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Business Climate for Maine's Environmental and Energy Technology Sector

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Miscellaneous Report 442

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MAINE AGRICULTURAL AND FOREST EXPERIMENT STATION
The University of Maine

Business Climate for Maine's Environmental and Energy Technology Sector

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INTRODUCTION

The environmental and energy technology industry is a growing sector of the U.S. economy. Studies of the industry by the *Environmental Business Journal* (2005) indicate that environmental and energy technology firms generated \$244.9 billion in sales during 2004, and the sector is expected to experience a 3.4% average annual growth rate over the next three years. Additionally, industry sales output grew by 44% during the 1990s, from \$148.8 billion in 1990 to \$214.2 billion in 2000 (EBJ 2005). These impressive growth figures may have contributed to the inclusion of the environmental and energy technology sector as a targeted industry by the Maine Department of Economic and Community Development in *A Science and Technology Action Plan for Maine 2005* and by the Maine Science and Technology Foundation's *Maine's Science and Technology Action Plan 2001*.

In a companion report of this current work, Gabe and Noblet (2006) found that the environmental and energy technology industry of Maine generated \$574.1 million in annual sales and employed 5,268 full- and part-time workers. Including multiplier effects, the environmental and energy technology industry contributed \$882.7 million in output to the Maine economy in 2005 and supported 9,650 jobs (Gabe and Noblet 2006).

This report presents findings from a survey that concentrated on issues pertaining to Maine's business climate for the environmental and energy technology sector. The Environmental and Energy Technology (E2Tech) Council of Maine commissioned the survey, with support from the Maine Technology Institute's Cluster Enhancement Award. The survey, conducted during the summer of 2006, collected information on the factors believed to affect the business climate for Maine's environmental and energy technology sector, including availability of external investment, skilled workforce, collaboration among firms and in-state partners. Information on state characteristics (e.g., taxes, state/local government support, location relative to key inputs) that may affect growth potential was also captured on the survey.

SURVEY METHODOLOGY

The environmental and energy technology sector is made up of firms and organizations engaged in activities ranging from environmental consulting services to the manufacture of air pollution control instruments. Unlike other industry sectors, the environmental and energy technology sector can-

not be distinguished by an identifiable output (e.g., the automotive industry and cars), or production process (e.g., the biotechnology industry's use of living organisms) (Allen and Gabe 2003). For the purposes of this study, we use the definition of the environmental and energy technology industry set forth by Environmental Business International (EBI) and used by the E2Tech Council of Maine. The sector is characterized by 14 segments of business activity, which are divided into three broad categories: environmental services, environmental equipment, and environmental and energy resources (Table 1). These segments are not classifications of environmental problems in a media sense, such as air pollution or water or solid waste, rather they focus on an establishment's revenue source. For example, fees paid for environmental services, such as consulting, generate environmental service revenues.

To obtain names and addresses of companies involved in Maine's environmental and energy technology sector, we used two separate sources of information: a list provided by the E2Tech Council, comprised of 270 contacts, including members or other affiliated entities and a mailing list purchased from the North American Industrial Classification (NAICS) Association, based on NAICS codes. Work by Burns and Flaming (2006) informed the classification of environmental and energy technology businesses with respect to NAICS categorization. The companion economic profile report provides a detailed discussion of the NAICS codes corresponding to the environmental and energy technology sector segments (Gabe and Noblet 2006).

Survey Implementation

The survey instrument was developed in cooperation with the E2Tech Council of Maine. Questions were based on previous studies of industrial sectors by Statistics Canada (2000) and the *Environmental Business Journal* (2001a-f). The survey sample contained a total of 660 addresses believed to represent the 688 firms that comprise the environmental and energy technology industry in Maine. The survey instrument (contained in the appendix) was administered during the summer of 2006. After the initial mailing, we sent a reminder postcard and a replacement survey to non-respondents. We removed 93 records from the analysis in cases where the firms were found not to be members of the environmental and energy technology sector, or the surveys were undeliverable due to invalid addresses. We received 135 completed surveys for a response rate of 23.6%. Of the respondents, 48% were E2Tech affiliates, while 51% were not affiliated with E2Tech¹ (Table 2).

¹The E2Tech Council membership status of one respondent was not determined

Table 1. Overview of the environmental and energy technology industry.

| Industry Segment | Description |
|---|--|
| <i>Environmental Services</i> | |
| Environmental Testing & Analytical Services | Provide testing of "environmental samples" (soil, water, air and some biological tissues) |
| Water Treatment Works | Management and operation of wastewater treatment plants |
| Solid Waste Management | Collection, processing and disposal of solid waste |
| Hazardous Waste Management | Manage on-going hazardous waste streams, medical waste, nuclear waste handling |
| Remediation/Industrial Services | Physical cleanup of contaminated sites, buildings and environmental cleaning of operating facilities |
| Environmental Consulting & Engineering | Engineering, consulting, design, assessment, permitting, project management, O&M, monitoring, etc. |
| <i>Environmental Equipment</i> | |
| Water Equipment & Chemicals | Provide equipment, supplies and maintenance in the delivery and treatment of water |
| Instrument Manufacturing | Produce instrumentation for the analysis of environmental samples |
| Air Pollution Control Equipment | Produce equipment and technology to control air pollution |
| Waste Management Equipment | Equipment for handling, storing or transporting solid, liquid or hazardous waste; includes information systems |
| Process & Prevention Technology | Equipment and technology for in-process (rather than end-of-pipe) pollution prevention and treatment |
| <i>Environmental Resources</i> | |
| Water Utilities | Selling water to end users |
| Resource Recovery | Selling materials recovered and converted from industrial by-products or post-consumer waste |
| Environmental Energy Sources | Selling power and systems in solar, wind, geothermal, small-scale hydro, energy efficiency and DSM |

Source: Environmental Business International, Inc.

Table 2. Survey sample and respondents.

| Participants | Original Sample | Removed ^a | Final Sample | Respondents |
|----------------|-----------------|----------------------|--------------|------------------|
| E2Tech Council | 219 | 14 | 205 | 65 |
| Non-Council | 441 | 79 | 362 | 69 |
| Total | 660 | 93 | 567 | 135 ^b |

^a Records were removed if (a) survey participants contacted us and indicated that the survey did not apply to their establishment, (b) survey mailings were returned by the postal service as undeliverable, or (c) researchers determined that an establishment was not a member of the environmental and energy technology sector

^bThe E2Tech Council membership status of one respondent was not determined

FIRM CHARACTERISTICS

Firms in the environmental and energy technology sector have been in operation an average of 12 years. One-third were formed after 2000, just under half are less than 10 years old, and a quarter of firms have been in business for more than 20 years. The survey results indicate that 47% of firms are privately owned corporations, while 37% are partnerships. The remaining firms responding to the survey includes publicly owned corporations and non-profit organizations. A strong majority of the respondents

are single establishment firms (80%), while 8.9% are branch plants of a multi-establishment firm, and the remaining businesses are headquarters of a multi-establishment firm (3.7%), part of a multi-national corporation (3.7%), or of another organizational structure, such as a chapter of a national non-profit organization.

To obtain information on the activities of firms in the environmental and energy technology sector, respondents were asked to select the primary activity of their firm from the following options: (1) research and development, (2) making a product,

(3) providing a service, (4) producing, transmitting, or selling energy, (5) retaining or distributing environmental products, or (6) retaining or distributing energy products. A majority of the environmental and energy technology firms in Maine are primarily service providers (66.3%). Nine percent of firms listed research and development (R&D) as the company's primary activity, while 8% indicated they are involved in making products. Additionally, 4.9% of firms retail or distribute energy products, 4.3% retail or distribute environmental products, and 1.8% produce, transmit, or sell energy. Six percent of respondents indicated that their primary activity was not listed and provided an additional activity, including environmental or energy education and scientific modeling.

Firms were also asked to select the segment of the industry that best described their operations, from those listed in Table 1. The strength of Maine's environmental and energy technology sector appears to lie in environmental services, as 52.9% of firms are engaged in these operations. Environmental and energy resource firms constitute 18.8% of Maine's industry, while 5.9% of the survey respondents are environmental equipment businesses.

To further investigate the involvement of Maine firms in the energy sector, firms were also asked to indicate the energy areas that they were currently involved in, or expected to be involved by 2015. Fifty-five percent of firms indicated that they are currently involved in the energy sector. Twelve percent of these firms are currently involved in traditional energy areas, such as natural gas and oil, while 88% are currently involved in non-traditional sectors such as energy efficiency, solar energy systems, biomass energy systems, wind energy, tidal energy, geothermal energy, or hydrogen fuel cells. In comparison, 5% of firms currently involved in the energy sector expect to be involved in traditional energy areas in 2015, while 95% indicate they will be involved in non-traditional energy sectors, indicating a potential shift towards non-traditional energy sectors.

CLIENTELE

Environmental and energy technology firms serve a wide range of clientele. Firms performed work for both public and private sector clients, ranging from agricultural establishments to residential employers to construction firms (Table 3).

Maine's environmental and energy technology sector's clientele are located within Maine and out of state, with an average of 65.6% of firm sales being to in-state customers. Interestingly, more than one-third of firms (36.6%) indicated that all of their

sales were to Maine firms. Survey results also show that an average of 27.4% of sales were to out-of-state clients, and 3.6% to international clients.

In addition to primarily serving Maine-based clients, environmental and energy technology firms also make many of their purchases in Maine. Firms made, on average, 69.0% of their purchases from in-state firms, 28.8% from out-of-state firms, and 1.7% from firms outside the United States. Moreover, as environmental and energy technology businesses work to serve their existing clientele, they are also working to attract new clients. Seventy-five percent of firms had undertaken at least one action (e.g., direct mail to current and/or potential customers) to attract additional clients and promote their firm in the past year.

INVESTMENT AND GROWTH

Growth

Growth in environmental and energy technology firms was captured by a number of indicators in the survey instrument, including facilities expansion and equipment purchase and projected revenue increases. More than a quarter of firms have experienced an increase in revenue of more than 10% in the last year. Table 4 reflects the expectations of firms with respect to growth indicators over the next three years.

With respect to facility expansion, firms in the environmental and energy technology sector have already expanded their facilities and expect to continue this trend. Table 4 shows that 23.4% of firms have expanded their facilities in the last 12 months, with a majority of firms reporting that they expanded their facilities by less than 2,500 square feet. Of those reporting expansion, 6.9% expanded their facilities by more than 10,000 square feet last year. Additionally, firms anticipate expanding in the next 12 months as well. Of these firms, a majority expect to expand by less than 2,500 feet; however, 16.7% reported they would expand their facilities between 2,500 and 10,000 square feet. Survey results also show that firms will continue this investment in their facilities, as 25.6% of survey respondents expect to expand their facilities during the next three years. Eleven percent of these firms anticipate expanding by more than 10,000 square feet during this time period. This planned expansion of facilities is not uniform across sectors, however; of the respondents who intend to expand their facilities, 47% are in the environmental services sector, while only 3.5% of expanding firms are environmental equipment firms.

Table 3. Clients served by Maine’s environmental and energy technology firms.

| Public Sector Clients | | 61.5% |
|---|--|--------------|
| Municipal Governments | | 51.2 |
| County Governments | | 12.4 |
| State Governments | | 38.0 |
| Federal Government(s) | | 19.8 |
| Other ^a | | 4.13 |
| Private Sector Clients | | 87.4% |
| Agriculture, Forestry, Fisheries | | 26.5 |
| Utilities | | 33.9 |
| Mining | | 5.0 |
| Construction | | 38.0 |
| Manufacturing (select from below) | | |
| Computer and Electronic Manufacturing | | 10.7 |
| Pulp and Paper Processing | | 19.8 |
| Food Processing | | 14.9 |
| Other Manufacturing (not included above) | | 33.1 |
| Transportation and Warehousing | | 19.8 |
| Wholesale or Retail Establishments | | 26.5 |
| Finance, Law and Insurance | | 30.0 |
| Real Estate (e.g. Development, Property Management, etc.) | | 38.0 |
| Waste Management Facilities/Remediation Firms | | 23.0 |
| Healthcare Facilities | | 19.0 |
| Non-Profit Organizations | | 33.9 |
| Residential | | 34.7 |
| Other | | 14.8 |

^aAn additional five firms indicated they served an alternative form of public sector clientele, not listed above. Twenty firms indicated they served an alternative form of private sector client, not listed above.

Table 4. Growth indicators.

| Growth Indicators | Last 12 months | Next 12 months | 3 years |
|--------------------------------|----------------|----------------|---------|
| | % | | |
| Expand Facilities | 23.4 | 18.8 | 25.60 |
| Purchase New Equipment | 41.9 | 32.5 | 37.20 |
| Increase Revenue more than 10% | 27.4 | 44.4 | 32.60 |

Table 5. Internal and external investment by firm size.

| Firm Size | Own Investment on R&D | External Investment Received |
|----------------------|-----------------------|------------------------------|
| | % | |
| 1–4 employees | 46.9 | 8.0 |
| 5 to 9 employees | 35.0 | 21.1 |
| 10 or more employees | 65.2 | 22.7 |

Firms are also investing in new equipment. Forty-two percent of respondents purchased new equipment in the last 12 months, with 15% of these firms purchasing equipment valued at between \$100,000 and \$500,000. As shown in Table 4, firms also anticipate continued investment in new equipment during the next year, with 11% of respondents indicating that they anticipate investing more than \$100,000 in the next year on new equipment. Of the firms who plan to purchase new equipment, 48% are environmental service providers, 21% are environmental and energy resource firms, 5% are environmental equipment providers, and 27% fall outside of the three traditional sectors.

Environmental and energy technology firms are also employing business strategies that suggest confidence in potential growth of the industry. Twenty-one percent of firms launched a new service or released a new product in the past 12 months. Figure 1 shows the planned strategies of environmental and energy technology firms over the next three years, which indicate that firms anticipate further growth of their services, products, and research and development activities.

Investment

Sources of funding that support the growth of Maine’s environmental and energy technology firms are also important to identify, as only 12% of respondents stated that they received external investment capital, with a majority of firms receiving investments under \$100,000. In comparison, 48% of firms surveyed reported investing firm resources on research and development in the past year, with a majority of internal investment under \$25,000. Both external and internal investments differ by the size of the firm (Table 5).

Firms were also asked to identify sources of funding, from an assortment of private, state, and federal programs available to Maine business (Table 6). Twenty-two percent of firms had received assistance from these sources, while 8.9% had sought, but not received, funding from one of these sources. However, many firms were unaware of the programs listed (Table 6). For 10 of the 11 programs, the percentage of firms unaware of the program was greater than those seeking and receiving assistance. The exception to this is the Maine Technology Institute’s grant program. These results suggest a need may exist for promotion of programs available to environmental and energy technology firms.

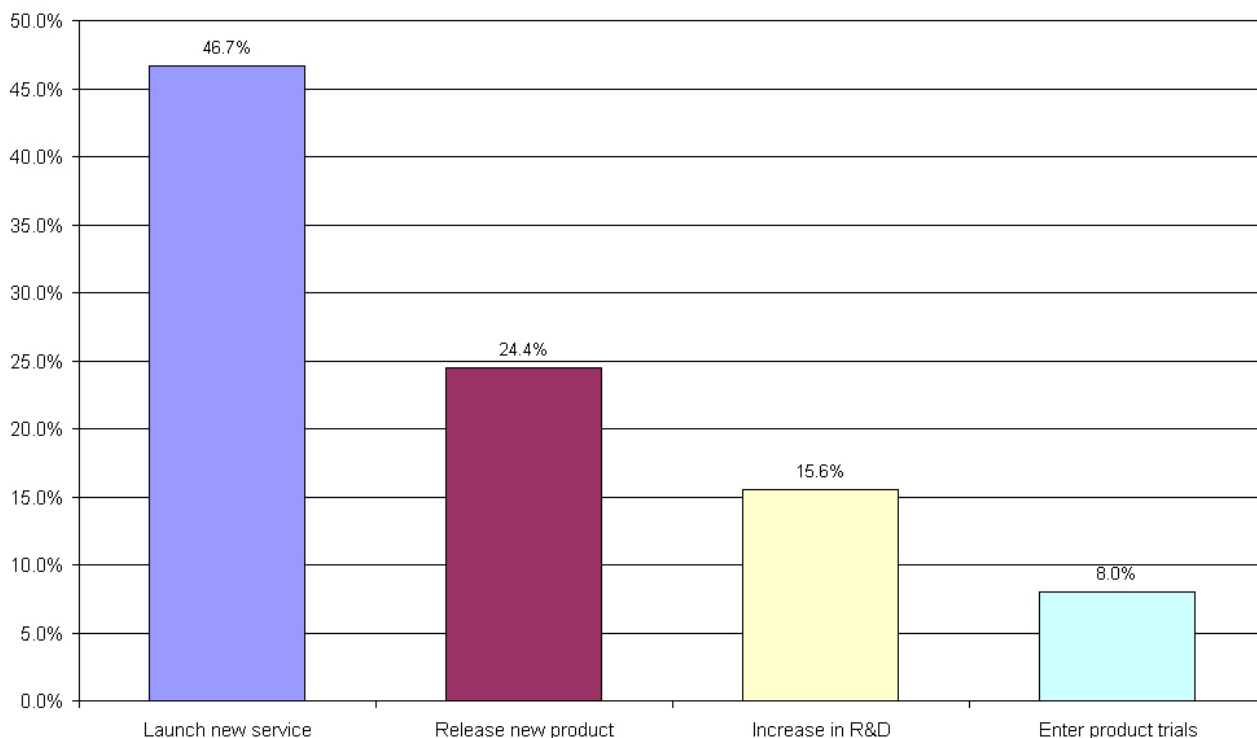


Figure 1. Planned strategies of Maine environmental and energy technology firms.

Table 6. Programs for environmental and energy technology.

| | Sought or Received Assistance | Unaware of the Program |
|--|-------------------------------|------------------------|
| | % | |
| Maine Technology Institute (MTI) funds | 17 | 16 |
| Private Foundation | 7 | 12 |
| Small Business Innovation Research Program | 3 | 12 |
| Research Expense Credit | 2 | 19 |
| Regional Economic Development Program | 2 | 14 |
| Tax increment-financing | 3 | 14 |
| Bus. Equip. Property Tax Reimbursement | 7 | 14 |
| Research & development sales tax exemption | 2 | 16 |
| FAME | 2 | 12 |
| Small Enterprise Growth Fund | - | 16 |
| Small Business Administration | 4 | 9 |

COLLABORATION AND COOPERATION

Environmental and energy technology firms report working with a variety of collaborators to form partnerships, or to develop new products and markets. The survey provided a list of Maine-based potential collaborators, ranging from the Maine Technology Institute to the Department of Economic and Community Development and the Manufacturer Extension Program.² The most common relationship reported with these Maine-based institutions was a partnership, with 40% of respondents having formed a partnership with one of the listed entities. Twenty-seven percent of firms engaged in product development with at least one of the Maine institutions, while 18.5% established a new market. Figure 2 shows the five most common collaborators from the list in the survey.

The interaction among firms is an additional important contributor to the strength of an industry cluster, as firms share knowledge and workers and sometimes collaborate on purchases. Table 7 outlines the collaborative activities among environmental and energy technology firms. Results indicate that firms in this sector are more likely to have a relationship with another Maine business than with firms outside of Maine, Maine colleges/universities, or non-profits. The firms rely on other Maine businesses for sub-contract relationships (41%), to share equipment or personnel (22%), and to share technical informa-

tion (16%). Some of the Maine-based contact occurs close to home, with 27% of firms having engaged in cooperative activities with a business in the same town. The most common relationship with businesses in the same town is the sharing of technical information. The most common interactions with out-of-state firms are shared technical information and sub-contracting arrangements.

The most common cooperative activities, as shown on the far-right column of Table 7, is the sharing of technical information (46%), engaging in a sub-contract arrangements (44%), or sharing of equipment or personnel (31%). Firms are most likely to engage in a coordinated R&D or marketing efforts with other Maine firms.

The partnerships described in Table 7 may have the potential to evolve into common business strategies such as a technology transfer, formation of a joint venture, merging with another establishment, or acquiring another establishment. Survey respondents cited the formation of a joint venture with a Maine business (20.0%), as the most common business strategy they will engage in over the next three years, while 17.0% plan to form a joint venture with a non-Maine business. Respondents were also planning to acquire another business, with some firms planning to acquire businesses inside Maine and others planning to acquire firms outside of Maine. A larger percent of environmental and energy technology firms plan on acquiring another

²In addition to the entities listed in Figure 2, the following Maine-based institutions were also included in the survey instrument: Maine Community College System, Department of Economic and Community Development, Maine International Trade Center, Maine Department of Conservation, Maine Patent Program, Technology Development Center, and Maine Manufacturing Extension Partnership.

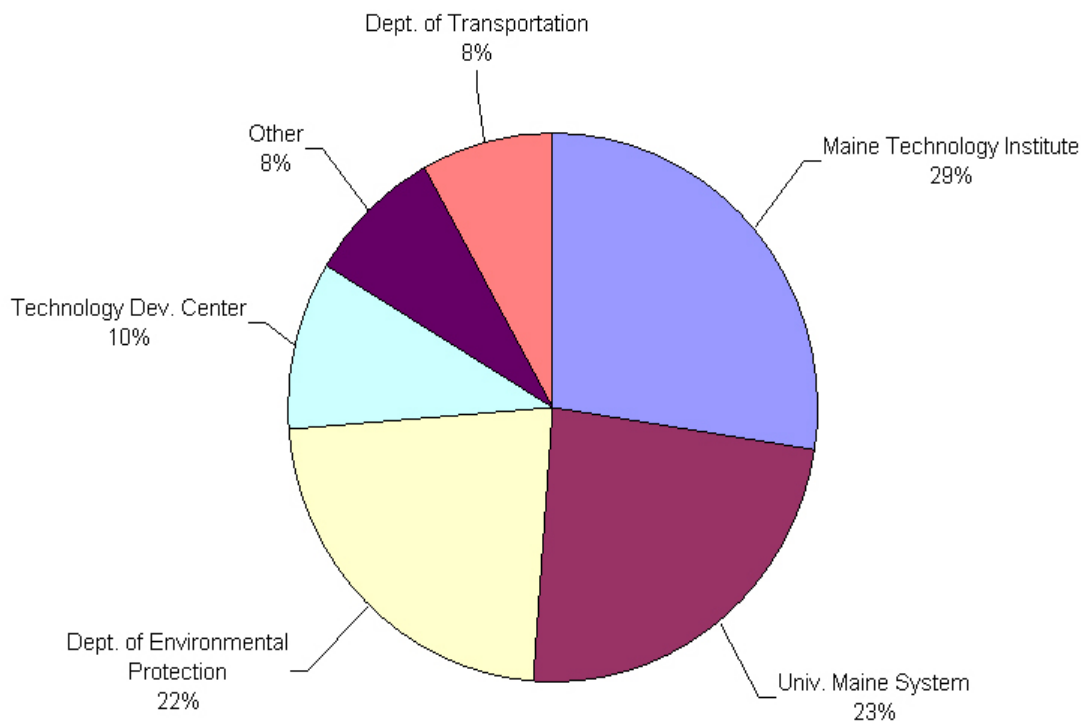


Figure 2. Collaboration with Maine institutions.

Table 7. Partnerships of Maine environmental and energy technology firms.

| Cooperative Activity | Business in same town | Other business in Maine | Business outside of Maine | Maine university or college | Maine non-profit organization | Total* |
|--|-----------------------|-------------------------|---------------------------|-----------------------------|-------------------------------|-----------|
| | % | | | | | |
| Joint R&D | 2 | 13 | 8 | 3 | 4 | 17 |
| Submitted Joint Research Proposal | 2 | 10 | 7 | 4 | 4 | 18 |
| Coordinated marketing | 4 | 19 | 13 | 0 | 2 | 27 |
| Shared equipment or personnel | 11 | 22 | 9 | 1 | 4 | 31 |
| Coordinated supply purchase | 2 | 5 | 1 | 0 | 1 | 8 |
| Shared technical information | 16 | 37 | 23 | 7 | 10 | 46 |
| Established a new market | 2 | 10 | 7 | 1 | 1 | 13 |
| Shared facilities and space | 7 | 8 | 1 | 1 | 1 | 19 |
| Launched a new service or product | 3 | 5 | 5 | 1 | 1 | 10 |
| Established a partnership | 3 | 13 | 7 | 0 | 6 | 18 |
| Established a sub-contract arrangement | 13 | 41 | 25 | 1 | 4 | 44 |
| Total | 27 | 60 | 34 | 13 | 16 | |

*As businesses may be involved in multiple partnerships and activities, the individual percentages provided in the table may exceed the totals provided in the far right-hand side column and last row.

business (6.7%) than on merging with another business (3.7%). In both cases, the acquisition or merger is equally likely to occur with a Maine business as with an out-of-state business.

The primary relationship that firms have with Maine universities and non-profits is the sharing of technical information. Some firms also expect to be involved with technology transfers from Maine universities and universities located outside the state. Six percent of respondents expect technology transfers from Maine universities, while only 3.7% expect a similar relationship with an out-of-state university. The theme of collaboration is also evident in the open-ended questions included in the survey and will be discussed again in a later section of this report.

BUSINESS CLIMATE

Environmental and energy firms were also asked to comment on Maine's business climate by indicating those factors that are relevant to profitability or growth potential. If the factor was relevant, firms were then asked to comment on whether the factor was a positive or negative influence, where "1" indicated very negative, and "7" indicated very positive. The value of "4" is considered neutral. Neutral, negative, and positive factors are categorized in Figure 3.

The average ratings may be an imprecise measurement because factors may have wide variation in responses. We used statistical analysis to determine those factors whose average ratings were



Figure 3. Business climate for Maine's environmental and energy technology firms.

significantly more or less than 4.0. Factors that have an average rating significantly less than 4.0 are considered “negative growth factors” in Figure 3. Those with ratings significantly greater than 4.0, at the 10% significance level, are “positive growth factors.” “Neutral growth factors” are those whose average rating is not statistically different from 4.0. The average rating provided for each factor is summarized in Figure 4. As evident in this figure, financing factors are relevant to less than one-quarter of the environmental and energy technology firms. These results are consistent with earlier findings regarding low external investment in environmental and energy technology firms. The factors that appear most relevant to the environmental and energy technology sector are Maine’s quality of life (81%), health care costs (78%), utility costs (75%), and taxes (75%). The effect of business costs on firm viability is also evident in responses to the open-ended questions discussed in a later section.

Financing Issues

As previously noted, less than one-quarter of respondents reported that access to in-state venture capital, debt financing, and angel capital have an impact on the growth potential of their establishment. Access to in-state capital received an average rating of 3.8; while accessibility of in-state debt financing received a 4.4, and access to in-state Angel capital received a 3.9. State-sponsored funding for R&D was a factor for 29% of environmental and energy technology firms, and received a rating of 4.0. However, none of the financing factors received an average rating that was statistically different from 4.0.

Business Costs and Regulations

Establishments were asked to rate 10 factors associated with the cost of doing business. As previously noted, many of these factors were relevant to more than 70% of firms and were also frequently cited in responses to the open-ended questions. Respondents generally perceived business costs and regulations as significant negative factors, where only state environmental regulations received a neutral rating. Health care costs, the factor with the widest impact in this category, received an average rating of 2.0, the lowest rating of all the business factors. Other low ratings were assigned to state sales and income taxes (2.2), municipal personal property tax (2.3), workers compensation (2.4), and utility costs (2.6).

Location Issues

The desirability of doing business in Maine varies depending upon where the establishment is

located. This category of factors is aimed at capturing firm perceptions regarding the area where they are located, including factors relevant to their business and more general factors such as the quality of local schools or other public services.

Three of the factors associated with location were considered relevant by more than 60% of environmental and energy technology firms. Location relative to consumers received a neutral rating of 4.0, availability of qualified employees received a negative rating of 3.4, and interaction with other businesses was rated a neutral 4.3. Location relative to suppliers was viewed a negative growth factor, with an average rating of 3.4, although this factor only affected 39% of firms. Interestingly, the quality of local schools received a positive rating of 4.7, the second highest rated factor. The third highest rated factor was availability of business services (4.6). Local infrastructure also received a positive rating of 4.5.

Other Business Climate Factors

This category includes factors aimed at capturing a firm’s perception of support for the industry from policymakers and the public. Seventy percent of firms felt that the views of Maine government officials affected their business, and that these views were negative growth factors. Support of local policymakers affected 66% of firms, although this support was perceived to be a neutral growth factor. Firms perceived that state and local tax incentives were negative growth factors. While 74% of firms indicated that public perception of the industry affected their business, the average rating of 4.1 was neutral. Another neutral growth factor was the strength of state industry associations, although 57% of firms felt that these associations had an impact on their business. Finally, the highest rated positive growth factor was Maine’s quality of life, which received an average rating of 5.9. Eighty-one percent of firms indicated that Maine’s quality of life affected the growth potential of their business.

OPEN-ENDED QUESTIONS

The survey also included several open-ended questions that allowed the respondents to comment on the strengths and weaknesses of doing business in Maine. These questions also provided the opportunity to comment on the types of policy changes that may affect their viability. The responses to these open-ended questions reinforce themes revealed throughout the survey analysis. When asked to indicate the factors that led to locating and maintaining a business in Maine, 26% of respondents cited Maine’s quality of

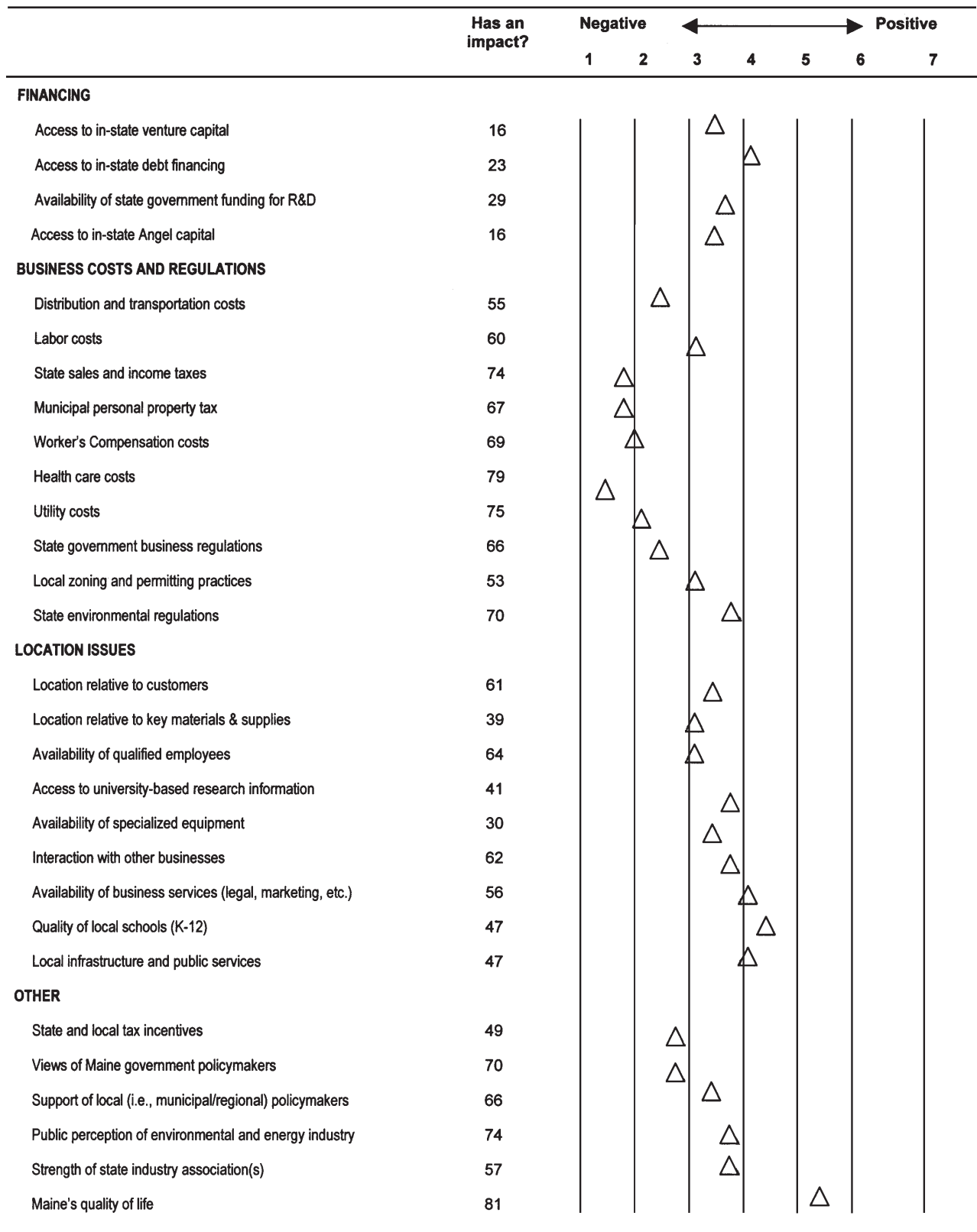


Figure 4. Ratings of business climate factors.

life. An additional 30% indicated that the primary founder was either a Maine native (17%) or living in Maine at the time of business opening (13%). Twelve percent of respondents to this question cited factors surrounding the industry as the reason for locating in Maine, including growth potential (3.8%) and Maine's natural resources (6.4%). The business climate was cited by 15.4% of firms, including their customer base (7.1%) and professional relationships (5.8%).

Operating costs were cited as the primary drawback to operating a business in Maine. While high taxes were frequently cited (22%), the distance and accessibility to major markets, including the transportation cost, were also mentioned by 19.9% of the survey respondents. Other costs of operation, including energy costs, health insurance for workers, and labor costs were also identified as drawbacks (15.2%). Perceptions of Maine's business climate and the lack of support from state government were also frequently cited drawbacks. When asked to indicate what actions state policymakers could take to enhance the competitiveness of Maine's environmental and energy technology sector, the responses were again concentrated on operating costs. Of the 107 responses to this question, 34.6% identified lowering operation costs as important actions that could be taken. This included 20.6% of respondents who indicated that lower taxes would increase competitiveness, 10.3% citing lower insurance costs, and 3.7% calling for public transportation improvements. The second most common submission for improving the competitiveness of environmental and energy technology businesses centered on legislative support for business growth and innovation with particular emphases on support for renewable energy, and support of small and micro businesses. Finally, respondents believed that policymakers should use in-state businesses to perform contract work for the state in lieu of out-sourcing to out-of-state contractors.

The theme of collaboration was also evident in the open-ended questions included in the survey. Respondents were asked to provide an example of how collaboration with another entity had benefited their business or organization. Of the 71 respondents who answered this question, 23.9% had submitted a joint proposal with another firm. Collaboration with the Maine Technology Institute and/or the Environmental and Energy Technology Council of Maine was cited by 15.5% of respondents. Eleven percent of respondents had collaborated or participated in a contract relationship with a state agency (including the University of Maine System). Sharing of knowledge, space, or personnel with another entity

provided other examples of collaboration between firms as did sub-contract relationships and development of new project/market.

SUMMARY AND CONCLUSIONS

The Maine environmental and energy technology industry is comprised of approximately 688 businesses. These firms and organizations operate in fields as diverse as environmental consulting services, the manufacture of air pollution control instruments, and the retailing of energy conservation supplies. The range of activities encompassed in the industry may contribute to some of the survey findings, such as the diversity of the client base and collaboration among firms.

The variety of clients served by the environmental and energy technology industry may enable firms within the industry, who differ in their specialization, to partner or share resources without proprietary concerns. More than one-half (60%) of the survey respondents had engaged in a cooperative activity with another Maine entity in the past year. Survey results show that environmental and energy technology firms are more likely to partner with a Maine entity, particularly when engaging in research and development or marketing efforts. Forming a joint venture with another Maine-based business was a commonly reported strategy. The theme of collaboration was evident throughout the survey results, and suggests that the environmental and energy industry is poised to benefit from additional cluster activities such as knowledge spillovers, or technology transfers.

Survey results also show that members of the environmental and energy technology industry see potential growth opportunities in the industry. Firms report past investments in facilities, equipment, and new products/services and plan to continue these investments over the next three years. Forty-seven percent of firms anticipate launching a new service in the next three years, while 24% plan to release a new product in the next three years. An additional sign of confidence was the current, and anticipated, revenue increases expressed by participants. More than a quarter of firms had experienced a revenue increase greater than 10% in the past year, and 44% of the firms expect to see a revenue increase greater than 10% in the next 12 months. However, environmental and energy technology firms are receiving little external investment to finance these growth activities. Only 12% of firms reported receiving external investments, with a majority of firms receiving less than \$100,000.

Environmental and energy technology firms report that the cost of doing business in the state is harmful to their growth. More than 70% of firms reported that state sales/income taxes, health care costs, and utility costs were relevant to their business. Additionally, statistical analysis indicates that each of these factors is perceived by environmental and energy technology firms to have a significant, negative impact on their ability to grow. Other factors that have a negative impact include (but are not limited to) local property taxes, labor costs, worker's compensation costs, and location relative to key materials/supplies. Four factors were identified as having a significant positive affect on these firms' ability to grow: availability of business services, quality of local schools, local infrastructure and public services, and Maine's quality of life.

Based on the survey results and analysis presented in this report, the following recommendations are offered as a means to support the environmental and energy technology industry in Maine. First, the state should widely promote state- and private-funding programs available to environmental and energy technology firms. As noted in Table 6 of the report, a small percentage of firms have used, or are aware, of funding mechanisms. The percentage of firms unaware of governmental programs, aside from the Maine Technology Institute (MTI), exceeds the percentage of firms who have sought or received assistance. Second, collaboration with Maine institutions such as the University of Maine System, and state agencies should be expanded to promote growth and potential technology transfers. As seen in Figure 2, less than one-quarter of firms have a relationship with the University of Maine System or pertinent state agencies such as the Department of Environmental Protection and the Department of Transportation. Promotion of the relevant support programs for environmental and energy technology firms could be administered through these state agencies and other agencies administering support programs, as well as the E2Tech Council of Maine.

Third, given the diversity of the industry and the variety of clients served, efforts to build connections among environmental and energy technology firms and between these firms and potential markets may be beneficial to the industry. A role may exist for relevant state agencies and the E2Tech Council to assist firms in learning of opportunities to work collaboratively in pursuing new markets. The E2Tech Council may also be able to assist firms by facilitating further intra-industry collaboration, which may yield shared personnel or equipment and potential contract arrangements or pursuit of new markets.

Fourth, the environmental and energy technology firms strongly, and repeatedly, indicated that the cost of doing business in Maine was detrimental to their growth potential. Further analysis on the effect of high costs of doing business in Maine, across industries, may be warranted. Firms also indicated that legislative support for small and micro-businesses would have a positive influence on the industry particularly given the composition of the industry, in which 52% of firms employed two or fewer workers.

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