JOBS CREATION IN THE ENVIRONMENTAL INDUSTRY IN CALIFORNIA 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 California 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 Arizona, Connecticut, 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 California, 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 California 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 California in 2004
- Estimates the jobs created in California 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 California, 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 California
- Discusses how encouraging environmental and related industries in California 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 California, and MISI estimates that in 2004:

- Sales generated by the environmental industries in California totaled $51 billion.
- The number of environment-related jobs totaled 598,500.
- The environmental industry in California comprised over three percent of gross state product.
- California environmental industries accounted for nearly 16 percent of the sales of the U.S. environmental industry.

- With 12.2 percent of the nation's population, employment earnings in the California manufacturing sector account for 12.2 percent of manufacturing earnings nationally.

- Environment-related jobs comprised about four percent of California employment.

- Environment-related jobs in California comprised nearly 12 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 two and three percent annually.

Most of the environmental jobs in California 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 California

Environmental jobs in California are widely distributed through all occupations and skill levels, and requirements for virtually all occupations are generated by environmental expenditures. Thus, in California 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 California, 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 California 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 California comprises only about 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 California 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 California has been concerned about jobs, especially for highly skilled, well-paid, technical and professional workers

Salience of the Jobs-Environment Link in California 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 California -- 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 California are concentrated within a number of sectors, including manufacturing and professional, scientific, and technical services. This is significant because California 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 California – 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 California -- 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 California based on attracting and retaining professional, scientific, technical, high-skilled, well paying jobs, including manufacturing jobs. There is no inherent institutional impediment in California 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 California economy and labor market

- Chapter V -- Size, employment, and industrial and occupational composition of the environmental industry in California

- Chapter VI – Profiles of typical environmental firms in the state

- Chapter VII -- California 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 California in 2004
- Estimate the jobs created in California 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 California, 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 California

- Discuss how encouraging environment and related industries in California 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 California -- 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

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

[2]The 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

[3]For 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 31,000 more jobs in California 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 (28,000) in California. 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 2004, Wal-Mart, the largest U.S. corporation, had sales of $288 billion.

- In 2004, the number two U.S. corporation, Exxon Mobil, had sales of $271 billion, while the third-ranked corporation, General Motors, had sales of $194 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.

[4]All 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 statues 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 California that produces emissions control equipment for power plants in Utah? It seems clear that the jobs in the California company should be considered green or environmental jobs, even though the user of the equipment in Utah may cause pollution in California.

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 and 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).

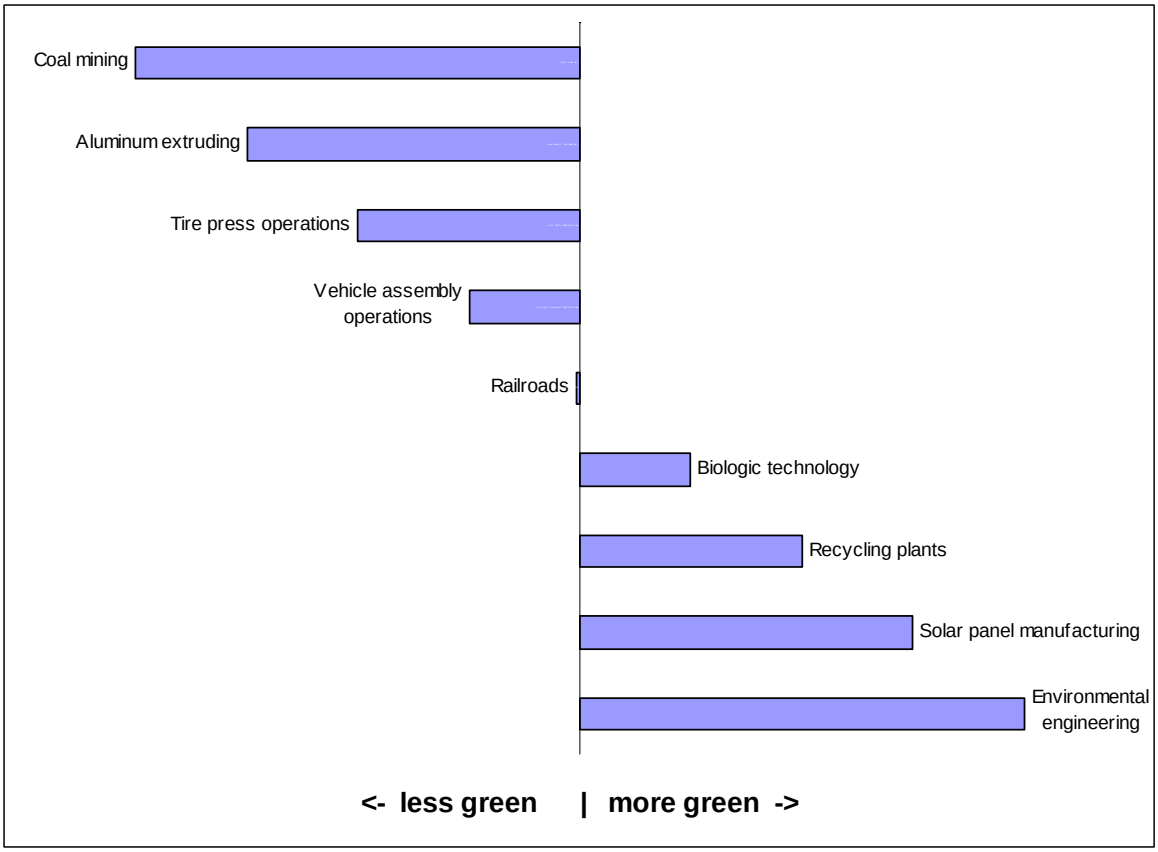
Using the spectrum concept, MISI defines environmental industries and green jobs as those which, as a result of environmental pressures and concerns, have produced the development of numerous products, processes, and services, which specifically target the reduction of environmental impact. Environment-related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

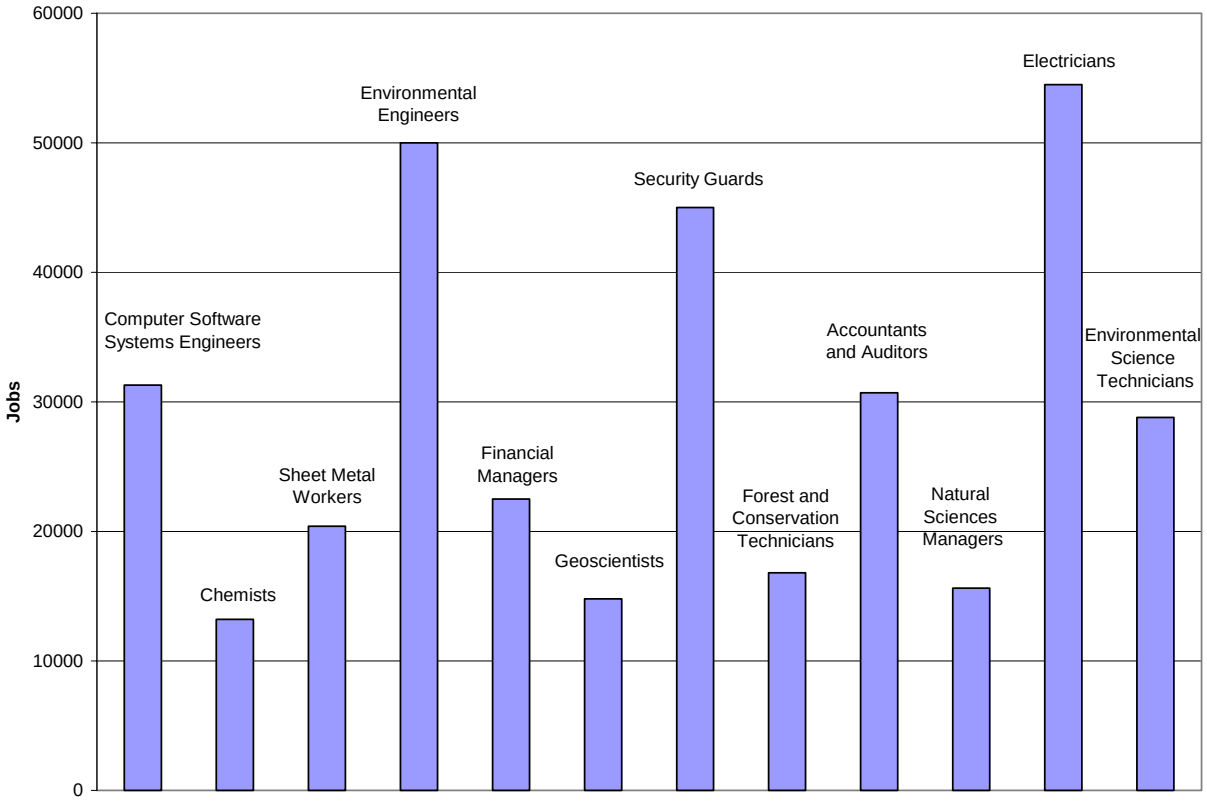


Source: Management Information Services, Inc., 2005.

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 disaggegates 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.

[5]For 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 CALIFORNIA ECONOMY IN 2004

The California economy performed well in 2004, growing at an estimated 5.8 percent rate compared to the national average of 5.3 percent. This was the first year since 2000 that the state has seen personal income increase at a rate exceeding the national average. Per capita income increased in 2004 to almost $34,000, staying well-ahead of neighboring Oregon, Nevada, and Arizona, but trailing the nation's wealthiest state, Connecticut, by almost $10,000. California per capita income continued to exceed the national average by $2,000. Gross state product (GSP) has steadily increased over the past four years and reached $1.530 trillion in 2004. The state's contribution to U.S. GDP has remained fairly constant since 2000, accounting for 13.3 percent of the national total. California's population increased an estimated 6.0 percent since the last decennial census, a rate far exceeding the nation's 4.1 percent growth rate. The state's population reached 36 million in 2004 and California remains the largest state in the nation, with a lead of 13 million over the second most populous state, Texas. California accounts for 12.2 percent of the nation's total population.

The California labor market improved in 2004, reflecting the improvement in the state's economy. The state's labor force grew consistently throughout 2004, reaching a level of 17,777,000 in November, the highest level in the state's history. State employment kept pace with the expansion in the labor force, growing to an all-time high of 16,745,000, also in November. With state employment rising at a rate slightly higher rate than the expansion in the labor force, California experienced reductions in unemployment, with the number decreasing an average of around 90,000 to just over 1,022,000 by December 2004. California's unemployment rate declined from 2003, falling to 5.8 percent of the civilian labor force by the fourth quarter of 2004. However, the state's monthly unemployment rate remained from 0.4 to 0.9 percentage points above the nation's average throughout the year.

California has an enormously productive economy, which for a nation would be one of the largest in the world. Although agriculture is gradually yielding to industry as the core of the state's economy, California leads the nation in the production of fruits, vegetables, dairy products, and many other crops, and also produces the major share of U.S. domestic wine. Fishing is another important industry.

Much of the state's industrial production depends on the processing of farm produce and upon such local resources as petroleum, natural gas, lumber, cement, and sand and gravel. Since World War II, manufacturing, notably of electronic equipment, computers, machinery, transportation equipment, and metal products, has increased enormously. Defense and aerospace industries provide a strong base of the economy especially in Southern California, but have declined following the end of the cold war, and this represented a serious blow to the state economy. But many high-tech companies and small low-tech, often low-wage, companies remain in Southern California, in what is the largest manufacturing belt in the United States. Farther north, "Silicon Valley" between Palo Alto and San Jose is the nation's leading producer of semiconductors and is also the focus of software development.

California continues to be a major U.S. center for motion-picture, television film, and related entertainment industries, especially in Hollywood and Burbank. Tourism is also an important source of income, and California abounds in natural beauty and environmental attractions.

California has numerous economic strengths; for example:

- California has the sixth largest economy in the world, with a GSP of more than $1.5 trillion. If California were a country its economy would be surpassed only by the economies of the United States, Japan, Germany, the United Kingdom, and France.

- California accounts for the largest share of any state -- about 13 percent -- of total U.S. economic output, and the state's GSP has exceeded $1 trillion since 1997.

- Financial services lead a diversified state economy. By a margin of almost two to one, the financial services sector is the largest sector of California's economy. Manufacturing is the second largest. Services, including the financial sector, wholesale and retail trade, and transportation and public utilities, account for more than 70 percent of economic activity in the state.

- California's agricultural sector is the largest in the nation and one of the largest in the world. Although agriculture accounts for a small fraction of the state's overall output, California's farms, dairies, and ranches lead the nation, with more than $25 billion of agricultural products sold in 2002. Fresno, Tulare, and Monterey are the nation's top three counties in terms of agricultural products sold, and the state produces almost all of the nation's grapes and almonds and more than three-quarters of its strawberries and lettuce.

- Despite a decline in recent years, goods exports are important to the state's economy, and in 2003 California goods exports increased to $94 billion. California leads the nation in service exports combined with goods exports, and it also leads the nation in exports of computers and electronic products: In 2003, exports of these products accounted for 39 percent of total California exports and 24 percent of total U.S exports.

- California is home to more Fortune 500 companies than any other state. In the past decade, California has ranked either first or second in the number of Fortune 500 companies headquartered in the state. In 2003, California edged out New York to top the list with 53 Fortune 500 companies, split evenly between northern and

southern California. Taken together, those companies generated revenue totaling more than $763 billion.

California ranks high in terms of many important economic indicators; for example, among the 50 states it ranks[6]:

- First in commercial Internet domain names
- Second in venture capital invested as a percentage of GSP
- Second in aggregated innovation capacity
- Second in broadband telecommunications
- Second in aggregated digital economy scores
- Third in overall economic indicators
- Third in the education level of manufacturing workers
- Third in "Gazelle" Jobs -- jobs in gazelle companies (companies with annual sales revenue that have grown 20 percent or more for four straight years) as a share of total employment
- Third in Initial Public Offerings
- Fourth in high-tech jobs
- Fifth in the number of patents issued to companies or individuals per 1,000 workers
- Fifth in managerial, professional and technical jobs -- managers, professionals, and technicians as a share of the total workforce
- Eighth in job churning -- the number of new start-ups and business failures, combined, as a share of all establishments in each state
- Eighth in industry investment in R&D -- industry investment in research and development as a percentage of GSP
- Eight in export focus of manufacturing -- manufacturing export sales per manufacturing worker
- Tenth in aggregated knowledge jobs

[6]Derived from the State New Economy Index, www.neweconomyindex.org.

- Tenth in scientists and engineers -- scientists and engineers as a percentage of the workforce

- Tenth in digital government -- a measure of the utilization of digital technologies in state governments

- Tenth in aggregated globalization score

However, California has some serious economic and competitive disadvantages, and ranks relatively poorly on the basis of some indicators; for example, it ranks:

- 50th (worst among all of the states) in technology in schools -- a weighted measure of five factors measuring computer and Internet use in schools

- 42nd in per-pupil education spending

- 35th in online population – the percentage of adults with Internet access in each state

- 32nd in online manufacturers -- the percentage of manufacturing establishments with Internet access

- 28th in workforce education -- a weighted measure of the educational attainment (advanced degrees, bachelor's degrees, associate degrees, or some college course work) of the workforce

- 21st in foreign direct investment -- the percentage of each state workforce employed by foreign companies

The state also faces a host of serious long term challenges:

- Loss of manufacturing jobs -- over the past four years, the state has lost 15 percent of its manufacturing jobs and 25 percent of its high-tech manufacturing jobs

- A large and persistent state fiscal budget deficit

- An aging and strained public infrastructure which has failed to keep pace with population growth over the past three decades

- Housing costs that are among the most expensive in the nation

- An education system that has declined from one of the best in the nation to one that, by many measures, is now one of the lower-ranked systems

- High energy costs and a strained and unreliable energy infrastructure

- Acute problems relates to water resources, irrigation, and water consumption.

Table 4 shows the earnings by industry of employment in California and how these compare to the U.S. averages. This table shows that California ranks relatively low with respect to sectors such as mining, educational services, and health care and social assistance. However, this illustrates that the state ranks high with respect to several sectors: Specifically, with 12.1 percent of the nation's population:

- Employment earnings in the California Arts, Entertainment, and Recreation sector account for 19.9 percent of total earnings nationally in that sector.

- Employment earnings in the California Information sector account for 19.6 percent of total earnings nationally in that sector.

- Employment earnings in the California Agriculture, Forestry, Fishing, and Hunting sector account for 18 percent of total earnings nationally in that sector.

- Employment earnings in the California Real Estate and Rental sector account for 17.1 percent of total earnings nationally in that sector.

- Employment earnings in the California Professional, Scientific, and Technical Services sector account for 17.1 percent of total earnings nationally in that sector.

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

	California (mill.$)	California Share of U.S.	California Share of Earnings	U.S. Share of Earnings	California Index
Personal Income (including adjustments)	$1,254,045	13.0%	-	-	-
Agriculture, Forestry, Fishing and Hunting	15,055	18.0%	1.5%	1.1%	135
Mining	2,756	4.4%	0.3%	0.8%	33
Utilities	9,764	12.5%	1.0%	1.0%	94
Construction	65,655	14.2%	6.6%	6.1%	107
Manufacturing	121,062	12.2%	12.1%	13.2%	92
Wholesale Trade	47,088	12.2%	4.7%	5.1%	92
Retail Trade	68,457	13.7%	6.9%	6.7%	103
Transportation and Warehousing	27,122	11.1%	2.7%	3.2%	84
Information	57,493	19.6%	5.8%	3.9%	148
Finance and Insurance	70,643	12.3%	7.1%	7.6%	93
Real Estate and Rental and Leasing	34,343	17.1%	3.4%	2.7%	129
Professional, Scientific, and Technical Services	106,802	15.6%	10.7%	9.1%	117
Management of Companies and Enterprises	21,712	13.5%	2.2%	2.1%	102
Administrative/Support/Waste Management/Remediation Services	37,188	13.7%	3.7%	3.6%	103
Educational Services	10,601	10.8%	1.1%	1.3%	81
Health Care and Social Assistance	79,406	11.2%	7.9%	9.4%	84
Arts, Entertainment, and Recreation	16,155	19.9%	1.6%	1.1%	150
Accommodation and Food Services	27,454	13.3%	2.7%	2.8%	100
Other Services	29,452	13.2%	2.9%	3.0%	99
Public Administration	150,900	12.5%	15.1%	16.0%	94

Source: Management Information Services, Inc., 2005.

V. THE ENVIRONMENTAL INDUSTRY AND JOBS IN CALIFORNIA

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

MISI estimates that in 2004:

- Sales generated by environment-related industries in California totaled $51 billion.
- The number of environment-related jobs totaled 598,500.
- The environmental industry in California comprised 3.3 percent of gross state product.
- California environmental industries accounted for 15.8 percent of the sales of the U.S. environmental industry.
- Environment-related jobs comprised 4.1 percent of California non-farm employment.
- Environment-related jobs in California comprised 11.7 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 two and three percent annually.

V.B. Environmental Jobs in California by Industrial Sector

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

Comparison of the industrial sector distribution of environment-related jobs in California 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 California 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 California is more manufacturing intensive than other average private sector activity in the state:

Table 5
Environmental-Related Non-farm Jobs in California in 2004, by Industry

Industry	Establishments	Total Employment	Environmental Employment	Environmental Jobs (percent)
Agriculture, Forestry, Fishing and Hunting	2,170	23,700	2,501	10.6
Mining	869	20,400	880	4.3
Utilities	1,204	56,200	11,924	21.2
Construction	76,224	847,300	26,010	3.1
Manufacturing	44,812	1,532,700	51,350	3.4
Wholesale Trade	59,281	653,900	8,729	1.3
Retail Trade	113,746	1,616,500	13,580	0.8
Transportation and Warehousing	18,152	426,000	3,090	0.7
Information	20,303	482,500	19,483	4.0
Finance and Insurance	50,191	626,700	5,398	0.9
Real Estate and Rental and Leasing	43,969	276,100	4,769	1.7
Professional, Scientific, and Technical Services	101,355	905,800	99,219	11.0
Management of Companies and Enterprises	4,223	232,600	3,884	1.7
Administrative/Support/Waste Management/Remediation Services	41,063	960,400	81,444	8.5
Educational Services	10,407	264,900	9,122	3.4
Health Care and Social Assistance	92,043	1,297,400	8,893	0.7
Arts, Entertainment, and Recreation	17,054	238,800	5,545	2.3
Accommodation and Food Services	69,976	1,203,500	10,550	0.9
Other Services	71,109	504,500	7,232	1.4
Public Administration	-	2,390,300	224,924	9.4
State Total	**838,152**	**14,560,200**	**598,528**	**4.1**

Source: Management Information Services, Inc., 2005.

- 13.7 percent of private sector jobs in the environmental industry are in manufacturing, compared to 12.3 percent in manufacturing among all private sector industrial activities in California.

- 27 percent of private sector environmental jobs are in professional, scientific, and technical services, compared to seven percent of all private sector jobs in the state.

- 22 percent of private sector environmental jobs are in administrative, support, and waste management services, compared to eight percent of all private sector jobs in the state.

- 5.2 percent of private sector environmental jobs are in information, compared to four percent of all private sector jobs in the state.

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

- Four percent of private sector environmental jobs are in the retail trade sector, compared to 13 percent in retail trade among all private sector jobs in the state.

- One percent of environmental jobs are in the finance and insurance sector, compared to five percent among all private sector jobs in the state.

- Two percent of environmental jobs are in the health care and social service sector, compared to 11 percent among all private sector jobs in the state.

- 0.8 percent of environmental jobs are in the transportation and warehousing sector, compared to four 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 600,000 environmental jobs account for about four percent of all jobs in California. However, this distribution is uneven among industry sectors:

- 21 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.

- 11 percent of California jobs in the professional, scientific, and technical services are environmental jobs.

- **3.4 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, nearly 14 percent of private sector environmental jobs are in manufacturing, compared to 12 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 seven percent of all private sector jobs in the state.

This indicates that investments in the environment will provide a greater than proportionate assist to California's high-tech and manufacturing sectors. As noted in Chapter IV, California 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, nearly 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 California – 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 California by Occupation and Skill

Environmental employment in California 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 California 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 California in 2004 within selected occupations. This table shows that in 2004 environmental protection generated in California generated:

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

Occupation	Jobs
Accountants and Auditors	5,547
Bookkeeping and Accounting Clerks	5,004
Biochemists and Biophysicists	736
Cashiers	12,832
Chemists	1,548
Computer Software Engineers	11,344
Conservation Scientists	1,064
Customer Service Representatives	6,804
Electricians	4,723
Electronics Engineers	4,399
Environmental Engineers	5,779
Environmental Engineering Technicians	1,996
Environmental Scientists and Specialists	7,676
Executive Secretaries and Administrative Assistants	8,218
Financial Managers	2,470
Forest and Conservation Workers	2,110
Geoscientists	2,283
Graphic Designers	917
Hazardous Material Removal Workers	5,044
Inspectors, Testers, and Sorters	1,862
Janitors and Cleaners	13,565
Management Analysts	4,499
Marketing Managers	1,951
Mechanical Engineers	1,386
Medical Scientists, Except Epidemiologists	2,560
Natural Science Managers	1,917
Office Clerks	16,059
Plumbers, Pipefitters, and Steamfitters	1,399
Security Guards	7,575
Septic Tank Servicers and Sewer Pipe Cleaners	1,305
Sheet Metal Workers	2,147
Stock Clerks	5,312
Training and Development Specialists	860
Truck Drivers	7,310
Water and Liquid Waste Treatment Plant Operators	10,023
Welders and Solderers	951

Source: Management Information Services, Inc., 2005.

- More jobs for cashiers (12,832) than for geoscientists (2,283)
- More jobs for office clerks (16,059) than for environmental engineers (5,779)
- More jobs for executive secretaries (8,218) than for forest and conservation workers (2,110)
- More jobs for janitors (13,565) than for natural science managers (1,917)
- More jobs for electricians (4,723) than for chemists (1,548)
- More jobs for accountants and auditors (5,547) than for medical scientists (2,560)
- More jobs for truck drivers (7,310) than for septic tank servicers (1,305)
- More jobs for financial managers (2,470) than for conservation scientists (1,064)
- More jobs for management analysts (4,499) than for environmental engineering technicians (1,996)
- More jobs for computer software engineers (11,344) than for hazardous material removal workers (5,044)

Thus, many workers in California 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 California 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 California comprises only about 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 systems software engineers
- Electronics engineers
- Geoscientists
- Landscape architects
- Medical scientists
- Natural sciences managers
- Occupational, health, and safety specialists
- Surveyors
- Urban and regional planners

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 California 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
- Separation and still machine setters
- Sheet metal workers
- Technical writers
- 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 California -- 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 California generated by environmental protection are close to the average of four percent of total employment; including:

- Accountants and auditors
- Brickmasons

- Carpenters
- Computer and information systems managers
- Computer support specialists
- Construction managers
- Customer service representatives
- Database administrators
- Electricians
- File Clerks
- Financial managers
- Graphic designers
- Human resource managers
- Industrial engineers
- Industrial production managers
- Interviewers
- Janitors
- Machinists
- Mobile heavy equipment mechanics
- Network and Computer systems Administrators
- Office clerks
- Plumbers and Pipefitters
- Purchasing agents
- Security guards

- Stock clerks
- Training and development specialists
- Truck drivers
- Welders
- Word processors and typists

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

This study demonstrates that environmental protection can form an important part of a strategy for California 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 California. For example:

- This study demonstrates that, at present in California, environmental protection is creating nearly 600,000 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 more than 28,000 jobs in California. Thus, contrary to what many believe, the production of more fuel-efficient vehicles would create substantial numbers of jobs in California, not reduce them.[7]

[7]Management 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.

- 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 80,000 jobs in California.[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 California, which currently has a thriving, job creating environmental industry, currently generating 600,000 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 Arizona, Connecticut, 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 California economy from defense-orientation to environment-related industries.

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

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

VI. SUMMARY PROFILES OF SELECTED CALIFORNIA ENVIRONMENTAL COMPANIES

We conducted a survey of existing environmental companies in California, 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, research, 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 February 2005.

VI.A. Blasland, Bouck, and Lee, Inc.

Blasland, Bouck and Lee, Inc. (BBL) is a leading provider of environmental, health, and safety services in the United States and internationally, and has offices in Irvine, Petaluma, San Diego, Walnut Creek, and Carpeteria. The firm has 750 employees nationwide, including 60 in California, and has hired 10 new staff within the past six months. Its staff consists of engineers, consultants, technologists, and support personnel. BBL's business is 90 percent industrial/commercial and 10 percent government, and its California offices' sales are almost entirely domestic.

BBL began with 12 employees and grew rapidly as industry began to increasingly focus on environmental issues. The company was able to position itself as a provider of high value services and currently has a diverse client base of Fortune 100 companies and large municipalities.

The firm has become a leader in the environmental consulting industry and has grown into one of the largest firms of its kind in the country. Since 1992, the firm has been ranked as one of the Top 100 design firms in the United States by *Engineering News-Record*, and it currently ranks 75th on the magazine's list.

Table 7
Summary of the Select California Environmental Companies Profiled

Company	Location	Products/Services	Jobs
Blasland, Bouck and Lee	Irvine, Los Angeles, Petaluma, San Diego, Walnut Creek, Carpenteria	A leading provider of environmental, health, and safety services	US: 750 CA: 60
Clean Harbors Environmental Services	Numerous locations throughout California	Largest provider of hazardous waste management and disposal services in North America	US: 3,800 CA: 400
Columbia Analytical Services	Simi Valley, Redding, Canoga Park, Los Gatos, Orange County	Full-service analytical laboratory network specializing in environmental testing	US: 350 CA: 90
Ecoenergies	Sunnyvale	One of California's largest providers of solar electric systems	US: 32 CA: 32
Environmental & Occupational Risk Management	Oakland, Sunnyvale, Newport Beach, San Diego	Environmental, health, and safety management services	US: 140 CA: 65
Forensic Analytical	Hayward, Rancho Dominguez, Citrus Heights	Analytical environmental, public health, and industrial hygiene laboratories	US: 250 CA: 200
Geomatrix Consultants	Oakland, Costa Mesa, Corona, Fresno, Folsom, Sacremento	Geological and environmental engineering services	US: 275 CA: 175
GeoSync Consultants	Huntington Beach, Oakland, Pasedena, San Bernadino, San Diego, Santa Barbara	Earth and environmental sciences company	US: 400 CA: 200
Locus Technologies	Walnut Creek, Middletown, Sacramento, San Francisco, Los Angeles	Environmental engineering and management company specializing in hazardous waste sites and facilities	US: 75 CA: 65
LSA Associates, Inc.	Irvine, Riverside, Berkeley, Rocklin, Point Richmond, San Luis Obispo, and other cities	Environmental, transportation, and community planning company	US: 270 CA: 260
Malcolm Pirnie	Los Angeles, San Diego, Emeryville, Sacramento, Oxnard, Irvine	Environmental services, consulting, compliance, assessment, and remediation	US: 1,400 CA: 70

Table 7
Summary of the Select California Environmental Companies Profiled
(Continued)

Company	Location	Products/Services	Jobs
Psomas	San Diego, Palm Desert, Riverside, Costa Mesa, Santa Clarita, San Jose, Sacramento, Roseville	Environmental engineering company specializing in water and wastewater projects	US: 550 CA: 500
Severn Trent	Los Angeles, Sacramento, San Francisco	One of the leading environmental testing companies in the world	US: 2,300 CA: 250
Sun Light & Power	Berkeley	Designs and installs renewable, solar, and alternative energy systems	US: 40 CA: 40
Tetra Tech	Alameda, Arcata, Burlingame, Calistoga, Camerillo, Citrus Heights, Lafayette, McCllean, Monterey Park, Oceanside, Ontario, Palm Desert, Pasadena, and other cities	A leading U.S. provider of environmental consulting, engineering, and technical services	US: 9,000 CA: 400
Trend Setter Industries	Eureka	Designs and installs solar energy, energy efficiency, and alterative energy systems	US: 40 CA: 15
Winzler & Kelly	Eureka, Anaheim, Pleasanton, San Diego, San Francisco, San Leandro, Santa Rosa	Provides a full range of environmental and engineering solutions	US: 235 CA: 225

Source: Management Information Services, Inc., 2005.

BBL brings together professionals with experience from all corners of the globe. In addition to work in the U.S., its personnel have successfully completed work in Europe, Asia/Pacific Rim, North America, Latin America, South America, and Australia. BBL's services offered Include:

- Asset Evaluation
- Construction Related Services

- Environmental Economics and Environmental Business Consulting
- Environmental Health and Safety
- Hydrogeologic Services
- Life Sciences
- Litigation Support
- Operations, Maintenance, and Monitoring
- Planning
- Remedial Services
- Water and Wastewater Services
- Waterfront Services, including contaminated sediments and ports and harbors
- Watershed/TMDL Services

VI.B. Clean Harbors Environmental Services, Inc.

Clean Harbors Environmental Services, Inc. has numerous offices throughout California and provides environmental and hazardous waste management services. The firm has 3,800 employees nationwide, including more than 400 in California. Its employees include engineers, technicians, plant workers and operators, and various field service personnel. Its clientele is 70 percent industrial and 10 percent government, and 95 percent of the business of its California 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.C. Columbia Analytical Services

Columbia Analytical Services (CAS) is a full-service analytical laboratory network specializing in environmental testing and has offices in Simi Valley, Redding, Canoga Park, Los Gatos, and Orange County. The firm has 350 employees nationwide, including 90 in California, and has hired 10 new staff within the past six months. Its staff consists of engineers, chemists, biologists, technologists, and support personnel. CAS' business is 50 percent industrial/commercial and 50 percent government, and all of its California offices' sales are domestic.

CAS was established in 1986 and is employee-owned. Over the years, CAS has grown in to one of the largest independent commercial testing laboratories in the United States – currently with over $30 million in revenues, eight laboratory locations, and multiple service centers. CAS has laboratories and client service centers strategically located throughout the United States offering a complete range of laboratory services. The firm provides sound environmental science, high testing quality and exemplary customer service.

CAS has developed expertise and testing capabilities in many areas, including:

- Air
- Low-level Analyses for Risk Management
- Drinking Water
- Water, Soil, Sludge, and Hazardous Waste
- Trace Analysis of Marine Water, Sediments, Animal and Plant Tissues
- Pharmaceutical and Nutraceutical Analysis
- PCB Congeners, Dioxins, Furans
- Technical Consulting
- Project Management
- Analytical Method Development

- Sampling, Field and Mobile Laboratory Services
- Customized Reports and Data Deliverables

CAS laboratories were all recipients of the Seal of Excellence Award presented by the American Council of Independent Laboratories (ACIL) in October 2004. This program provides laboratory data users with a mechanism for evaluating environmental testing laboratories.

VI.D. EcoEnergies, Inc.

EcoEnergies is a leading provider of solar electric systems and is located in Sunnyvale. The firm has 32 employees, all in California, and has hired three new staff within the past six months. Its staff consists of engineers, technicians, system installers, and support personnel. The firm's business is 90 percent residential, and its sales are 95 percent domestic.

EcoEnergies designs, constructs, delivers, and maintains renewable energy power systems and related energy efficiency products using wind, solar, small hydro, and other "green power" and energy efficiency technologies. It specializes in renewable energy systems design, installation, and operation, and sales of photovoltaic modules and BOS components. EcoEnergie staff includes professional engineers who are NABCEP certified, and the firm offers a limited 5-Year Warranty, which meets the requirements for the California Energy Commission Rebate Program.

EcoEnergies sister company, EcoEnergies Construction, serves as EcoEnergies' contracting arm for project installation and construction contracts. EcoEnergies is one of California's largest renewable energy systems companies, with 18,000 square feet of warehouse and office space. It is part of the ACI energy group, with affiliates producing over 150 megawatts of electricity from renewable biomass and waste products.

VI.E. Environmental & Occupational Risk Management

Environmental and Occupational Risk Management, Inc. (EORM) provides Environmental, Health and Safety management services. It is headquartered in Sunnyvale and has offices in Oakland, Newport Beach, and San Diego. The firm has 140 employees nationwide, including 65 in California, and has hired eight new staff within the past six months. Its staff consists of engineers, environmental and health scientists, technicians, and support personnel. EROM's business is 80 percent industrial/commercial and 20 percent government, and its California offices' sales are all domestic.

EORM partners with companies worldwide to develop and implement cost-effective environmental, health and safety (EHS) management programs and has offices strategically located across the United States. It focuses on integrating EHS management into business operation processes to make it a beneficial part of a company's business strategy and corporate culture. Partnering with clients, EORM develops customized management solutions and strategies that reduce clients' potential for liability and increase their ability to provide a safe work environment.

The firm's 450 clients benefit from its expertise in implementing EHS management programs that conform to ISO 14001 or OHSAS 18001 standards, seamlessly integrated with existing management systems. This allows clients to realize sustainable and measurable improvements in their EHS management and make informed business choices regarding EHS and business risks. Each EROM office is staffed with EHS professionals trained to develop and implement programs that enable its clients to better manage their EHS challenges.

VI.F. Forensic Analytical

Forensic Analytical is an analytical laboratory and consulting firm with offices in Hayward, Rancho Dominguez, and Citrus Heights. The firm has 250 employees nationwide, including 200 in California, and has hired 10 new staff within the past six months. Its staff consists of engineers, chemists, biologists, industrial hygienists, technicians, and administrative and support personnel. Forensic Analytical's business is 50 percent industrial/commercial and 50 percent government, and all of its sales are domestic.

Founded in 1986, Forensic Analytical provides a variety of services in the interest of public health and has become recognized as one of the highest quality industrial hygiene laboratories in the country. With highly qualified professionals in Northern California, Southern California, Chicago, Las Vegas, and Portland offices, the firm offers consulting and analytical services to a variety of clients throughout the United States.

Forensic Analytical's Environmental Laboratory Services Division includes four locations with combined capabilities for the analysis of asbestos, lead-based paint, heavy metals, hazardous waste, mold, bacteria, allergen, and particulate. Known throughout the environmental industry as a leader in customer service, Forensic Analytical's laboratories provide high quality service at competitive rates.

The firm's laboratories are accredited by the American Industrial Hygiene Association (AIHA), the National Voluntary Laboratory Accreditation Program (NVLAP), and the California Department of Health Services (Cal DHS). The laboratories are successful participants in several proficiency programs including the PAT, ELPAT, and EMPAT programs. Each laboratory also maintains a rigorous in-house QA/QC program to ensure that clients receive the most accurate and legally defensible results possible.

VI.G. Geomatrix Consultants, Inc.

Geomatrix is a geological and environmental engineering company with headquarters in Oakland and offices in Costa Mesa, Corona, Fresno, Folsom, and Sacramento. The firm has 275 employees nationwide, including 175 in California, and has hired 15 new staff within the past six months. Its staff consists of engineers, geologists, environmental scientists, technicians, and administrative and support personnel. Geomatrix's business is 50 percent industrial/commercial and 50 percent government, and about ten percent of its sales are international.

Geomatrix is a mid-sized, employee-owned firm founded in 1984 by a group of recognized authorities in the engineering geology consulting profession. Building on the company's beginnings in geology, geotechnical engineering, and foundation engineering, Geomatrix staff includes proven innovators in a wide range of technical disciplines, from seismic analysis and remediation engineering to water resources management, air quality permitting, and decision analysis.

Starting in Northern California, and retaining the corporate headquarters in Oakland, Geomatrix has expanded its geographic presence throughout North America. In addition, the company has affiliates or partnerships in several countries and has performed projects worldwide. Geomatrix's experts have helped develop industry standards in such fields as highway construction and remedial treatments and staff have testified before local, state, and federal agencies and boards, written white papers, and served as expert witnesses.

Geomatrix's consultants are recognized innovators in an ever-widening spectrum of technical disciplines -- from water resources management, environmental compliance, and air quality to decision analysis and geographic information systems. The firm's services include:

- Decision Analysis and Performance Assessment
- Earthquake-Related Services
- Environmental Health and Safety Management
- Environmental Sciences and Engineering
- Geographic Information Systems
- Geotechnical Engineering and Engineering Geology
- Groundwater Resources
- Industrial Utilities Engineering

- Risk Assessment and Toxicology

VI.H. GeoSyntec Consultants

GeoSyntec is an earth and environmental sciences company with offices in Huntington Beach, Oakland, Pasadena, San Bernadino, San Diego, and Santa Barbara. The firm has 400 employees nationwide, including 200 in California, and has hired 10 new staff within the past six months. Its staff consists of engineers, geologists, environmental scientists, water resource specialists, technicians, and administrative and support personnel. Geomatrix's business is 20 percent industrial/commercial and 80 percent government, and about ten percent of its sales are international.

GeoSyntec was founded in 1983 to provide private and public sector clients with earth and environmental sciences consulting services; environmental, geotechnical, and hydrological engineering consulting and design services; and construction management and quality assurance services for projects involving these practices. It is an employee-owned company with offices throughout the United States and Canada, and the company's philosophy is that all professionals, including principals, maintain their focus on their professional practice and client relationships.

Since inception, GeoSyntec's business has grown around projects involving environmental studies and restoration, natural resources management, and engineering, and design for the solid waste disposal, water resources, and transportation infrastructures. The company is nationally recognized for its practice leadership, broad experience, technological innovation, and client service.

GeoSyntec provides earth and environmental sciences consulting services, geotechnical, and hydrological engineering consulting and design services, and construction management and quality assurance services for projects involving the following practices:

- Groundwater Assessment and Remediation
- Surface Water and Natural Resources Management
- Site Investigation and Remedial Design/Action
- Geoenvironmental Engineering
- Geotechnical Engineering
- Environmental Management
- Pollution Prevention

- Risk Assessment and Management
- Brownfield Site Development
- Waste Disposal Facility Permitting, Design, Construction and Closure
- Vapor Intrusion, Indoor Air Quality, and Vapor Control Services

VI.I. Locus Technologies

Locus Technologies is an environmental engineering and management company specializing in hazardous waste sites and facilities. It is headquartered in Walnut Creek, and has offices in Middletown, Sacramento, San Francisco, and Los Angeles. The firm has 75 employees nationwide, including 65 in California, and has hired three new staff within the past six months. Its staff consists of engineers, environmental scientists, construction and project managers, technicians, and administrative and support personnel. Locus' business is 90 percent industrial/commercial and 10 percent government, and all of its clients are domestic.

Locus specializes in providing comprehensive consulting, design, construction, information management, and automation services for the environmental, infrastructure, and energy markets. The company's business is solving complex, multi-disciplinary design and engineering problems and its clients are almost exclusively industrial firms and Potentially Responsible Parties (PRP) committees with special environmental problems.

The firm provides services for all types of hazardous waste sites and facilities and has conducted remedial investigations for many proposed and inactive hazardous waste sites. The Locus team has designed and implemented necessary remedial actions for Superfund and non-Superfund sites and its combined experience includes the provision of a wide variety of design and remediation services at more than 100 Superfund sites. Locus supports its industrial and governmental clients in complying with the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements.

Locus team members have provided comprehensive site assessment, design, and remediation services for more than 20 years. The firm has the staff and support systems required to complete all types of projects for landfill closure design and remediation, cutoff wall design and installation, treatment facilities, leachate collection systems, excavation and/or regrading at complex sites, and surface water and groundwater management.

Locus is a leader in applying web-based technologies to the environmental industry. Its suite of web services, LocusFocus, provides a web portal for managing all environmental issues for environmentally imported sites. The system offers web-based

remote control and automation of treatment systems, analytical data management, and document control, storage, and management.

Locus Technologies provide the following services:

- Asbestos Management
- Automation of Treatment Systems
- CERCLA
- Environmental Information Management
- Expert Witness/Litigation Support
- Groundwater
- Health Risk Assessment
- International
- Internet-based Solutions
- Landfill and Containment Structures
- Nuclear and Mixed Waste
- Operation and Maintenance
- RCRA
- Remediation
- Risk Management
- Real Estate Transactions
- Regulatory Compliance
- Sampling
- Site Investigation/Characterization
- Storage Tank Management

- Technology Selection
- Water Quality

VI.J. LSA Associates, Inc.

LSA Associates is an environmental, transportation, and community planning company with offices in Irvine, Riverside, Berkeley, Rocking Point, Richmond, San Luis Obispo, Palm Springs, and Carlsbad. The firm has 270 employees nationwide, including 260 in California, and has hired 35 new staff within the past six months. Its staff consists of engineers, ecologists, biologists, transportation specialists, urban planners, environmental scientists, project managers, technicians, and administrative and support personnel. Locus' business is 50 percent industrial/commercial and 50 percent government, and 95 percent of its sales are domestic.

LSA is a diversified environmental, transportation, and community planning firm that evolved from a small consulting firm formed by Larry Seeman in 1976, then called Larry Seeman Associates. The firm was designed to meet the need for environmental evaluation as a result of the passage of the California Environmental Quality Act (CEQA).

Since the firm's founding more than 25 years ago, it has grown into a full-service consulting firm that continues to grow in terms of the markets it serves and the services it provides. Public and private sector clients select LSA because it provides them with expertise and experience, integrity and trust, and service and responsiveness.

LSA has a well qualified staff capable of handling a broad range of project assignments, both large and small. The firm has served a variety of private industry and public agency clients, many of whom have been clients for more than 20 years. It is recognized as an innovator in the field of environmental impact assessment, and has developed a reputation among clients and professional peers as being thorough and objective.

LSA is a 100 percent employee owned company with a diverse group of highly skilled professionals and provides services in the following fields:

- Air Quality
- Biology and Wetlands
- Community and Land Use Planning
- Cultural and Paleontological Resources

- Environmental Analysis
- Geographic Information Systems (GIS)
- Habitat Restoration
- Noise Analysis
- Resource Planning and Management
- Transportation and Urban Design

VI.K. 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, 70 work out of its offices in Los Angeles, San Diego, Emeryville, Sacramento, Oxnard, and Irvine, and it has added 10 new jobs in California over the past six months. The firm's employees are about 80 percent engineering/technical and 20 percent sales/administrative, and its business is 80 percent government/public sector and 20 percent private – commercial and industrial. It has relatively little international sales.

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.L. Psomas

Psomas is an environmental engineering company specializing in water and wastewater projects. The firm's headquarters is in Los Angeles, and it has offices in San Diego, Palm Desert, Riverside, Costa Mesa, Santa Clarita, San Jose, Sacramento, and Roseville. The firm has 550 employees nationwide, including 500 in California, and has hired 12 new staff within the past six months. Its staff consists of engineers, chemists, ecologists, biologists, water specialists, environmental scientists, project managers, technicians, and administrative and support personnel. Locus' business is 50 percent industrial/commercial and 50 percent government, and all of its sales are domestic.

Psomas is a leading consulting engineering firm serving the land development, transportation, water, and information technology markets. Ranked nationally as one of *Engineering News Record* magazine's Top Engineering Firms, Psomas has achieved an award-winning reputation for innovation, creativity, and cutting-edge technical

expertise. Founded in 1946 by George Psomas, the firm has grown into a full-service consulting firm.

The firm's core strength is its well-trained staff, which provide multi-disciplined teams of experts who excel at producing innovative solutions. Psomas services include:

- Civil Engineering Construction Management
- Information Technology Consulting
- National ATLA Coordination
- Natural Resources
- Planning and Entitlements
- Surveying and Mapping
- Transportation Engineering
- Water Resources

Psomas projects include:

- Land Development Market
- Transportation Market
- Water Market
- Government Market

VI.M. Severn Trent

Severn Trent Laboratories (STL) has offices in Los Angeles, San Diego, Sacramento, and San Francisco and is one of the leading environmental testing companies in the world. It has 2,300 employees nationwide, including 250 in California, and has hired 20 new staff over the past six months. The firm's employees include chemists, microbiologists, environmental scientists, and administrative and support personnel, and 90 percent of its California work is domestic.

Focusing on 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.N. Sun, Light & Power

Sun Light & Power (SLP) is located in Berkeley and designs and installs renewable, solar, and alternative energy systems. It has 40 employees, all in California, and has hired 15 new staff over the past six months. The firm's employees include engineers, systems specialists, architects, electricians, technicians, installers, and administrative personnel. The firm's business is 50 percent residential, 40 percent commercial, and ten percent government, and all of its work is domestic.

SLP was founded in 1976 and specializes in turnkey installations of alternative energy solutions for residential, commercial, and municipal markets. It offers the latest in custom designed, energy efficient technology, including state-of-the-art solar systems for electricity and hot water, radiant heating, earth-source heat pumps, and wind systems.

SLP designs and builds complete energy solutions for homes and businesses, including solar electricity, solar thermal systems, high efficiency geo-exchange heat pumps, radiant heating, and other applications. The firm's offices are 100 percent solar and renewables powered, including a 6.6 KW PV array, an electric car, and a bio-diesel truck fleet. Over the past four decades, SLP has amassed an impressive portfolio of over five hundred solar systems installed throughout the San Francisco Bay Area.

Sun Light & Power possesses nearly 30 years of operational experience in solar installation, which is unmatched in Northern California, and its highly qualified staff has over 65 years of combined solar experience. The company is recognized as the first

solar company admitted to Bay Area Green Business -- a program that acknowledges companies who operate in an environmentally friendly manner.

SLP is in the process of becoming an employee-owned company, thereby ensuring that the team of employee-owners will pursue their long-term goals and keep the business running for many years. SLP's employees provide the highest quality installations possible because they have a vested interest in the company and in seeing their clients' systems run efficiently.

VI.O. Tetra Tech, Inc.

Tetra Tech, Inc. (TTI) is a leading U.S. provider of environmental consulting, engineering and technical services with offices in Pasadena, Alameda, Arcata, Burlingame, Calistoga, Camerillo, Citrus Heights, Lafayette, McClean, Monterey Park, Oceanside, Ontario, Palm Desert, and Pasadena. It has over 9,000 employees located in the United States and internationally, including 400 in California, and has hired 12 new employees within the past six months. The company supports commercial and government clients in the areas of resource management, environmental services, water/wastewater management, and infrastructure. TTI services include research and development, applied science and technology, engineering design, construction management, and operations and maintenance, and the firm has 350 offices worldwide and had total revenue of $1.1 billion in 2003. About half of its business is commercial/industrial and half is government, and all of its California work is domestic.

TTI was founded in 1966 to provide engineering services related to waterways, harbors, and coastal areas. Over the past 38 years, the company has substantially increased the size and scope of its business and expanded its service offerings through a series of strategic acquisitions and internal growth. Tetra Tech currently provides environmental services, water/wastewater management, infrastructure services, communications support, and outsourcing services.

TTI provides services to protect and improve the quality of life through responsible resource management and sustainable infrastructure. The company continuously adapts its services to provide for society’s changing needs and to meet customer expectations. The two business areas in which TTI provides capabilities to its customers are critical to sustain the quality of life -- Infrastructure services and resource management services:

- *Infrastructure Services*. TTI provides growing communities with facilities and systems to improve the quality of life and protect public health and safety. It designs and engineers facilities for water supply, water treatment, wastewater treatment, storm water management, transportation networks, communications networks, commercial and public facilities, educational facilities, and leisure facilities. As one of the largest design firms in the U.S., TTI

provides full service architectural and engineering capabilities for all types of buildings. The company also incorporates the latest technologies to enhance communications.

- *Resource Management Services*. TTI has a leadership position in water resource and environmental management, emphasizing solving critical problems in watershed management, groundwater cleanup, and environmental restoration to ensure clean water supply, productive reuse of economic assets, and sustainable development of natural resources. This business area emphasizes solutions to complex resource management problems which encompass broad geographic areas.

In addition to its service offerings, TTI encourages its professionals to participate in outreach programs, and its employees participate in many non-profit agencies and projects within their local communities. For example, TTI employees have worked with local watershed councils, such as the Huron River Watershed Adopt-A Steam, and the Clinton River Watershed Council, and TTI employees are frequent participants in Earth Day teaching programs to audiences from kindergartens to universities.

VI.P. TrendSetter Industries

TrendSetter Industries is located in Eureka and designs and installs solar energy, energy efficiency, and alterative energy systems. It has 40 employees, including 15 in California, and has hired two new staff over the past six months. The firm's employees include engineers, systems specialists, electricians, technicians, installers, and administrative personnel. The firm's business is 90 percent residential, five percent industrial/commercial, and five percent government, and all of its work is domestic.

The firm combines the latest solar and energy efficiency technologies with the best water heating methods and uses top brand-names products, including EnergStar, Taco, Takagi, and SunEarth. The firm also designs, configures, and ships complete, pre-assembled radiant floor heating systems designed with Energy Star Home compliance in mind.

TrendSetter provides consulting, installation, maintenance, and repair services for the following products:

- Solar-assisted radiant floor heating systems
- Solar water heating systems
- Solar water heating components
- Water storage tanks

- Solar electric power systems
- Natural daylighting
- Tubular skylights
- Backup power systems
- DC to AC power inverters
- Hydro energy systems (small)
- Hydronic radiant heating systems
- Photovoltaic systems
- Solar water heating systems
- Wind turbines

VI.Q. Winzler & Kelly

Winzler & Kelly is headquartered in Eureka and has other offices in Anaheim, Pleasanton, San Diego, San Francisco, San Leandro, and Santa Rosa, and it provides a full range of environmental and engineering solutions. It has 235 employees, including 225 in California, and has hired 12 new staff over the past six months. The firm's employees include engineers, technicians, and administrative and support personnel. W&K's business is 50 percent industrial/commercial and 50 percent government; about 85 percent of its work is domestic and 15 percent is international.

Winzler & Kelly was founded over 50 years ago and has grown steadily to rank among the top 500 environmental and engineering firms in the United States. The services it provides include:

- Environmental Remediation & Restoration
- Hazardous Materials Consulting
- Public & Private Infrastructure
- Campuses
- Buildings
- Military & Federal Facilities

- Marine & Industrial Structures

In 2004, Winzler & Kelly won two prestigious Engineering Excellence Awards a competition sponsored by the Consulting Engineers and Land Surveyors of California (CELSOC). The Haslett Warehouse Fire Cleanup Project and Mission Bay Redevelopment Project were both recognized for their innovative engineering, value to the engineering profession and community, complexity, and meeting or exceeding client needs.

W&K has been ranked among the winners of *The Zweig Letter* Hot Firm 2003 award by being one the 100 fastest growing architectural, engineering, planning and environmental firms in the country. Rankings for the award are based on growth in professional service revenues over the past three years, and during this period, the firm's annual revenues increased over 60 percent to $25 million.

VII. OPPORTUNITIES IN CALIFORNIA 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 California. The more important ones are summarized below. 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. California Commission For Jobs and Economic Growth

The Governor's Commission on Jobs and Economic Growth was created in 2004 to bring together leaders from business, labor, academic, and community organizations to help the Governor attract jobs to California. The Commission works side-by-side with state and local government, business associations, unions, educational institutions, and California's network of regional and local Economic Development Corporations to:

- Identify, illustrate, and suggest ways to remove barriers to increasing employment and doing business in California
- Identify and assist employers interested in expanding in California or at risk of leaving the state
- Help market California products, services, and destinations to national and international audiences

The Commission on Jobs and Economic Growth is in the position to help focus more attention on the environmental industries in California and make them a priority in the future. It is in a unique position to influence the state's policies on jobs for existing and emerging industries, and such policies could be used to help build environment-related industries and jobs by ensuring that the labor pool in California is well suited for the industry. A Governor's commission offers the high profile required to emphasize the jobs and environment nexus in California.

VII.A.2. California Council of Economic Advisors

The California Council of Economic Advisors was created in 2004 to serve in an advisory capacity to the Governor on economic matters. The 16-member council meets with the Governor periodically to assist him in confronting the economic challenges facing the state in addition to identifying economic opportunities for California. The

council consists of economic experts from both academia and the private sector including Nobel prize winners.

The California CEA could be an appropriate entity to raise jobs and the environment issues at the level of the governor and senior state officials, although this has thus far not been its focus. Nevertheless, integrating these issues into the state's portfolio of economic, industry, and job development programs and initiatives fits in well with the Council's mandate to "confront the economic challenges facing the state in addition to identifying economic opportunities for California " and its efforts to facilitate investment in job creating industries and to diversify the state economy.

VII.A.3. Environmental Initiatives

In his Action Plan for California's Environment, Governor Schwarzenegger stated "California's economic future depends significantly on the quality of our environment. We face serious environmental challenges, which have profound impact on public health and the economy. 'Jobs vs. the environment' is a false choice. Overwhelming evidence demonstrates that clean air and water result in a more productive workforce and a healthier economy, which will contribute to a balanced state budget." In his Action Plan, the Governor identified six core initiatives focused on the environment in California:

- Reduce Air Pollution Statewide by Up to 50 percent -- and Restore Independence From Foreign Oil
- Protect California's Rivers, Bays, and Coastline
- Solve California's Electrical Energy Crisis
- Protect and Restore California's Parks and Open Spaces
- Restore California's Urban Environments
- Protect California's Environment Through Tough Enforcement of Existing Laws

Since being elected, Governor Schwarzenegger has pursued his environmental goals via several routes. Some of his more significant initiatives include:

- Called for the creation of the California Hydrogen Highway Network, a project that will ultimately consist of putting between 150 and 200 hydrogen fueling stations along major California highways in an effort to encourage the use of hydrogen fuel-based vehicles and reduce fossil fuel emissions

- Signed legislation (AB 2628, Pavley, D-41) that allows hybrid vehicles (vehicles that operate on both batteries and gasoline) that have a fuel efficiency of more than 45 mpg to use High Occupancy Vehicle lanes, so-called “carpool” lanes, regardless of how many people are in the car

- Provided permanent funding (AB 923, Firebaugh, D-50; SB 1107, Committee on Budget and Fiscal Review) for the Carl Moyer Memorial Air Quality Standards Attainment Program. The program replaces old diesel engines with efficient and cleaner engines in school buses and agricultural machinery. In addition, the program progressed from reducing three tons of emissions per day for a cost effectiveness of $40,000/ton to 30 tons of emissions a day for at a cost of $5,000/ton, according to the Air Resources Board.

- Ended emissions test exemptions (AB 2683, Lieber, D-22) for older vehicles by requiring any car built after 1975 to have a smog check every two years. Currently, 10 percent of the vehicles on California’s roads contribute nearly half of the mobile-source air pollution.

- Signed legislation (AB 1009, Pavley, D-41) to require trucks coming into California from Mexico to meet national emissions standards

- Introduced a plan to put solar energy systems in one million homes by 2017, to which the Legislature agreed to initial funding of $60 million

- Revived the state monetary incentive to exchange vehicles that fail their smog check for $1,000, called the Consumer Assistance Program

- Signed legislation (AB 471, Simitian, D-Palo Alto) that prohibited cruise ships from conducting on-board waste incineration while operating within three miles of the California coast

By continuing to adhere to the policy that a clean environment will provide for a healthier economy, and working to expand his connection between the environment and job creation, even more can be done to increase the environmental industry in California. The Action Plan is especially notable due to the governor’s explicit recognition that “jobs vs. the environment” is a false choice.

VII.B. Environmental Protection Agency

The California Environmental Protection Agency (Cal/EPA) was created in 1991 by Governor's Executive Order. The six Boards, Departments and Office were placed within the Cal/EPA "umbrella" to create a cabinet level voice for the protection of human health and the environment and to assure the coordinated deployment of state resources. Cal/EPA's mission is to restore, protect, and enhance the environment and to ensure public health, environmental quality, and economic vitality. The Cal/EPA has several programs to handle different aspects of the environment.

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

VII.B.1. Air Resources Board

California's Legislature established the Air Resources Board (CARB) in 1967 to attain and maintain healthy air quality, conduct research into the causes of and solutions to air pollution, and systematically address the serious problem caused by motor vehicles, which are the major cause of air pollution in the state. Since its formation, CARB has worked with the public, the business sector, and local governments to protect the public's health, the economy, and the state's ecological resources through the most cost-effective reduction of air pollution.

California's air pollution control program is one of the most effective in the world. Coordinated state, regional, and local efforts have steadily improved California's air quality. While the air is the cleanest in years, Californians continue to lose billions of dollars due to air pollution every year. The cost of health-related problems, plus damage to crops, forests, and wild vegetation, constitute a significant drain on California's economy.

The CARB initiatives require environment-related industries for testing, remediation, and implementation of practices to help curtail air pollution. By California making air pollution reduction a priority, it has also ensured the need for environment-related industries and jobs far into the future. The Air Resources Board represents a unique opportunity, since California already has a strong base of industries that produce products and services that address the air pollution issue.

VII.B.2. Integrated Waste Management Board

The California Integrated Waste Management Board (IMWB) is responsible for managing California's solid waste stream, and its mission is to reduce waste, promote the management of all materials to their highest and best use, and protect public health

and safety and the environment. The Board helps California divert its waste from landfills by:

- Developing waste reduction programs
- Providing public education and outreach
- Assisting local governments and businesses
- Fostering market development for recyclable materials

VII.B.3. The State Water Resources Control Board

The State Water Resources Control Board (SWRCB) was created by the Legislature in 1967. The mission of the SWRCB is to ensure the highest reasonable quality for waters of the state, while allocating those waters to achieve the optimum balance of beneficial uses. The Board has many programs focused on water quality including providing financial assistance for water recycling projects, through the Division of Financial Assistance.

SWRCB's mission is critical, because one of California's most acute problems relates to water resources. The once fertile Owens valley is now arid, its waters tapped by Los Angeles 175 miles away. In the Imperial Valley, irrigation is controlled by the All-American Canal, which draws from the Colorado River. In the Central Valley the water problem is one of poor distribution, an imbalance lessened by the vast Central Valley project. Cutbacks in federally funded water projects in the 1970s and 1980s led many California cities to begin buying water from areas with a surplus, but political problems associated with water sharing continue. California's failure to develop a long-term plan to end surplus withdrawals from the Colorado led the federal government to stop the release of surplus water to the state in 2003.

The SWRCB currently has no office or division dealing directly with jobs and water quality issues. However, such an office or division could be established within SWRCB.

VII.C. Employment Development Department

The California Employment Development Department (EDD) offers a wide variety of services to millions of Californians under the Job Service, Unemployment Insurance, Disability Insurance, Workforce Investment, and Labor Market Information programs. As California's largest tax collection agency, EDD also handles the audit and collection of payroll taxes and maintains employment records for more than 17 million California workers.

The Workforce Development Branch administers several statewide workforce preparation programs and initiatives that focus on preparing adults and youth for participation in the labor force and building the state's economy. California distributes nearly $500 million in federal funds statewide on an annual basis to provide employment and training services for adults, dislocated workers, and youth. Workforce investment services are provided through comprehensive One-Stop Career Centers that provide individuals access to a full range of services pertaining to educational activities, employer services, and referrals to other appropriate social services. The purpose of these activities is to promote an increase in the employment, job retention, earnings, and occupational skills improvement of participants. This, in turn, improves the quality of the workforce, reduces welfare dependency, and improves the productivity and competitiveness of the state.

The WDB needs to help focus more of its efforts on the emerging environmental industry and job creation within that industry.

VII.D. California Economic Strategy Panel

The California Economic Strategy Panel was established in 1993 to develop an overall economic vision and strategy to guide public policy. The Panel engages in an objective and collaborative biennial planning process that examines economic regions, industry clusters, and cross-regional economic issues.

The Economic Strategy Panel, with input from a wide range of groups, has prepared guiding principles, goals, and indicators for state government investment in economic development. The goals of state government policies and investments are aimed at fostering an innovation-based economy that enhances California's economic leadership and provides for:

- Sustainable economic growth for all state regions
- Quality jobs for more people
- Improved global competitive advantage
- Higher quality of life, including environmental quality, adequate housing, and increased wealth for all, resulting from an equitable distribution of opportunities
- Improved and efficient utilization of human resources, financial capital, physical infrastructure, and technological assets

In the ESP's latest Biennial Panel Report *Creating A Shared California Economic Strategy: A Call to Action*, one of the major findings stated "Infrastructure investment needs to focus on the 'triple bottom line' of economic impact, environmental sustainability and equitable development. Numerous reports have documented the need to address the accumulated backlog of maintenance work, as well as the need to fund new infrastructure. During the next 20 years, California infrastructure will have to accommodate about 12 million more people, six million more workers and four million new homes. New planning methods, new funding sources, and new technologies will be needed to handle this enormous challenge efficiently and cost-effectively."

However, thus far, environment-related industries have not been a major priority emphasized under the state's strategic 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 strategy, and such an emphasis could:

- Help develop California into a global leader in knowledge-based jobs, leading-edge technology, and competitive enterprises
- Attract and retain globally competitive businesses, providing well paying jobs for state residents
- Ensure a high quality of life throughout the state
- Diversify California's economy and help it maintain global competitiveness
- Raise the "quality" of economic growth and achieve multiple engines of growth in high wage, high productivity clusters
- Maintain and enhance California as a leading state for entrepreneurship, innovation, and venture capital
- Retain and strengthen California's base in threatened industries

Based on the ESP's own findings, more emphasis needs to be placed on economic impact, environmental sustainability and equitable development. The ESP should increase its focus on expanding the invironmental industry in California.

VII.E. California Workforce Investment Board

The California Workforce Investment Board was established by Executive Order in response to the mandate of the federal Workforce Investment Act (WIA) of 1998. The Board assists the Governor in setting and guiding policy in the area of workforce development. All members of the Board are appointed by the Governor and represent the many facets of workforce development – business, labor, public education, higher

education, economic development, youth activities, employment and training, as well as the Legislature.

CWIB is currently working towards several goals as outlined in the report *California's Strategic 2-Year Plan.* State workforce investment priorities emphasize building a demand driven workforce system to better meet the workforce needs of business and industry. In addition, the plan recommends targeting limited resources to areas where they can have the greatest economic impact, such as focusing investments on high-wage, high skilled, high-growth jobs; assisting workers with barriers to employment; and aiding industries with statewide labor shortages.

Thus far, there appears to be little focus on the environmental industry at CWIB, but such a focus could strategically leverage the benefits of environmental protection for workforce development. CWIB could be used to assist California firms in environmental industries upgrade the skills of their workers.

VII.F. California State Treasurer's Office

The goals of the State Treasurer are to create opportunities by investing in California's communities, to protect the financial security of California's families by promoting fairness in financial markets, and to advance fiscally responsible policies that allow California to make the investments in people and infrastructure that the state needs to prosper in the 21st Century.

In 2004, the Treasurer launched the Green Wave initiative. This landmark environmental initiative is designed to increase financial returns, create jobs, and clean up the environment. The four-pronged initiative recommends that the state's two large public pension funds – the California Public Employees' Retirement System (CalPERS) and the California State Teachers' Retirement System (CalSTRS) – leverage the finance and capital markets with public purpose by committing $1.5 billion to investments in cutting-edge technologies and environmentally responsible companies. The goal of the initiative is to improve long-term financial returns for pensioners and taxpayers through investments in the burgeoning environmental technology sector, while also reducing the risks to the pension funds posed by corporate environmental liabilities.

Another initiative launched by the Treasurer's Office was outlined in a report titled *The Double Bottom Line: Investing in California's Emerging Markets*. The model initiatives contained in this report are designed to direct over $8 billion in investment capital — through state programs and the state's pension and investment funds — to facilitate economic growth and development in California communities by investing in California's emerging markets.

The Treasurer's Office Green Wave initiative holds great promise and potential for facilitating and expanding environmental industries and jobs in California. These industries – and the state – will benefit from the types of incentives currently targeted at industry sectors.

VII.G. California Energy Commission

VII.G.1. Commission Responsibilities

The California Energy Commission is the state's primary energy policy and planning agency. Created by the Legislature in 1974 and located in Sacramento, the Commission has five major responsibilities:

- Forecasting future energy needs and maintaining current and historical energy data
- Licensing thermal power plants that are 50 megawatts or larger
- Promoting energy efficiency through appliance and building standards
- Developing energy technologies and supporting renewable energy
- Planning for and directing state responses to energy emergencies

The CEC has identified several key steps for encouraging the state's economic growth. These include:

- Commercializing new technologies to create and retain jobs
- Energy export and agricultural business opportunities, economic incentives, and assistance to improve California's business climate
- Streamlining the permitting and regulatory processes without compromising the environment
- Investing in infrastructure
- Improving business-government relationships and coordination of economic development efforts
- Developing a comprehensive strategic plan for economic development

Thus far, relatively few projects related to jobs and the environment have been funded by the CEC. However, from a review of the CEC charter and projects it has previously funded, it is clear that projects related to jobs and the environment could be funded. This would integrate well with CEC's objectives, which include stabilizing energy costs for consumers, stimulating local economies, reducing dependence on foreign fuels, and mitigating the environmental impacts associated with fossil fuels. Therefore, the CEC may be a viable and important potential source of research and funding for such projects.

VII.G.2. Renewable Energy Program

The CEC's Renewable Energy Program began in 1998 to help increase total renewable electricity production statewide. The current program provides market-based incentives for new and existing utility-scale facilities powered by renewable energy, offers consumer rebates for those installing new renewable energy systems, and helps educate the public regarding renewable energy. Funding over four years for this program totals $540 million.

VII.G.3. Public Interest Energy Research (PIER) Program

The CEC Public Interest Energy Research (PIER) program supports energy research, development, and demonstration (RD&D) projects that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace. The PIER program annually awards up to $62 million to conduct the most promising public interest energy research by partnering with RD&D organizations including individuals, businesses, utilities, and public or private research institutions.

PIER brings new energy services and products to the marketplace and creates state-wide environmental and economic benefits. PIER funding efforts are focused on the following RD&D program areas:

- Buildings End-Use Energy Efficiency
- Energy Innovations Small Grant Program
- Energy-Related Environmental Research
- Energy Systems Integration
- Environmentally-Preferred Advanced Generation
- Industrial/Agricultural/Water End-Use Energy Efficiency

- Renewable Energy Technologies

The CEC Public Interest Energy Research program represents an excellent vehicle for bringing jobs and the environment issues to the forefront in the state:

- It is a high priority statutory state program.
- It leverages unique state resources and expertise.
- It can be used to create high-tech renewable energy jobs and businesses.
- It is amply funded.

VII.H. The California Council On Science And Technology

The California Council on Science and Technology (CCST) was founded by the California State Legislature and the Governor in 1988 via Assembly Concurrent Resolution No. 162. The CCST is the leading partnership of industry, academia, and government that identifies ways that science and technology can be used to improve California's economy and quality of life. CCST is a nonpartisan, impartial, not-for-profit corporation designed to offer expert advice to the state and provide solutions to science and technology-related policy issues. CCST is an up to 30 member independent assembly of corporate CEOs, academicians, scientists, and scholars.

CCST has five main objectives:

- Identify the long-range research and development requirements for sustaining the state's economic development and competitiveness
- Produce analyses of public policy issues and formulate policy recommendations in the areas of science and technology
- Provide direction for new scientific and technological activities
- Stimulate the technology transfer linkage between academic research and the private sector
- Provide an organizational structure for the development of collaborative public/private sector initiatives targeted to spur research and development activities, innovation, and the growth of new science and technology-based industries and jobs

The CCST has thus far not focused on environment-related industries, and we recommend that such a focus be added. This would integrate well with the CCST's core functions, which include establishing new leading-edge research programs, stimulating the technology transfer linkage between academic research and the private sector, strengthening research programs and development activities to benefit California's high-tech industries, and promoting technology commercialization by the growth of strategic partnerships.

VII.I. The Coalition for California Jobs

The Coalition for California Jobs (CCJ) is a coalition of small and large businesses and organizations united to fight anti-jobs legislation and protect and create jobs in California. The coalition includes the California Chamber of Commerce, California Business Roundtable, California Manufacturers and Technology Association, California Retailers Association, California Taxpayers Association, and Western States Petroleum Association, among others.

According to the CCJ, expensive health care mandates, increased litigation and oppressive taxes and fees threaten California jobs. Workers' compensation costs are skyrocketing with no relief in sight. In addition, there are over 100 bills in the legislature that threaten California jobs. The CCJ feels that stimulating the California economy and creating jobs would be a step in the right direction towards solving California's budget problems.

VII.J. The California Alliance for Jobs

The California Alliance for Jobs represents more than 1,700 heavy construction companies and 50,000 union construction workers from Kern County to the Oregon border. The Alliance advocates responsible investment in public infrastructure projects to help build a secure future for all Californians. The Alliance has developed the "ReBuild California" program, which is a broad-based public information campaign designed to heighten awareness and support for greater investment in California infrastructure and public works. The ReBuild California program was created in response to the serious infrastructure problems facing California and the decline in capital facilities funding. In the past 40 years, capital investment has declined significantly. In the 1950s and 1960s, California spent 20 cents of every dollar on capital projects. By the 1980 that figure dropped to less than five cents on the dollar, and this allocation has since not significantly increased, despite ever-increasing demands presented by population growth and economic development. Much of the state's public infrastructure was designed and built to serve a population half the size of California's 34 million residents and the state is still rapidly growing.

This lack of investment has taken a toll on both the economy and the quality of life for Californians. When infrastructure investment lags, the state's economy suffers

because fewer jobs are created and private sector expansion is stymied. As traffic congestion and related infrastructure problems increase, California becomes a less desirable place in which to live, work, and do business.

Thus far, the Alliance has not focused specifically on environmental infrastructure or environmental jobs. However, such an emphasis would fit well with its emphasis on infrastructure development and jobs creation.

VII.K. Savings By Design

Savings By Design is a statewide program for commercial, industrial and agricultural customers that encourages energy-efficient building design and construction. The program, administered by California's four investor-owned utilities under the auspices of the California Public Utilities Commission, offers building owners and their design teams a variety of services, including:

- Design assistance, analysis, and resources to aid building owners and design teams with energy-efficient facility design
- Owner incentives of up to $150,000 per project to help compensate for the investment in energy-efficient building and design
- Design team incentives of up to $50,000 per project to reward designers who meet ambitious energy-efficiency goals

VII.L. Commission on Building for the 21st Century

The Commission on Building for the 21st Century was created by Governor Gray Davis through Executive Order D-4-99 where it was directed to "study the building and infrastructure needs of California, with the intent of identifying existing critical infrastructure needs and developing a comprehensive long-term capital investment plan for financing public building needs, including responsible financial approaches and efficiency improvements." The Commission produced a report titled *Invest for California -- Strategic Planning for California's Future Prosperity and Quality of Life*. In this report, emphasis was placed on the need to improve the quality of life in California. Specifically, the report concluded that California needs to achieve success in economic growth, environmental quality, and social equity -- to leave a more sustainable California to future generations.

VIII. SUMMARY OF MAJOR FINDINGS

This report presents information about jobs creation and the potential of the environmental industry in the state of California, 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 California and California's Environmental Industry

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

- Sales generated by the environmental industries in California totaled $51 billion.

- The number of environment-related jobs totaled nearly 600,000.

- The environmental industry in California comprised 3.3 percent of gross state product.

- California environmental industries accounted for nearly 16 percent of the sales of the U.S. environmental industry.

- Environment-related jobs comprised about four percent of California employment.

- Environment-related jobs in California comprised nearly 12 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 two and three percent annually.

Most of the environment-related jobs in California 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 California 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 California 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 California, 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 California 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 California 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 California 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:

  -- Blasland, Bouck and Lee, Inc. (Irvine, Petaluma, San Diego, Walnut Creek, and Carpeteria) is a leading provider of environmental, health, and safety services in the United States and internationally.
  -- Clean Harbors Environmental Services, Inc. (numerous locations throughout California) is the largest provider of hazardous waste disposal services in North America.
  -- Columbia Analytical Services (Simi Valley, Redding, Canoga Park, Los Gatos, and Orange County) is a major full-service

analytical laboratory network specializing in environmental testing.

- -- Malcolm Pirnie (Los Angeles, San Diego, Emeryville, Sacramento, Oxnard, and Irvine) is one of the largest firms in the U.S. focused on environmental issues
- -- Psomas (Los Angeles, San Diego, Palm Desert, Riverside, Costa Mesa, Santa Clarita, San Jose, Sacramento, and Roseville) is a leading environmental engineering company specializing in water and wastewater projects.
- -- Severn Trent Laboratories (Los Angeles, San Diego, Sacramento, and San Francisco) is one of the leading environmental testing companies in the world.
- -- Sun Light & Power (Berkeley) is one of the largest firms in California that designs and installs renewable, solar, and alternative energy systems.
- -- Tetra Tech, Inc. (Pasadena, Alameda, Arcata, Burlingame, Calistoga, Camerillo, Citrus Heights, Lafayette, McClean, Monterey Park, Oceanside, Ontario, Palm Desert, and Pasadena) is a leading U.S. provider of environmental consulting, engineering, and technical services.

All of the California environmental firms profiled here 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, in particular, the California Commission For Jobs and Economic Growth, the California Council of Economic Advisors, the Air Resources Board, the California Economic Strategy Panel, the Treasurer's Office Green Wave Initiative, the California Workforce Investment Board, the California Energy Commission, the Renewable Energy Program, the Public Interest Energy Research (PIER) Program, and the Strategic Five-year State Workforce Investment Plan.

We suggest policy options that could maximize the jobs benefits of the environmental industry in California, 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 California, 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 CALIFORNIA

There are two historical sources of information about the environmental industry in California. 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.

[10]See 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 California. The ITA estimated that, in 1999, California accounted for about 12.7 percent of the U.S. industry, and that the number of environmental jobs in the state totaled more than 172,000.

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

		California	U.S.	California Share of U.S.
Revenues	(millions)	$24,986	$196,465	12.7%
Jobs	(number)	172,388	1,389,638	12.4%
Companies	(number)	12,492	115,030	10.8%
Exports	(millions)	$3,229	$21,310	15.1%

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

The ITA report disaggregated the California industry by metropolitan statistical area (MSA) – see Table A.2. In California, these consisted of the Los Angeles-Long Beach, Riverside-San Bernadino, San Diego, Orange County, Oakland, San Francisco, San Jose, and Sacramento MSAs. These MSAs accounted for 77 percent of the industry in the state and about 130,000 environment-related jobs.

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

		Los Angeles-Long Beach	Riverside-San Bernadino	San Diego	Orange County
Revenues	(millions)	$7,033	$2,413	$2,127	$2,081
Jobs	(number)	48,525	16,646	14,671	14,360
Companies	(number)	3,516	1,206	1,063	1,041
Exports	(millions)	$909	$312	$275	$269
MSA Average Share of California		28%	10%	9%	8%

		Oakland	San Francisco	San Jose	Sacra-mento
Revenues	(millions)	$1,771	$1,271	$1,242	$1,195
Jobs	(number)	12,216	8,767	8,568	8,246
Companies	(number)	885	635	621	598
Exports	(millions)	$229	$164	$161	$155
MSA Average Share of California		7%	5%	5%	5%

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

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

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 California and the United States from the most recent survey, for 1999. Pollution abatement costs in these selected California industries included $254 million of capital expenditures and $830 million for operating costs. Together with $291 million in operating costs for disposal and recycling activities and other categories of economic activity, the PACE estimates for California in 1999 totaled $2.1 billion. This represented about seven percent of the overall PACE estimates in the United States.

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

	California		U.S.		California Share of U.S.	
Pollution abatement						
Capital expenditures	253.5		5,809.9		*4.4%*	
Non-hazardous		211.0		4,497.8		*4.7%*
Hazardous		42.6		1,312.0		*3.2%*
Air	117.0		3,463.7		*3.4%*	
Non-hazardous		97.4		2,644.7		*3.7%*
Hazardous		19.6		819.0		*2.4%*
Water	117.6		1,801.9		*6.5%*	
Non-hazardous		100.9		1,488.2		*6.8%*
Hazardous		16.7		313.7		*5.3%*
Solid Waste	14.7		361.9		*4.1%*	
Non-hazardous		(D)		245.5		*(D)*
Hazardous		(D)		116.4		*(D)*
Multimedia	4.3		182.3		*2.4%*	
Non-hazardous		(D)		119.4		*(D)*
Hazardous		(D)		62.9		*(D)*
Operating Costs	830.1		11,864.4		*7.0%*	
Non-hazardous		619.3		8,924.9		*6.9%*
Hazardous		210.8		2,939.5		*7.2%*
Air	463.6		5,069.1		*9.1%*	
Non-hazardous		388.0		3,941.2		*9.8%*
Hazardous		75.6		1,127.9		*6.7%*
Water	274.7		4,586.5		*6.0%*	
Non-hazardous		171.8		3,511.8		*4.9%*
Hazardous		102.9		1,074.6		*9.6%*
Solid Waste	82.2		2,013.3		*4.1%*	
Non-hazardous		52.5		1,320.4		*4.0%*
Hazardous		29.7		692.9		*4.3%*
Multimedia	9.6		195.5		*4.9%*	
Non-hazardous		7.0		151.5		*4.6%*
Hazardous		2.6		44.0		*5.9%*
Disposal and recycling						
Capital expenditures	18.6		398.7		*4.7%*	
Disposal	13.9		267.2		*5.2%*	
Non-hazardous		11.6		218.0		*5.3%*
Hazardous		2.3		49.2		*4.7%*
Recycling	4.7		131.5		*3.6%*	
Operating costs	290.8		4,923.6		*5.9%*	
Disposal	202.4		3,680.9		*5.5%*	
Non-hazardous		125.0		2,466.2		*5.1%*
Hazardous		77.4		1,214.7		*6.4%*
Recycling	88.5		1,242.7		*7.1%*	

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

	California			U.S.			California Share of U.S.		
Pollution prevention	276.2			2,767.9			*10.0%*		
Other expenditures	242.0			3,154.5			*7.7%*		
Site cleanup		79.9			1,039.3			*7.7%*	
Remediation			67.8			827.3			*8.2%*
Replacement			4.8			83.1			*5.8%*
Other			7.3			128.8			*5.7%*
Habitat protection		5.1			155.2			*3.3%*	
Monitoring/testing		38.9			599.5			*6.5%*	
Administration		118.1			1,360.4			*8.7%*	
Other payments									
Payments to government	142.1			959.1			*14.8%*		
Permits/fees		137.0			816.6			*16.8%*	
Fines/penalties/charges		4.4			116.3			*3.8%*	
Other		0.7			26.2			*2.7%*	
Tradeable permits - bought	7.2			20.2			*35.6%*		
Tradeable permits - sold	(D)			23.7			*(D)*		
Tradeable permits - other	(D)			12.6			*(D)*		
Total	**2,060.5**			**29,934.6**			***6.9%***		

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.

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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.

BIOGRAPHICAL INFORMATION

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