineering and consulting services are available in all 50 states and internationally.

VI.G. Geologic Services Corporation

Geologic Services Corporation (GSC) is an environmental consulting company with offices in Windsor. The firm has 250 employees nationwide, including 45 in Connecticut, and its employees include environmental engineers and scientists, hydrogeologists, geologists, geophysicists, environmental, civil, chemical, geotechnical, mechanical, and petroleum engineers, health and safety specialists, industrial hygienists, toxicologists, biological technicians, and administrative and support personnel. All of its clients are industrial, and all of its business is domestic.

GSC provides environmental consulting and management solutions to the petrochemical, oil, and gas industries, manufacturing, industrial, financial, legal, and insurance industries as well as private and public water suppliers. GSC uniquely provides customer-intimate environmental consulting and management solutions designed to effectively manage clients' environmental liability. GSC helps clients eliminate their environmental liabilities, reclaim their assets, and free up cash for investments. GSC's headquarters is located in Littleton, Massachusetts and, in addition to Connecticut, it has facilities in California, Maryland, New Jersey, Pennsylvania, and New York.

For over 20 years, GSC has offered expertise in hydrogeology, geology, geophysics, civil, chemical, geotechnical, mechanical, and petroleum engineering, health and safety, industrial hygiene, toxicology, and biology. The company's services include:

- Environmental remediation (remedial feasibility evaluations, pilot testing and design, construction and management and installation, and operations and maintenance)
- Transaction-related and regulatory-driven environmental site assessment (ASTM property transaction screens)
- Environmental due diligence auditing, comprehensive site investigations, and groundwater fate and transport modeling

- Environmental management (reimbursement and cost recovery services, program and portfolio management, information management services with Perillon Software, permitting, and facility compliance)
- Litigation, expert witness, and third-party support, licensed professional review services, and regulatory compliance
- Health and safety/industrial hygiene (hazardous waste operations and emergency response training, OSHA hazard communication standard, human health and ecological risk assessments, petroleum spill response and clean-up, hazardous waste management, and customized training modules)
- Water supply resource development and engineering (land use studies and impact reporting)

VI.H. Leggette, Braxhears, and Graham, Inc.

Leggette, Brashears, and Graham, Inc. (LBG) is an environmental engineering and remediation services company with offices in Trumbull. The firm has 165 employees nationwide, including 50 in Connecticut, and has hired five new employees within the past six months. Its employees include environmental engineers, scientists, and technicians, hydrologists, and administrative and support personnel. About half of its business is direct customer sales, 40 percent is industrial, and ten percent is government; all of its Connecticut business is domestic.

Founded in 1944, LBG was the nation's first consulting firm to specialize in hydrogeology. At present, the LBG organization is a recognized leader in the environmental field, and LBG-Guyton Associates, established in 1951 as William F. Guyton Associates, provides ground-water services throughout the Southwest. Over the past seven decades, LBG has successfully completed more than 6,000 ground-water projects for over 4,000 clients on six continents. Assignments have ranged from municipal and community well-field development and testing to industrial well-field exploration, design, testing, and expansion.

LBG services include:

- Ground-Water Resource Development and Management
- Ground-Water Modeling
- 3-D Visualization
- Hydrocarbon

- Environmental Site Assessments
- Remediation Design and Construction Management
- Mine Dewatering and Pressurization
- Air Resources
- Water Rights
- RCRA
- Oil Field Brine Contamination
- Geographic Information System Analysis

VI.I. Malcolm Pirnie

Malcolm Pirnie is one of the largest firms in the U.S. focused on environmental issues, and for over a century has provided environmental engineering, science, and consulting services to 3,000 public and private clients. Of its 1,400 employees, 23 work out of its offices in Middletown and it has added two new jobs in Connecticut over the past six months. The firm's employees are primarily engineering/technical, and its business is about 60 percent government/public sector and 40 percent private – commercial and industrial. About five percent of its sales are international.

Malcolm Pirnie has built its practice and reputation on technical excellence and innovation, and its staff of engineers, scientists, consultants, designers, architects, and technical support personnel are located in more than 40 offices nationwide. More than 100 Pirnie projects over the last ten years have been recognized for engineering excellence in competitions nationwide, and the firm is a recognized source in developing environmental policy, management, and technology.

Malcolm Pirnie was founded in 1895 as consulting practice in Boston to solve "problems in water supply, sewerage and sewage disposal." The firm's reputation grew as early projects helped define where the emerging environmental profession was headed. New technologies such as rapid sand filtration and disinfection were perfected as the firm developed drinking water supplies for new Florida resorts and engineered water treatment plants and reservoirs along the Eastern seaboard. After various transitions in partners and management, the firm evolved to become Malcolm Pirnie Civil Engineer in 1930. By 1940, the firm had a staff of 25 devoted almost exclusively to Army and Navy work and defense projects across the country and in Puerto Rico, developing the high-purity oxygen concept to heighten effectiveness of aerobic wastewater treatment.

Spurred by the first federal environmental law passed in 1948, Malcolm Pirnie's water process experts continued to engineer drinking water facilities for America's cities. They expanded their focus from producing biologically safe water using filtration to concern about its chemical constituents, and revolutionized large-plant design by applying new high-rate technologies.

During the 1960s and 1970s, having developed expertise in large sewage treatment facilities, the firm designed innovative nitrification plants for New York State's Capital District that initiated the cleanup of the badly polluted Hudson River. Malcolm Pirnie engineered challenging environmental facilities overseas and designed improved processes to treat complex industrial wastes. With the 1970s, the first Earth Day signaled a new environmental era, and Pirnie's services were in demand for major projects in cities all across the country, including Cleveland and Cincinnati. New technologies and disciplines were added, expanding the firm's capabilities from engineering to environmental sciences and planning. In the 1980s, Superfund hazardous waste investigations and cleanups from Love Canal to Marathon Battery were a major focus for the firm, while a new array of drinking water quality issues related to organic contamination drove innovative project designs. The firm expanded into environmentally sound, state-of-the-art solid waste management and air quality solutions, and into new issues such as odor control and air toxics. Pirnie's engineers and scientists continue to evaluate and apply new technologies designed to safeguard public health and the environment.

Malcolm Pirnie is a closely-held "S" corporation with headquarters in White Plains New York. All shares are owned by full-time employees who are also officers or senior managers of the firm. The firm's annual revenues exceed \$200 million and it is ranked by the *Engineering News Record* among the top 25 U.S. firms in many environmental areas, including environmental science, water treatment and desalination, sewerage and solid waste, wastewater treatment, hazardous waste, chemical and soil remediation, and site assessment and compliance.

VI.J. Premier Laboratory, LLC

Premier Laboratory, LLC is an environmental testing laboratory headquartered in Dayville. The firm has 37 employees, all in Connecticut, and has hired two new employees within the past six months. Its employees include environmental scientists, biologists, hydrologists, technicians, and administrative staff. It serves the industrial, government, and consumer sectors, and all of its business is domestic.

Premier provides a complete environmental and potable water testing service and is considered to be one of the country's leading analytical laboratories, exemplified by the proficiency scores received from its participation in performance evaluation studies. The company provides its customers with high quality analytical reports and services.

Premier's commitment to quality has enabled it to successfully assist its customers with RCRA, CERCLA, and related hazardous waste problems. The firm maintains certifications throughout New England and it is also certified to perform State of New York DOH analysis. Premier Laboratory strictly adheres to stringent EPA protocols, which include 40 CFR 136 and SW-846 methodologies. Premier developed the new Massachusetts EPH and VPH methods utilizing Mass Spectrometry, which marked the first successful attempt by an environmental laboratory, utilizing GC/MS. By using the GC/MS method for EPH and VPH the possibility of false positives for PAH's is eliminated. Premier is currently performing both these methodologies while routinely meeting the MCP regulatory limits.

Parameters tested include:

- Volatiles
- Semi volatiles
- Metals
- General chemistry
- Microbiology

Instrumentation offered includes:

- Gas Chromatograph/Mass Spectrometry Systems
- Gas Chromatographs
- Spectrophotometers
- Wet Chemistry Systems

VI.K. Schuco USA, LP

Schuco USA manufactures and installs solar energy and energy efficient building envelope products and is headquartered in Newington. The firm has 117 employees, all in Connecticut, and its employees include manufacturing, sales, and installation staff, engineers, system design technicians, and administrative staff. About half of its business is industrial and the other half is governmental; all of its business is domestic.

Based on more than 50 years experience and their market leadership in Europe, Schüco USA partners with architects, homeowners, investors, and construction companies all over America. As a division of Schüco International, Schuco is a high-profile innovator and manufacturer of products for homes and building envelopes in the

U.S. and throughout the world. Solar energy in the U.S. is a new but fast growing sector to which Schüco brings many years of development experience. Services provided include:

Solar Energy Products

Schuco designs, manufactures, and installs solar panels, photovoltaic systems, and related solar energy products. Within the multifunctionality of Schüco's solar energy technology, all the components for solar heating and electricity production are perfectly integrated. As a leading supplier of photovoltaic and solar heating units, Schüco guarantees a uniform system of assembly and thereby also particularly efficient technology.

Energy Efficient Building Envelope Products

Schuco produces the highest quality vinyl replacement windows and doors uPVC with one of the most technologically advanced glazing systems in the vinyl window business. These products are distributed by an exclusive dealer network across the country.

Aluminum Replacement Construction Systems

Schuco's aluminum systems for windows, doors, facades, conservatories, and glazed roofs offer the economical energy efficient solution for the buildings of today and tomorrow.

VI.L. Severn Trent Laboratories

Severn Trent Laboratories (STL) has offices in Shelton and is one of the leading environmental testing companies in the world. It has 2,200 employees nationwide, including 46 in Connecticut, and has hired six new staff over the past six months. The firm's employees include chemists, microbiologists, environmental scientists, and administrative and support personnel. Fifty percent of its clients are industrial and 50 percent are government, and all of its Connecticut work is domestic.

Focusing upon the world's environmental testing concerns, STL has developed a passion for being the best in the business. In response to the firm's client service philosophy, the reliability of its data, the technical knowledge of its staff, and its leadership stance on quality and ethics, STL is increasingly being recognized as the leading provider of environmental testing services throughout the industry.

Through continued investment in facilities, equipment, methods, and people, STL has developed an unprecedented team of resources, experience and capabilities. It is well positioned to support a variety of clients including government departments such as the Department of Defense and Department of Energy and commercial organizations

operating in various sectors of industry, including environmental consultancy, engineering, waste management, power and energy, transportation, oil and petroleum, water treatment, and manufacturing.

STL's operations include environmental testing laboratories, service centers, and QED Environmental Systems -- the leading supplier of pumping systems, equipment used for groundwater sampling, and low-flow purging and sampling methodology systems such as Well Wizard™. The firm's testing capabilities include chemical, physical, and biological analyses of a variety of matrices, including aqueous, solid, drinking water, waste, tissue, air, and saline/estuarine samples. Specialty capabilities include air toxics testing, mixed waste testing, tissue preparation and analysis, aquatic toxicology, dioxin/furan testing, and microscopy.

VI.M. TRC Solutions

TRC Solutions is an environmental, energy, and infrastructure services company with offices in Hartford, Middle Haddam, Moodus, Weston, and Windsor Windsor. The firm has 2,200 employees nationwide, including 85 in Connecticut, and its employees include scientists, engineers, environmental specialists, technicians, and administrative and support staff. About 75 percent of its business is industrial and 25 percent is governmental; all of the business from its Connecticut operations is domestic.

Named one of FORTUNE Magazine's 100 Fastest Growing Companies in 2003, Forbes Top 200 Best Small Companies, and Business Week's Top 100 Hot Growth Companies, TRC Solutions is a customer-focused company that creates and implements sophisticated and innovative solutions to the challenges facing America's environmental, infrastructure, power, and transportation markets. The Company is also a leading provider of technical, financial, risk management, and construction services to both industry and government customers across the country.

TRC Solutions provides specialized services to public and private sector organizations in a broad range of commercial, industrial, and infrastructure markets. The company has extensive experience and expertise in these industries and provides services in several key areas, including:

Environment

TRC Solutions provides a range of services to meet customers' environmental compliance needs for both on-going operations and legacy environmental issues. The firm is also the market leader in providing fixed-cost remediation solutions to solve customer needs from mergers and acquisitions, discontinued operations, Superfund sites, and Brownfield redevelopment.

TRC Solutions provides engineering, scientific, and technical environmental services to customers in a variety of industries through its national network of offices. Services provided include pollution control, waste management, auditing and assessment, permitting and compliance, design and engineering, and natural and cultural resource management. The Company's environmental sector specializes in air quality and emissions control, licensing new and expanded facilities, and investigating and cleaning up environmentally impaired sites.

Energy

TRC Solutions provides a wide variety of services to the energy industry, as well as to end users of energy. Its environmental and engineering services include permitting and licensing, due diligence review for acquisitions, operational support, and design/construction solutions. TRC has specialized expertise in fossil-fuel projects, renewables, natural gas facilities, pipelines and LNG terminals, and power delivery. For end-users of energy, TRC develops and delivers comprehensive solutions at the clients' sites. These include distributed generation, combined heat and power (CHP), renewable energy applications, turnkey energy efficiency projects, energy information solutions, and energy program development and implementation.

Infrastructure

TRC Solutions is helping growing communities plan and construct the transportation, water resources, and other infrastructure improvements necessary to support their growth. The firm is also engaged in the design and construction inspection/management of highways and bridges in some of the fastest growing regions of the country. From New York City's Bronx/Bruckner Interchange to San Francisco's Golden Gate Bridge, TRC has provided engineering and construction support services to ensure public safety and convenience.

Security

TRC Solutions specializes in comprehensive assessments and managing risks from multiple threat types for major public and commercial and industrial facilities and infrastructure systems. Its professional team of experts include security design consultants, professional engineers, elite former military and intelligence personnel, scientists, and anti-terrorism consultants.

VII. OPPORTUNITIES IN CONNECTICUT STATE GOVERNMENT PROGRAMS FOR ENCOURAGING ENVIRONMENT-RELATED JOBS

There are a number of state government programs and initiatives that could be used to stimulate environment-related industries and jobs in Connecticut. Some of the more important ones are summarized below. All of the initiatives and programs discussed could be maximized to strengthen the environmental industry and tap inherent leverage and multiplier effect benefits, building upon the existing robust industry.

VII.A. Governor's Initiatives

VII.A.1. Governor's Jobs Cabinet

The Governor's JOBS Cabinet was created in 1999 to establish the implementation arm for statewide policies developed by the Connecticut Employment and Training Commission, and consists of state officials and representatives from the business community and the state's higher education community. The Cabinet explores, identifies, and reports on policies and actions necessary to ensure that Connecticut is building a well-trained and employed workforce. It also recommends ways in which the state can maintain and attract workers in the nursing, manufacturing, engineering, technological, and educational sectors.

The JOBS Cabinet is in the unique position to influence the state's policies on training Connecticut's workforce for existing and emerging industries. Such policies could be used to help build environment-related industries and jobs by ensuring the labor pool in Connecticut is well suited for the industry.

VII.A.2. Governor's Competitiveness Council

The Governor's Competitiveness Council was formed to provide leadership to enhance the technology transfer and commercialization process in Connecticut. The Council is made up of CEOs from a cross-section of industries, legislative leaders, heads of key educational institutions, labor representatives, officials of industry associations, and several state commissioners.

In 1998, the Council released a report *Partnership for Growth*, which set the stage for cluster-based economic development in Connecticut. A cluster is defined as a concentration of companies and industries in a geographic region that are interconnected by the markets they serve and the products they produce, as well as their suppliers, trade associations, and educational institutions. The cluster-based economic development initiative is built around the idea that nurturing the state's key industries improves the competitiveness of businesses within these industries, in turn improving the state's economy. The Initiative develops the resources needed to

compete globally and achieve sustained, measurable growth in jobs, educational levels, startups, and R&D funding.

The Cluster Initiative originally identified six industry areas which are key to Connecticut's economic competitiveness: Manufacturing, financial services, telecommunications and information, health care services, high technology, and tourism. Since then, the initiative has been expanded to entail several additional clusters.

In 2004, the Council released a new report *Partnership for Growth II: A Competitiveness Agenda for Connecticut*. The report provided Connecticut policy makers with a comprehensive set of recommendations in the areas of manufacturing, technology, workforce development, and inner city revitalization. It tasks the legislature with addressing critical issues affecting Connecticut's business competitiveness and to support innovative ways to coordinate and prioritize economic policies and strategies.

The Cluster Initiative could be used to focus more attention on the environmental industries in Connecticut and make them a priority in the future.

VII.A.3. Governor's Transportation Summit

A Transportation Summit was convened in September 2000 to discuss a variety of transportation concerns. The meeting resulted in the creation of a 15-member Connecticut Transportation Strategy Board, which was tasked with proposing an initial transportation strategy and preliminary costs to the governor. The Board submitted a report in 2003 that concluded Connecticut's transportation system and the investments necessary to support that system are critical to the state's long-term economic competitiveness and vitality. The report concluded: "The choice is not between investing or not investing [in transportation]; it is between investing smaller amounts on a planned, relatively orderly basis sooner or much greater amounts later on a reactive, crisis-driven basis."

The report prioritized transportation projects and made recommendations as to critical projects vital to Connecticut's economic competitiveness. All transportation initiatives require environmental impact analysis and stress the importance of environmental concerns. The focus on expanding Connecticut's transportation infrastructure could translate into increased need for environment-related industries and jobs in Connecticut.

The governor could organize an Environment and Jobs Summit, similar to the Transportation Summit, to discuss the relationship between environmental protection and jobs and recommend appropriate policies.

VII.B. Department of Environmental Protection

The Connecticut Department of Environmental Protection's (CDEP) mission is to conserve, improve, and protect the natural resources and environment of the state in such a manner as to encourage social and economic development. The CDEP has several major programs, including:

- Air -- air monitoring, ambient air quality, climate change, compliance, consumer information, fuels, permit information, radiation, regulations, small business information, and vehicle emissions.
- Waste -- planning and standards, engineering and enforcement, oil and chemical spill response, pesticides, and PBC and underground storage tanks.
- Water -- aquifer protection program, clean water fund, water planning, remediation programs, watershed management program, and water quality management program.
- Green Circle Program -- The Greencircle Awards Program recognizes businesses, institutions, individuals and civic organizations who have undertaken pollution prevention, waste reduction, or other projects promoting natural resource conservation and environmental awareness.

CDEP currently has no office or division dealing with jobs and the environment issues. However, such an office or division could be established within CDEP.

VII.C. Department of Economic and Community Development

The Department of Economic and Community Development (DECD) is Connecticut's lead agency for the development and implementation of policies, strategies, and programs designed to enhance the state's communities, business, and housing environments. DECD has a number of programs focused on business development, including:

- Economic Development and Manufacturing Assistance -- loans and loan guarantees to businesses for job retention or expansion, including funding and tax credits for new machinery or equipment, acquisition of real property, infrastructure improvements, and renovation or expansion of facilities.
- Naugatuck Valley Revolving Loan -- funding for manufacturers and eligible wholesale distributors.

- Micro Loan Guarantee Program for Women and Minority Owned Businesses -- a special loan guarantee program, offered in conjunction with the Community Economic Development Fund, that helps women and minority owned businesses obtain financing.
- Industrial Parks Program -- planning and development services, assistance to renovate or demolish vacant industrial buildings, and technical assistance to help municipalities develop industrial parks.
- Connecticut Brownfields Revolving Loan Fund -- provides loans for environmental cleanup of Hartford properties purchased after 9/11/02, and is designed to encourage redevelopment of Brownfields that have been contaminated with hazardous waste.
- Special Contaminated Property Remediation and Insurance Fund -- provides assistance to investigate the environmental conditions of a site and to encourage redevelopment.
- Urban Sites Remedial Action Program -- funds the preparation, planning, and implementation of site remediation.
- Dry Cleaning Establishment Remediation Fund -- grants to dry cleaning businesses for clean-up, containment, and mitigation of pollution.
- Enterprise Zone Program -- tax incentives, tax credits and deferrals.

Thus far, there appears to be no focus on the environmental industry in DECD, but such a focus could strategically leverage the benefits of environmental protection for economic and community development.

VII.D. Connecticut Development Authority

The Connecticut Development Authority offers business assistance, including direct and guaranteed loans. The Authority's programs include:

- Small Business Financing – loan guarantees to help small business get started and grow.
- Grants and Financing for Brownfields Redevelopment – grants, financing, and assistance to transform brownfields industrial sites into economically viable commercial and industrial properties.

- Grants and Financing for IT expansion – Equity financing and grants to developers of high technology and/or information technology projects.
- Incentives for Business Expansion and Relocation – financial and tax incentives for businesses that significantly expand in or relocate to Connecticut.

CDA funds can be used to help create environment-related industries and jobs, and this effort could be greatly expanded.

VII.E. Connecticut Employment and Training Commission

The Connecticut Employment and Training Commission (CETC) was established in 1989 as Connecticut's highest workforce development policy body, and is charged with overseeing and improving the coordination of all education, employment, and training programs in the state. Most of its 24 members are from business and industry, with the rest representing state and local governments, organized labor, education, and community-based organizations.

CETC has developed the state's Human Resources Investment Goals for the 21st Century, and provides an effective vehicle to continuously develop state and local policies to achieve the state's workforce investment goals. The CETC has been designated by the Governor as Connecticut's state-level Workforce Development Board for the purposes of implementing Workforce Investment Act of 1998.

CETC is currently working towards several goals as outlined in the report *Strategic Five-year State Workforce Investment Plan*. As discussed in Section VII.M, the plan guides the workforce development system and re-emphasizes a broad commitment to the concept of life-long learning as a driving principle addressing the needs of all customers. It also includes a commitment to the concept of continuous improvement as an integral part of Connecticut's workforce development system.

VII.F. Office for Workforce Competitiveness (OWC)

The Office for Workforce Competitiveness (OWC) was created by Executive Order and focuses on the changes needed to prepare Connecticut's workforce for the competitive economy of the 21st Century. OWC also provides a small full-time staff capability to support CETC and the Governor's JOBS Cabinet.

OWC is charged with implementing and accomplishing demand-driven employment and training initiatives in Connecticut. OWC works closely with CETC to play a key role in the effort to ensure the success of the workforce development system.

Thus far, there appears to be little focus on the environmental industry at the Connecticut Employment and Training Commission or the Office for Workforce Competitiveness, but such a focus could strategically leverage the benefits of environmental protection for workforce development. Both the CETC and the OWC could be used to assist Connecticut firms in environmental industries upgrade the skills of their workers.

VII.G. Connecticut Innovations

The Connecticut Legislature created Connecticut Innovations (CI) in 1989 and charged it with growing Connecticut's entrepreneurial technology economy by making venture and other investments. By building a vibrant technology community in the state, CI is designed to create substantial, long-term economic opportunity for Connecticut citizens.

Since 1995, CI has become the state's leading investor in high technology, investing more than \$133 million in Connecticut companies. CI's investments are targeted to benefit all Connecticut residents by attracting and retaining innovative companies, creating high-paying jobs, and positioning the state to excel in the global, knowledge-driven economy.

CI was funded originally by state bonding; however, since 1995, CI has financed its equity investments solely through its own investment returns. Successful investing has also enabled CI to fund initiatives essential to Connecticut's technology leadership, including Connecticut Innovations Technology Scholar Program, the Yankee Ingenuity Technology Competition, and Connecticut's BioBus.

VII.H. Yankee Ingenuity Technology Competition

Yankee Ingenuity Technology Competition is a competition administered by Connecticut Innovations. Yankee Ingenuity funding is available to Connecticut colleges and universities for research and development projects with commercial potential conducted in conjunction with Connecticut businesses that match the state funding. Applicants may be eligible for funding of up to \$300,000 per project.

CI considers projects from a Connecticut college or university with a pledge from a Connecticut business to match the funding with cash or in-kind contributions. Colleges or universities agree to share royalties from successful projects.

Neither the environmental industry nor the renewable energy industry is currently a major priority for Connecticut Innovations or Yankee Ingenuity Technology Competition, and we recommend that this oversight be remedied. These industries – and the state – would benefit from the types of incentives currently targeted at other industry sectors.

VII.I. Connecticut Inner City Business Strategy

In 1999, the Governor's Council on Economic Competitiveness and Technology and the DECD established the Connecticut Inner City Business Strategy to work closely with five targeted cities (Bridgeport, Hartford, New Britain, New Haven, and Waterbury) to develop plans for inner city economic revitalization. Part of the state's industry cluster initiative, the Connecticut Inner City Business Strategy was funded and overseen by the DECD. The strategy has resulted in several initiatives aimed at strengthening the ability of Connecticut residents, businesses and cities to compete in the New Economy, including:

- Preparation of inner-city residents to compete for higher-skill jobs with strong career paths.
- Support and acceleration of inner-city business growth and attraction of new businesses to the urban core.
- Development of a cadre of inner-city entrepreneurs poised to take on new business opportunities.
- Alter the opinions and attitudes of customers, investors, business professionals, and inner-city residents regarding opportunities in Connecticut's inner cities.

The Connecticut Inner City 10 Initiative was established as the result of the Inner City Business Strategy. Each year, the *Connecticut Inner City 10* identifies Connecticut's 10 fastest growing inner city companies.

VII.J. Connecticut Economic Resource Center

The Connecticut Economic Resource Center is a nonprofit organization managed through a unique partnership of utility and telecommunication companies and state government. CERC coordinates Connecticut's business-to-business marketing and recruitment efforts on behalf of the state. It helps businesses obtain quick and accurate information in the areas of financing, export assistance, licensing, manufacturing programs, job training, utility, telecommunications, and real estate. It takes a three-step approach to comprehensive economic development strategy:

- *Establish a Strong Foundation for Organization and Planning:* Assess strengths and opportunities, determine best opportunities for growth, identify obstacles to growth, build consensus, and create a vision.

- *Understand What is Needed for Growth to Occur:* Conduct an economic audit of infrastructure, workforce, market/demographics, role in the larger economic region, and land use and real estate market conditions.
- *Develop a Blueprint for Action:* Establish market niches and strategies, community promotion tactics, business retention/recruitment strategy, infrastructure improvements, and land use strategy

CERC economists conducted an analysis of historical and forecast data to provide a broad perspective about state demographic and economic trends as a basis for recommendations to the legislature regarding state policies and investments in the employment and training arena. Key findings of the analysis included:

- Population and job growth in the Northeast have lagged the U.S. for more than 30 years, and demographic and economic changes have had, and will continue to exert, a strong influence on Connecticut's growth for the foreseeable future. State and regional growth will continue to be below the U.S. average through 2010, and occupational projections reflect this trend.
- A shrinking pool of younger workers, coupled with an aging population, will make it increasingly difficult for businesses to fill vacancies. Connecticut's relative decline in the 18-34 year age group has been the third largest in the nation, and there are 200,000 fewer people in this group in the state than in 1990.
- Half of all new jobs will require some level of post-secondary education, and the growth rate for these occupations is double that of occupations with minimal training requirements. High-paying jobs requiring more education are growing significantly faster than lower-paying jobs that require less education, despite the sheer number of opportunities in lower-wage industries, such as retail.
- Information technology occupations are projected to be the fastest growing in the state and, except for computer programmers, IT occupations will grow at five times the overall rate for the state. IT occupational employment currently accounts for less than two percent of total state employment but will contribute 12 percent of all net new jobs.
- Employment in technology occupations exceeds 275,000 and represents 16 percent of total employment in Connecticut, and growth in this area is projected to be 25 percent greater than overall employment growth. The state consistently ranks near the top

among all states in terms of the relative size of its technology employment.

- All high-tech occupations will require some level of post-secondary training. Of the 40,000 new technology jobs that are projected by 2010, half will require a bachelor's degree or higher, while the balance will require some level of specialized post-secondary training up to and including an associate's degree.

CERC has thus far not focused on environment-related industries, and we recommend that such a focus be added. This would integrate well with the Center's objectives and priorities.

VII.K. Renewable Energy and Energy Efficiency Programs

VII.K.1. Connecticut Clean Energy Fund

The Connecticut Clean Energy Fund (CCEF) invests in technologies, enterprises, and other initiatives that promote and develop sustainable markets for energy from renewables and fuel cells that are designed to benefit Connecticut ratepayers. CCEF is a fund administered by Connecticut Innovations.

CCEF is engaged in a long-term effort to foster in Connecticut the production and use of energy from clean and renewable sources, and invests in enterprises and initiatives aimed at:

- Developing a vibrant market for clean power
- Educating consumers about the benefits and availability of clean power
- Building a base of renewable energy technologies and infrastructure

As the state's clean energy industry progresses from its current, early stages and approaches its full potential, CCEF will help ensure that Connecticut ratepayers will reap the benefits:

- Health -- the environment will be cleaner and healthier.
- Security -- the energy supply will be secure and affordable.

- Prosperity -- the Connecticut economy will be stronger, as innovative clean energy enterprises proliferate within state borders, providing good jobs and bringing additional dollars into the state by selling energy and technologies to out-of-state buyers.
- Lifestyle -- the quality of life will remain high for Connecticut residents.
- Stature -- Connecticut will gain national stature for leadership in this field.

VII.K.2. New Energy Technology Program

The purpose of the New Energy Technology (NET) program is to harness the creative talents in Connecticut to develop the most innovative energy-saving and renewable energy technologies and to aid in getting them to the market. The program is designed to save energy, to improve air quality, and to help invigorate Connecticut's economy by creating employment opportunities. The program is administered by the Office of Policy and Management.

Grants are awarded to applicants who propose promising Connecticut technologies and, in addition to the grant, guidance is provided to recipients for finding technical and financial assistance. Guidance includes locating potential industry partners and/or identifying and applying for other state and federally sponsored programs. Although additional assistance is not guaranteed, these programs are potential sources of aid, including low-interest loans, grants, business-plan development, marketing assistance, and procurement opportunities. New Energy Technology Grants have been awarded for the past ten years to help small firms commercialize new energy related technologies and provide \$10,000 each for up to five small firms.

VII.K.3. Solar Photovoltaic Program

The Solar Photovoltaics program supports commercial, industrial, and institutional buildings applications in Connecticut. The program is administered by Connecticut Innovations and provides incentives that will reduce the cost of solar PV installations for state residents. The subsidy level is \$5 per watt, with a funding cap of \$25,000 per residence (up to 5 kilowatts).

VII.K.4. Municipal Electric Energy Cooperative -- Energy Efficiency Support

The Connecticut Municipal Electric Energy Cooperative (CMEEC) is a publicly directed joint action supply agency formed by the state's municipal electric utilities in 1976. CMEEC is responsible for the financing, acquisition, and construction of generating resources and implementation of power supply contracts for the purpose of furnishing low-cost and reliable electric power to its members and participants. CMEEC provides energy efficiency support through technical assistance, generation evaluations, energy audits, and recommendations for commercial and industrial customers.

The Connecticut renewable and energy efficiency programs represent excellent vehicles for bringing jobs and the environment issues to the forefront in the state:

- They are high priority statutory state programs.
- They leverage unique state resources and expertise.
- They have the express goal of creating high-tech renewable energy jobs and businesses.
- They are amply funded.

VII.L. Trans-boundary Air Pollution

Trans-boundary transport of air pollution is one of the most serious environmental issues facing Connecticut, as well as the rest of the Northeast and Eastern Canada. The transport of air pollution contributes to higher levels of ground-level ozone, to atmospheric mercury deposition and contamination, the generation and movement of acid rain, and to escalating levels of greenhouse gases that contribute to broader climate change problems.

Connecticut and the region have developed a number of initiatives to address these environmental concerns:

- Mercury – a resolution to eliminate man-made mercury from the region through emission control, outreach, and waste stream management efforts. The region exceeded its goal of 50 percent reduction by 2003 and is calling for a 75 percent reduction by 2010.
- Ozone – states and provinces have achieved significant reductions in pollutants such as nitrogen oxides and sulfur dioxide that are precursors to ground-level ozone through the implementation of strict emission standards within their jurisdictions. The region has also filed lawsuits against Midwestern states and their power

companies who emit air pollution that is transported into the region by the prevailing winds.

- Climate Change – the Governor organized a task force of representatives from various state agencies to devise a long-range strategy to inventory and control greenhouse gases (GHGs). The task force is working with stakeholders from business and industry, environmental groups, and universities to develop a detailed state climate change action plan. The plan will detail actions that can be implemented to reduce GHG emissions to 1990 levels by 2010 and to 10 percent below 1990 levels by 2020.
- Acid Rain – the state adopted an Acid Rain Action Plan in the late 1990s that seeks the reduction of SO₂ and nitrogen emissions, which are the main components of acid rain, and the development of strategies to address impacts on humans, lakes, forests, and estuaries. Connecticut has exceeded the goals embodied in the Plan by adopting stringent air pollution control standards that have reduced SO₂ emissions by 78 percent and NO_x emissions beyond those required to address ozone by an additional 26 percent.

All of the initiatives above require environment-related industries for testing, remediation, and implementation of practices to help curtail air pollution. By Connecticut making air pollution reduction a priority, they have also ensured the need of environment-related industries and jobs far into the future.

VII.M. Strategic Five-year State Workforce Investment Plan

Connecticut has adopted five major economic and workforce development goals under the Strategic Five-year State Workforce Investment Plan to guide the evolution of its workforce investment system:

- *Goal 1: Workforce investment system* -- Connecticut will implement an integrated, accountable, and universally accessible workforce investment system, with appropriate public and private resources to meet the complementary needs of the state's employers, workers and job-seekers. The structure of the system will reflect the roles and responsibilities of all key public and private-sector partners.
- *Goal 2: Strategic focus* – The workforce investment system will complement the state's economic development efforts by targeting the needs of the workforce and strategic industries. It will address major growth opportunities by identifying and disseminating timely and accurate labor market and other relevant information.

- *Goal 3: Skills and competencies* -- Connecticut's workforce investment system will impart knowledge, skills, competencies, and credentials appropriate to the career paths of a changing economy and workplace requirements, while maintaining the high standards of existing apprenticeship and certification programs.
- *Goal 4: Economic growth* -- The state's workforce investment system will promote economic growth for all Connecticut employers, workers, and job-seekers. For employers, qualified workers and developing training options will be provided to upgrade the skills of incumbent workers. For workers and job-seekers, effective job search assistance and skill upgrading strategies leading to productive employment will be provided.
- *Goal 5: Youth issues* – The system will focus on meeting the educational and skill development requirements of the state's youth to bring them into the workforce as productive citizens.

Connecticut is implementing an integrated, accountable, and universally accessible workforce investment system that serves the needs of the state's employers, workers, and jobseekers and achieves the goals outlined above. The state's One-Stop delivery system (*Connecticut Works*) will streamline services by providing access electronically as well as through physical One-Stop centers which will build on existing *Connecticut Works* Career Centers. Universal access to core services will guarantee barrier-free admission to all seekers of employment and training services, including individuals with disabilities. Connecticut remains committed to the principle of life-long learning to offer its citizens the opportunity to continue building skills in pursuit of career growth and economic security.

Thus far, environment-related industries have not been a major priority emphasized under the state's Strategic Five-year State Workforce Investment Plan, and this is an oversight that should be remedied. The environmental industry and the jobs it creates adhere well to the objectives of the Plan, and such an emphasis could:

- Complement the state's economic development efforts
- Impart knowledge, skills, competencies, and credentials appropriate to the career paths of a changing economy
- Promote economic growth for all Connecticut employers, workers, and job-seekers
- Diversify Connecticut's economy and help it achieve global competitiveness

- Raise the “quality” of economic growth and achieve multiple engines of growth in high wage, high productivity industries
- Establish Connecticut as a leading state for entrepreneurship, innovation, and venture capital
- Maintain and strengthen Connecticut’s base in threatened industries

VIII. SUMMARY OF MAJOR FINDINGS

This report presents information about jobs creation and the potential of the environmental industry in the state of Connecticut, as well as background information on the jobs impact of the environmental industry in the nation as a whole. The report finds that the environmental industry is a major player in both the state and national economy, and that the direct and indirect jobs creation potential of the environmental industry is significant, multi-sectoral, under-appreciated, and could be maximized for broad socio-economic and environmental benefit.

Jobs and the National Environmental Industry

The report summarizes MISI findings on the national environmental industry. MISI research has found that over the past four decades, protection of the environment has grown rapidly to become a major sales-generating, profit-making, job-creating U.S. industry. This “industry” ranks well above those in the top of the Fortune 500, and MISI estimates that in 2004 protecting the environment generated:

- \$320 billion in total industry sales
- \$21 billion in corporate profits
- 5.1 million jobs
- \$46 billion in Federal, state, and local government tax revenues

It is likely that the environmental industry will continue to grow significantly for the foreseeable future, and MISI forecasts that in the U.S. real expenditures (2004 dollars) will increase from \$320 billion in 2004 to:

- \$397 billion in 2010
- \$439 billion in 2015
- \$486 billion in 2020

Environmental protection generates large numbers of jobs throughout all sectors of the economy and within many diverse occupations, and MISI forecasts that U.S. employment created directly and indirectly by environmental protection will increase from 5.1 million jobs in 2004 to:

- 5.9 million jobs in 2010
- 6.2 million jobs in 2015

- 6.9 million jobs in 2020

Environmental protection created more than five million jobs in the U.S. in 2004, and these were distributed widely throughout all states and regions within the U.S. The vast majority of the jobs created by environmental protection are standard jobs for accountants, engineers, computer analysts, clerks, factory workers, truck drivers, mechanics, etc. In fact, most of the persons employed in these jobs may not even realize that they owe their livelihood to protecting the environment.

Firms working in the environmental and related areas employ a wide range of workers at all educational and skill levels and at widely differing earnings levels. Even in environmental companies, most of the employees are not classified as “environmental specialists.” Rather, most of the workers are in occupations such as laborers, clerks, bookkeepers, accountants, maintenance workers, cost estimators, engine assemblers, machinists, machine tool operators, mechanical and industrial engineers, welders, tool and die makers, mechanics, managers, purchasing agents, etc.

Jobs in Connecticut and Connecticut’s Environmental Industry

We found that environmental protection is a large and growing industry in Connecticut. MISI estimates that in 2004:

- Sales generated by the environmental industries in Connecticut totaled \$5.8 billion.
- The number of environment-related jobs totaled nearly 66,000.
- The environmental industry in Connecticut comprised 3.2 percent of gross state product.
- Connecticut environmental industries accounted for nearly two percent of the sales of the U.S. environmental industry.
- Environment-related jobs comprised four percent of Connecticut employment.
- Environment-related jobs in Connecticut comprised 1.3 percent of the total number of environment-related jobs in the U.S.
- Environment-related employment in the state has been increasing in recent years between one and two percent annually.

Most of the environment-related jobs in Connecticut are in the private sector, and these are heavily concentrated in several sectors, including manufacturing, professional, scientific, and technical services, and educational services.

Environmental jobs in Connecticut are widely distributed among all occupations and skill levels and, while the number of jobs created in different occupations varies substantially, requirements for virtually all occupations are generated by environmental spending. Thus, in Connecticut as in the U.S. generally, the vast majority of the jobs created by environmental protection are standard jobs for all occupations.

Nevertheless, we found that, in Connecticut, the importance of environmental protection for jobs in some occupations is much greater than for others. For some occupations, such as environmental scientists and specialists, environmental engineers, hazardous materials workers, water and liquid waste treatment plant operators, environmental science protection technicians, refuse and recyclable material collectors, and environmental engineering technicians, virtually all of the demand in Connecticut is created by environmental protection activities. This is hardly surprising, for most of these jobs are clearly identifiable as “environmental” jobs.

However, for many occupations not traditionally identified as environment-related, a greater than proportionate share of the jobs are also generated by environmental protection. While, on average, environment-related employment in Connecticut comprises only three percent of total employment, in 2004 environmental protection generated jobs for a greater than proportionate share of many professional, scientific, high-tech, and skilled workers in the state.

Our survey of existing environmental companies in Connecticut revealed a wide range of firms, located throughout the state and across sectors. These firms:

- Are located throughout the state, in major urban centers, suburbs, small towns, and rural areas.
- Range in size from small firms of 30 employees to large firms employing thousands
- Are engaged a wide variety of activities, including manufacturing, engineering, remediation, testing, monitoring, analysis, etc.
- Include some of the most sophisticated, innovative, high-tech firms in the state; for example:
 - Bkm Energy and Environmental Products (East Hartford) is one of the nation’s leading manufacturers of energy recovery heating, ventilation, and cooling (HVAC) systems.
 - Clean Harbors Environmental Services, Inc. (Bristol and Milford) is the largest provider of hazardous waste disposal services in North America.

- Environmental Data Resources, Inc. (Milford) is one of the nation's leading environmental information dissemination, distribution, and education companies
- Geologic Services Corporation (Windsor) is a major U.S. provider of environmental consulting and management solutions to the petrochemical, oil and gas industries, manufacturing, industrial, financial, legal, and insurance industries as well as private and public water suppliers.
- Severn Trent Laboratories (Shelton) is one of the leading environmental testing companies in the world.
- Schuco USA (Newington) is one of the nation's leading manufacturers of solar energy and energy efficient building envelope products.
- TRC Solutions (Hartford, Middle Haddam, Moodus, Weston, and Windsor) is an environmental and infrastructure services firm and is one of the fastest growing companies in the U.S.

A number of these firms, including Bkm Energy and Environmental Products, Clean Harbors Environmental Services, Dewberry (New Haven), Environmental Data Resources, Environmental Risk, Limited (Bloomfield), Leggette, Brashears, and Graham (Trumbull), Malcolm Pirnie (Middletown), Premier Laboratory (Dayville), and Severn Trent Laboratories, have created many new jobs over the past six months.

We identified a number of existing state agencies and initiatives that could be used to maximize the jobs creation benefit and potential of the environmental industry. These include the Governor's Jobs Cabinet, the Governor's Competitiveness Council, the Department of Environmental Protection, the Department of Economic and Community Development, the Connecticut Development Authority, the Connecticut Employment and Training Commission, the Office for Workforce Competitiveness, Connecticut Innovations, the Yankee Ingenuity Technology Competition, the Connecticut Inner City Business Strategy, the Connecticut Economic Resource Center, the Connecticut Clean Energy Fund, the New Energy Technology Program, the Solar Photovoltaic Program, the Municipal Electric Energy Cooperative – Energy Efficiency Support, and the Strategic Five-year State Workforce Investment Plan. Of these, the Governor's Jobs Cabinet, the Governor's Competitiveness Council, the Connecticut Development Authority, the Office for Workforce Competitiveness, Connecticut Innovations, the Connecticut Economic Resource Center, the Connecticut Clean Energy Fund, the New Energy Technology Program, and the Strategic Five-year State Workforce Investment Plan are especially notable and hold considerable promise.

We suggest policy options that could maximize the jobs benefits of the environmental industry in Connecticut, with no institutional impediment. Such initiatives should be encouraged and expanded. This study demonstrates that environment-related initiatives can create substantial numbers of jobs in Connecticut, a state that is currently seeking new ideas for employment generation, stable good jobs, and workforce development.

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APPENDIX: U.S. COMMERCE DEPARTMENT ESTIMATES OF THE ENVIRONMENTAL INDUSTRY IN CONNECTICUT

There are two historical sources of information about the environmental industry in Connecticut. Unfortunately, they only address certain segments of the industry, do not focus on jobs, and were conducted for 1999. These are briefly summarized below.

International Trade Administration

One estimate of the size of the environmental industry is available through the U.S. Department of Commerce.¹⁰ The Department's International Trade Administration (ITA), Office of Environmental Technologies Industries estimated, for 1999, the world market for environmental products and services and the size of the U.S. market, including estimates at the state and metropolitan statistical area levels. In this example of environmental accounting, the environmental industry is defined to include:

- Environmental-related services
 - Environmental testing and analytical services
 - Wastewater treatment works
 - Solid waste management
 - Hazardous waste management
 - Remediation/Industrial services
 - Consulting and engineering

- Environmental equipment
 - Water equipment and chemicals
 - Water equipment and chemicals
 - Instruments and information systems
 - Air pollution control equipment
 - Waste management equipment
 - Process and prevention technology;

- Environmental resources:
 - Water utilities
 - Resource recovery
 - Environmental energy sources.

¹⁰See U.S. Department of Commerce, International Trade Administration, Office of Environmental Technologies Industries, *Environmental Industry of the United States*, a USDOC/ITA web-accessible briefing generated by Environmental Business International, Inc. for 1999.

ITA estimated that the 1999 U.S. environmental market totaled \$189 billion, almost 38 percent of the global \$499 billion market. In meeting the demands of those markets, the U.S. environmental industry was estimated to have generated \$196 billion of revenues. ITA also estimated the U.S. environmental trade balance for 1999. It estimated that the U.S. exported \$21 billion worth of environmental products and services and imported \$14 billion, thus generating a positive net U.S. exports balance of just over \$7 billion in environmental-related goods and services.

The ITA U.S. industry estimates were disaggregated by state, and Table A.1 lists the estimated industry revenues, jobs, the number of companies, and the exports of the industry in Connecticut. The ITA estimated that, in 1999, Connecticut accounted for about 1.3 percent of the U.S. industry, and that the number of environmental jobs in the state totaled more than 19,000.

Table A.1
U.S. Department of Commerce Estimates
of the U.S. and Connecticut Environmental Industries, 1999

		Connecticut	U.S.	Connecticut Share of U.S.
Revenues	(millions)	\$2,548.5	\$196,465	1.3%
Jobs	(number)	19,163	1,389,638	1.3%
Companies	(number)	1,475	115,030	1.2%
Exports	(millions)	\$372.6	\$21,310	1.7%

Source: U.S. Department of Commerce (ITA) and Environmental Business International; 1999.

The ITA report disaggregated the Connecticut industry by metropolitan statistical area (MSA) – see Table A.2. In Connecticut, this consisted of the Hartford MSA. This MSA accounted for 35 percent of the industry in the state and about 6,700 environment-related jobs.

Table A.2
U.S. Department of Commerce Estimates of the Connecticut
Environmental Industry by Metropolitan Statistical Areas, 1999

		Hartford CT
Revenues	(millions)	\$903.7
Jobs	(number)	6,700
Companies	(number)	516
Exports	(millions)	\$130.3
MSA Average Share of Connecticut		35%

Source: U.S. Department of Commerce (ITA) and Environmental Business International; 1999.

Census Bureau -- Pollution Abatement Costs and Expenditures (PACE)

The Census MA200 survey has been one of the more respected sources for information on the U.S. environmental industry.¹¹ This report was not available for a number of years after 1994, but was revived for the year 1999. The results of the survey are not consistent with previous reports for a number of reasons, but they do present a snapshot of major portions of the environmental industry with information available by detailed North American Industry Classification System (NAICS) industry and geographically, by state. However, the survey's biggest weakness is that it only covers the mining (NAICS 21), manufacturing (NAICS 31-33), and electric power generation industries (NAICS 22111). Clearly, the U.S. agricultural, services, transportation, and government sectors have pollution abatement costs and expenditures that contribute to and help define the U.S. environmental industry, but they are not included in the PACE survey. Therefore, while the survey estimates are of sufficient quality, they lack comprehensiveness and describe only a small fraction of the environmentally-related business activities in the U.S.

Table A.3. lists the pertinent information for Connecticut and the United States from the most recent survey, for 1999. Pollution abatement costs in these selected Connecticut industries included \$46 million of capital expenditures and \$53 million for operating costs. Together with \$48 million in operating costs for disposal and recycling activities and other categories of economic activity, the PACE estimates for Connecticut in 1999 totaled \$291 million. This represented one percent of the overall PACE estimates in the United States.

¹¹See U.S. Department of Commerce, Economic and Statistics Administration, Census Bureau, *Pollution Abatement Cost and Expenditures: 1999, MA200(99)*, November 2002.

Table A.3
Pollution Abatement Costs and Expenditures Estimates for Connecticut
and the U.S. From the Census MA200 Survey, 1999
(million dollars, except where noted)

	Connecticut		U.S.		Connecticut Share of U.S.	
Pollution abatement						
Capital expenditures	45.7		5,809.9		0.8%	
Non-hazardous		20.8		4,497.8		0.5%
Hazardous		24.8		1,312.0		1.9%
Air	23.1		3,463.7		0.7%	
Non-hazardous		13.9		2,644.7		0.5%
Hazardous		9.3		819.0		1.1%
Water	21.2		1,801.9		1.2%	
Non-hazardous		6.6		1,488.2		0.4%
Hazardous		14.6		313.7		4.7%
Solid Waste	(D)		361.9		(D)	
Non-hazardous		(D)		245.5		(D)
Hazardous		(D)		116.4		(D)
Multimedia	(D)		182.3		(D)	
Non-hazardous		(D)		119.4		(D)
Hazardous		(D)		62.9		(D)
Operating Costs	53.0		11,864.4		0.4%	
Non-hazardous		32.3		8,924.9		0.4%
Hazardous		20.8		2,939.5		0.7%
Air	9.8		5,069.1		0.2%	
Non-hazardous		5.5		3,941.2		0.1%
Hazardous		4.4		1,127.9		0.4%
Water	32.0		4,586.5		0.7%	
Non-hazardous		19.9		3,511.8		0.6%
Hazardous		12.0		1,074.6		1.1%
Solid Waste	9.2		2,013.3		0.5%	
Non-hazardous		5.8		1,320.4		0.4%
Hazardous		3.4		692.9		0.5%
Multimedia	2.1		195.5		1.1%	
Non-hazardous		1.0		151.5		0.7%
Hazardous		1.0		44.0		2.3%
Disposal and recycling						
Capital expenditures	1.8		398.7		0.5%	
Disposal		1.0		267.2		0.4%
Non-hazardous		0.3		218.0		0.1%
Hazardous		0.7		49.2		1.4%
Recycling		0.8		131.5		0.6%

Table A.3 (Continued)
Pollution Abatement Costs and Expenditures Estimates for Connecticut
and the U.S. From the Census MA200 Survey, 1999
(million dollars, except where noted)

Operating costs	47.9		4,923.6		1.0%	
Disposal		35.3		3,680.9		1.0%
Non-hazardous			18.4		2,466.2	0.7%
Hazardous			16.9		1,214.7	1.4%
Recycling		12.7		1,242.7		1.0%
Pollution prevention	16.9		2,767.9		0.6%	
Other expenditures	73.0		3,154.5		2.3%	
Site cleanup		24.0		1,039.3		2.3%
Remediation			11.9		827.3	1.4%
Replacement			0.8		83.1	1.0%
Other			11.3		128.8	8.8%
Habitat protection		0.1		155.2		0.1%
Monitoring/testing		16.6		599.5		2.8%
Administration		32.3		1,360.4		2.4%
Other payments						
Payments to government	52.6		959.1		5.5%	
Permits/fees		13.8		816.6		1.7%
Fines/penalties/charges		35.8		116.3		30.8%
Other		0.2		26.2		0.8%
Tradeable permits - bought	-		20.2		-	
Tradeable permits - sold	0.3		23.7		-	
Tradeable permits - other	-		12.6		-	
Total	291.2		29,934.6		1.0%	

Source: U.S. Department of Commerce (ESA/Census Bureau), 2002.

ABOUT THE JOBS AND ENVIRONMENT INITIATIVE

The Jobs and Environment Initiative, founded in 2004 by Paula DiPerna, is a pilot program of research, policy analysis and public education. The objective of the Initiative is to examine and demonstrate the links between jobs creation in all sectors of economic activity, including manufacturing, and all aspects of environmental management. The Initiative seeks to describe and analyze current jobs benefits of environmental investment and stewardship; bring further public and policy attention to the strength and scope of the environmental industry; examine potential for further jobs creation; highlight policy opportunities, and improve understanding of the positive contributions of environmental management to economic growth and employment generation, at the local, state, regional, national and international levels. The Initiative conducts state-based and national reports and other inquiries, and is a collaboration between Management Information Services, Inc. (www.misi-net.com) and the Building Diagnostics Research Institute (www.buildingdiagnostics.org). For information contact Paula DiPerna at 607-547-8356

ABOUT MANAGEMENT INFORMATION SERVICES, INC.

Management Information Services, Inc. (MISI) is an economic research firm with expertise on a wide range of complex issues, including energy, electricity, and the environment. The MISI staff offers expertise in economics, information technology, engineering, and finance, and includes former senior officials from private industry, federal and state government, and academia. Over the past two decades MISI has conducted extensive proprietary research, and since 1985 has assisted hundreds of clients, including Fortune 500 companies, nonprofit organizations and foundations, academic and research institutions, and state and federal government agencies including the National Academy of Sciences, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the Department of Defense, and the Energy Information Administration.

For more information, please visit the MISI web site at www.misi-net.com.

ABOUT THE BUILDING DIAGNOSTICS RESEARCH INSTITUTE

The Building Diagnostics Research Institute, Inc. (BDRI) is a Section 501(c)(3) not-for-profit organization dedicated to providing the highest level of research, education and training, and public outreach on issues related to the effects of building performance on health, safety, security, and productivity. The Institute's mission is to leverage more than 25 years of building diagnostics experience in order to enhance health, safety, security, and productivity, and it is implemented by conducting basic and applied research, providing education and training for health and building professionals, disseminating knowledge, and serving as an advocate for the general public. BDRI's basic and applied research, its education and training, and its public outreach are

carried out by an interdisciplinary team of staff and external scientists and professionals representing a variety of disciplines, including chemistry, industrial hygiene, engineering, microbiology, and law and public policy.

For more information, please visit the BDRI web site at www.buildingdiagnostics.org.

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