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Profile of the  
**Environment  
Sector**

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Prepared for the Expert Panel on Skills  
by Chris Parsley

1999

Canada

**PROFILE OF  
THE ENVIRONMENT SECTOR**

Advisory Council on Science and Technology  
Expert Panel on Skills

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## **Abstract**

The global environmental industry has grown significantly in recent years and can be expected to continue growing. The main driver behind this industry is a market created by regulation, voluntary agreements, and industry and international protocols. Significant technical knowledge and the ability to stay abreast of technological developments are critical in this industry. With a relatively small domestic market, the greatest opportunity for growth of the Canadian environmental industry is in international markets. However, unlike the United States with 28 percent of the global market, Canada has very little profile, with just 3 percent. Although Canada's environmental industry is a world leader in technical expertise and consulting, it has difficulty leveraging this expertise into high value-added products associated with manufacturing, construction and development activities.

The critical skills are technical skills, which form the essential knowledge base in the industry. However, no single specialization exists because of the diverse nature of the industry. The principal skill shortage is the combination of business and management skills with the technical skills. Business and management skills are critical in leveraging higher dollars from technical expertise. A shortage of these combined skills threatens the ability of Canadian companies to maintain their relative technical superiority and competitive position. The majority of Canadian companies are small and medium-sized enterprises, which have difficulty accessing all the necessary skill sets because of their smaller budgets. Trends toward consolidation and full-service capability in the global environmental market also means small companies will have problems surviving.

Younger workers, particularly women, have been identified as a source of skills that could be tapped to address this skill shortage. Companies will need to overcome a certain discomfort (perceived or otherwise) from hiring less experienced workers. Future environmental professionals will need to have a solid grounding in many areas of environmental science and engineering as well as management. They will also have to be more adept at utilizing both sets of skills to reap the benefits from designing and implementing environmental initiatives. Skill sets and occupational standards, including a detailed analysis, have been documented for this sector, and initiatives are under way to develop a national voluntary certification program.

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## INDUSTRY SECTOR CHARACTERISTICS

### The Challenge of the Future

#### International Markets

*The major opportunities for Canadian companies, as in many other sectors, are in international markets. The world environmental industry was worth US\$453 billion in 1996 and is expected to grow between 3 and 5 percent over the next five years. Exports are critical for the growth of the Canadian industry because of the limited size of its domestic market vis-à-vis the rest of the world.*

The United States will remain the largest export market for Canadian firms, but other strategic markets are likely to have higher growth rates. According to U.S. Department of Commerce estimates, rapid market growth will occur in developing nations with growing populations. In Asia, the Chinese economy continues to grow despite current troubles in the region. Latin America is also seen as a high growth area, and Mexico will become an important export market for Canada as a result of the implementation of the North American Free Trade Agreement (NAFTA) and the supplemental North American Agreement on Environmental Cooperation (NAAEC). Double-digit growth is also predicted in Africa.

The international market will be increasingly competitive as globalization and a struggle for market share continue. Canadian companies will face significant competition from large international companies that are able to provide integrated packages of various services.

The challenge for Canadian environmental firms is to better employ their assets in international markets and to convert their leading position in technical expertise and consulting into larger contracts for products downstream.

#### Role of Domestic Markets

Although small environmental companies are the fastest growing in terms of sales and jobs, these companies generally do not have the full complement of skills to compete for large international contracts.

A strong domestic market is seen as necessary for success in international markets. Both the fragmented structure of the industry (with only a few companies spanning many segments of the market) and the limited scope of operations (about half of the companies in the environmental sector are only local or provincial in nature) are seen as working against the industry's competitiveness, both internationally and domestically. The Canadian industry, while generally

in a period of consolidation and rationalization, will need to create larger companies or partnerships to compete internationally and meet the higher capital requirements.

## **Regulation and Environmental Standards**

The environmental industry in North America is seen by industry executives as being at a critical juncture. Traditionally, government regulation and legislation have been major drivers of the industry, both domestically and internationally. In the United States, 86 cents of every dollar spent in the industry is due to current environmental statutes. Environmental regulation has more recently had a diminished effect on the demand for environmental products. Furthermore, the intent of regulation has shifted from pollution management to pollution prevention, i.e., re-engineering industrial production processes to reduce pollution at the source, rather than treating pollution through an "end of pipe" solution.

The shift in the focus of regulation is reinforced by the increasing use of voluntarism, which will continue to be a model for limiting the release of toxins and eliminating polluting activities. Sectors will continue to develop their own initiatives that increasingly focus on preparing for the future, rather than correcting the mistakes of the past. One such example is the Responsible Care program in the Canadian chemicals industry. This shift has implications for both skills and human resources in the industry.

In addition to regulation and voluntary agreements, there are plans and programs (e.g. the National Packaging Protocol), mandatory instruments, economic instruments, financial aid, and economic incentives, as well as international conventions and protocols (e.g. the Kyoto Protocol relating to climate change and the series of standards on Sustainable Forest Management by the Canadian Standards Association). All of these will continue to promote waste reduction and increase the demand for environmental equipment and services.

Internationally, registration with environmental management standards, such as the ISO 14000, will continue to be a major driver of economic activity in the industry. The standard has been adopted voluntarily in Canada, and accreditation is very often required for companies exporting to some European markets.

## **Technological Factors**

The environmental industry is rapidly developing different technologies to meet environmental challenges. Consequently, technological capability is and will continue to be an important driver of growth and efficiency for firms in this industry. Among these technologies are those relating to water and wastewater, air pollution control, waste management, process and prevention,

recovery and recycling, and renewable and alternative energy. Canadian firms will therefore need to build upon their technical expertise to remain competitive.

Biotechnology is an emerging technology that, in many cases, can be integral to improving environmental performance. A separate profile of the biotechnology industry has been prepared for the Expert Panel on Skills.

### **Social and Demographic Factors**

Increasing pressure from consumers for green products and services and cleaner production technologies will also push growth in the environmental industry. Both Canadian and international public opinion polls reveal that the environment is a long-term concern to the consuming public. In September 1998, 46 percent of Canadians saw the state of the environment as the most important threat to health.

Companies will increasingly view progressive environmental practices as good business practice to improve relationships with customers and hence aid sales and profitability. Suppliers to these industries will, in turn, be forced to adopt more effective practices with respect to the environment. The range of activities that will be subject to environmental scrutiny is likely to expand. Canadian environmental companies will therefore need to stay abreast of these developments to take advantage of emerging market opportunities.

Continued population growth and increasing urbanization in both Canada and developing countries will lead to stronger demand for environmental goods and services, particularly by municipal governments.

### **Current Situation**

#### **Definition**

Statistics Canada's definition views the environmental industry as including establishments engaged primarily in the production of environmental goods and services and environment-related construction services. The principal activities in this industry include the supply of goods and services used in the following:

- air pollution control;
- water supply and conservation;
- wastewater treatment;
- solid and hazardous waste management;
- remediation and treatment of soil and ground water;
- noise control and vibration abatement;



- environmental monitoring, analysis and assessment;
- analytical services, data collection and analysis;
- environmental consulting (environmental engineering design and project management, biological and ecosystem studies, impact and site assessments, environmental management systems, environmental auditing, conservation and resource management, emergency response planning, and risk and hazards management);
- environmental education, training and information;
- environmental research and development;
- chemicals used in pollution control;
- energy efficiency and renewable and alternative energy; and
- environment-related construction services.

The definition excludes workers in all levels of government who perform environmental work. Furthermore, manufacturing and resource companies performing significant environmental work are *not* included in the industry definition if this work is not the principal source of their business. On the other hand, the definition of the industry does include some companies and workers not directly engaged in environmental work.

### **Performance**

Companies in the environmental industry had total revenues of \$19.4 billion in 1995. Of this total, 53 percent or \$10.2 billion were identified as revenues from environmental goods, services and construction. Environmental goods accounted for \$4.2 billion; environmental services generated \$1.5 billion and construction services amounted to \$2.1 billion. Historical data, calculated by the Canadian Council for Human Resources in the Environmental Industry (CCHREI), indicate that the revenues from environmental goods, services and construction rose from \$7 billion in 1990 to \$14 billion in 1997. By comparison, production in the U.S. environmental industry was US\$181 billion dollars in 1996.

The world environmental industry was estimated to be US\$453 billion in 1996. Canada accounted for slightly less than 3 percent of global spending on environmental goods and services. Four industry groups accounted for 81 percent of environmental revenues in 1995: waste management (26 percent); wholesale other and scrap metal (25 percent), construction and engineering (20 percent), and business services (11 percent).

Revenues for the industry groups were usually derived from one major source of activity. Very few industry groups generated revenue from both environmental goods and services.

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## Structure

The industry is comprised of a very large number of small companies and a few large multinationals. In 1995, very large firms (more than 500 employees) accounted for 0.6 percent of businesses and 10 percent of revenues. On the other hand, 90 percent of companies had fewer than 50 employees, and accounted for 49 percent of revenues. Moreover, 63 percent of businesses had fewer than 10 employees. In 1995, medium-sized firms (50 to 99 employees) and large companies (100 to 499 employees) generated 18 percent and 22 percent of revenues, respectively, and together accounted for 9 percent of businesses.

Companies are concentrated in Ontario, with 32 percent located in that province, and Quebec, which has 27 percent of the companies. British Columbia is home to 12 percent and Alberta, 9 percent. The Atlantic region has 11 percent of the companies.

The location of environmental companies is determined by the proximity of large buyers of environmental goods and services. The three levels of government are collectively the largest purchasers, and natural resource industries are also significant buyers of environmental goods and services.

The industry in Quebec mirrors the developments in U.S. markets to the extent that growth has been substantially lower in the 1990s. Further, in many sub-sectors, a cyclical pattern is evident and competition for market share has affected profit margins. To some extent, these developments reflect the transition that can be expected for the world environmental industry in coming years.

Private sector investment in environmental technology research and development (R & D) was estimated to be \$355 million in 1996. This expenditure is comparable with R&D levels in other Organisation for Economic Co-operation and Development (OECD) countries, though a more rigorous study has not been undertaken in Canada.

Sector expenditures on technology commercialization and demonstration is very low in Canada compared with other OECD countries. These activities are important for market penetration and are often undertaken with the assistance of government agencies. Canada is one of only two OECD countries lacking this type of agency.

## Demand Factors

The industry is identified as a growth industry, and revenue from environmental goods and services is expected to reach \$22 billion by 2000. Growth rates will vary by region and are likely to be larger in those areas that already have a larger market share. For example, in Canada's Technology Triangle (the Cambridge, Guelph and Kitchener-Waterloo area) 16 percent annual growth was predicted between 1995 and 2000.

Currently, Canada runs a trade deficit in pollution control equipment (where the leaders are Germany and Japan). Exports currently account for between 10 and 15 percent of industry shipments. Almost 80 percent of exports go to the United States, which is the largest and most accessible market for Canadian firms. The United States is also an important supplier of imports to Canada. Overall imports account for 35 percent of the Canadian environmental equipment market.

Canadian companies have gained an international reputation for their technical expertise in water and wastewater treatment technologies, handling liquid and solid waste, manufacturing environmental equipment such as shredders, and for environmental engineering and consulting expertise. These sectors are not in the strongest demand in developing countries, nor do they provide the large payback that comes with environmental activities such as manufacturing and construction.

Although demand is generally perceived as non-cyclical because of regulatory compliance, some significant customers for environmental services, such as resource companies, do experience significant cyclical fluctuations. Therefore, attempts to improve environmental performance in line with voluntary agreements and protocols can be cyclical.

Environmental companies have to become forward-looking as the global environmental market evolves from auditing and compliance, through environmental management standards and the integration of environmental and business considerations, to full sustainable development. The shifting context of demand means that environmental companies will have to become more strategic in accessing markets and clients.

### **Unions and Professional Associations**

Because of the large number of small companies, unionization across the industry is generally considered to be low. Even in the larger firms such as Safety-Kleen (formerly Laidlaw, Environmental Services) and Philip Environmental Services, unionization is around 10 percent of the work force.

The Canadian Environment Industry Association (CEIA) is the national voice for the environmental industry. The CEIA, along with its provincial affiliates, represents the interests of 1500 companies that supply environmental products and services. Reflecting the importance of provincial regulation and legislation there are also environmental industry associations at the provincial level.

Composed primarily of small and medium-sized enterprises (SMEs), the industry and its sub-sectors are also well organized. There are close to 200 sub-sector trade associations that cover different facets of the environmental industry.

The CCHREI is the sector council that has been assisting the Canadian environmental industry with the development of its human resources. It is an industry-initiated and industry-led organization that includes employers, workers, educators and governments in a joint effort to address training, occupation standards, and other critical human resource issues in the environmental industry.

In Quebec, the *Comité sectoriel de main-d'œuvre de l'industrie de l'environnement* (CSMOIE) was created in 1996 with the aim of promoting training, employment and human resource development in the environmental industry. The sector council is composed of representatives from business, labour, government and other industry participants.

There are also three Canadian Environmental Technology Advancement Centres (CETAC) throughout Canada, namely in Toronto, Sherbrooke and Calgary. These centres are responsible for supporting the start-up and growth of businesses seeking to commercialize environmental technologies and develop business opportunities.

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## MANAGEMENT PRACTICES

### Employment

According to Statistics Canada, employment in the industry was 149 957 in 1995. This figure represents the total number of jobs in the industry, not simply the jobs that contributed to environmental revenue. Generally, it is very difficult to distinguish environmental employment from other types of employment.

Double-digit growth is expected up to the year 2000 for employment in the industry. Environmental management and control are important to all sectors of the economy. Therefore, companies that use environmental control technology (e.g. in pulp and paper, chemicals, mining, and petroleum) also make considerable use of environmental practitioners as well as environmental equipment and services. These workers are not included in the employment estimates provided above.

Based on revenue distributions, the CCHREI has estimated that the actual number of people employed in performing environmental work across all industries was 96 779 in 1998. The environmental industry employs a broad range of individuals with a wide variety of skills and occupations. Many of these are specialists with specific environmental training. There are also scientists whose training has not been specifically environmental in scope, such as chemists, engineers, biologists, geologists, geographers and others. The skills of these workers can be applied in other sectors as well as in the environmental industry.

### Employment Structure

Some 47 percent of employees are located in Ontario, with a further 20 percent in Quebec, 12 percent in British Columbia and 11 percent in Alberta. The Atlantic region accounts for 5 percent of employment.

The same four industries that generated 81 percent of environmental revenues accounted for 77 percent of jobs in this sector, though their relative position was different. The largest source of employment was business services (32 percent), followed by waste management (26 percent), wholesale other and scrap metal (10 percent), and construction and engineering (9 percent).

Small firms of fewer than 50 workers account for 29 percent of employment; medium-sized firms (50 to 99 employees) account for 13 percent of employment; large firms (100 to 499 employees) provide 23 percent of the jobs. Very large firms of more than 500 employees account for 35 percent of employment in the industry.

### **Demographic Features**

The proportion of women in the industry work force — currently 28 percent — is well below that for the labour force overall. However, there are signs that this is changing. Workers in the industry are relatively young, with a higher proportion than the national average in the 20 to 34 age group.

### **Wages, Productivity and Other Work Force Characteristics**

Employees in the industry are also seen as having above average productivity. One industry estimate was that each worker produced \$130 000 of output annually, which is 25 percent higher than the manufacturing sector overall.

Based on job advertisements over the past five years, the average range of salaries for environmental practitioners was estimated to be between \$38 800 and \$52 600.

The mobility of employees in the industry is seen by industry employers as being a disincentive to greater investment in employee training. A constant theme has been the need to improve and maintain communication among all stakeholder groups in the industry.

Work arrangements in some occupations are changing. There are indications of a shift to contract-based work on a project basis. Some compensation packages cases include share options. However, the large majority of environmental practitioners continue to work on a full-time basis.

### **Human Resource Studies in Progress**

The CCHREI is preparing a study of human resources in the environmental industry that is scheduled for release in summer 1999<sup>a</sup>.

In Quebec, the CSMOIE is currently engaged in a survey of environmental management practices examining the commitments of Quebec firms and their impact on human resources in the environmental industry.

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<sup>a</sup> That study was published after this Profile was completed. It may be found at the CCHREI website: <http://www.chatsubo.com/cchrei/>

Other reports on the environmental industry are under way and may contain references to human resource factors. Industry Canada and the Atlantic Canada Opportunities Agency (ACOA) are currently developing a strategy for the Atlantic environmental industry. In British Columbia, the Globe Foundation, in conjunction with the Delphi Group, is preparing a report on the environmental industry. In Ontario two reports — on air quality markets and waste markets — are under way. Statistics Canada continues to develop further data on the environmental industry in Canada.

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## CRITICAL SKILL NEEDS AND GAPS

### Skill Needs

The critical skills are technical ones, since they represent the knowledge needed for operating in the industry. The diverse nature of the industry means there is no single specialization. Skills encompass compliance, waste reduction, pollution prevention, sampling and analysis, employee training, health and safety, risk assessment, natural resource management, communications and community relations, and business development. Evidence suggests that the typical ratio of technicians and technologists to management and professional staff is five to one, and likely higher in start-up companies.

The environmental industry, like other knowledge-based industries, is dependent on a skilled and knowledgeable work force. Among environmental consulting firms, almost 70 percent of the positions require professional or technical skills in the sciences. Among the technical workers in the industry, 53 percent have a university degree and 46 percent have a diploma from a college or CEGEP.

The dependence on a highly skilled technical work force is more pronounced in small companies, especially in environmental services. A study of the Ontario industry found that 76 percent of the employees in these companies have post-secondary education, compared with 55 percent for medium-sized companies and 42 percent for larger companies.

Non-technical skills are also important in the environmental industry. Familiarity with federal, provincial and municipal regulations governing the environment is a significant challenge for many companies. Communication skills, particularly with consumer groups, have become an important factor in discussions relating to the environment. Knowledge of foreign regulations, standards and practices is critical for export success. Other non-technical skills include the ability to work with off-the-shelf computer software and advanced computer applications; research and investigation techniques; the ability to gauge public opinion; data analysis and interpretation; conflict resolution and negotiation; deductive reasoning and forecasting; presentation skills; implementation of plans; skills for training others; integrative skills; interdisciplinary teamwork; the management of contractors; observation and the recording of observations.

With the increasing use of voluntary standards and codes of practice, there has been a stronger emphasis on the skills and knowledge needed to document, report and monitor environmental performance against the standards. This was a function previously performed by provincial environmental ministries. The desire for such expertise has also led to a shift away from use of internal skills to a greater use of environmental consultants.

As companies grow, the type of skills they require are proportionately less on the technical side, since technical skills are the basis of a start-up company. The larger firms in the industry, having



built a technical base, tend to hire proportionately more people with legal, accountancy and information technology skills.

Experience is also critically important, because environmental solutions are usually different each time. According to one estimate, it now takes about five years until a new worker begins to add value to the company i.e. the value of his or her work exceeds their compensation. This is a feature of any highly technical area but also has implications for hiring young workers.

### **Skills and Occupational Documentation**

The CCHREI has documented the skill sets required of environmental practitioners in Canada. The data contains detail on the work activities, skills and areas of knowledge in 15 sub-sectors of the environmental industry, together with an indication of their relative importance to employment.

The CCHREI has also released the first round of its national occupational standards for technicians and technologists who work in the environment protection industry. The standards identify the main competencies, skills and knowledge expected of experienced workers in these occupations.

### **Skill Gaps**

The most common skill shortage reported was in management and business skills, particularly the ability to manage projects, deal with different government offices and procedures, and employ technical expertise in more efficient ways. These skills are seen as critical if Canadian environmental companies are to break into international markets. In a recent survey, 48 percent of environmental organization considered these to be either very important or important, while a further 33 percent indicated they were "somewhat" important.

Previous studies of the industry have illustrated the shortage of highly skilled professionals with significant experience, particularly technicians and technologists (Ernst and Young, 1993, and the Impact Group, 1996). Between 1993 and 1997, organizations that hired environmental practitioners experienced some difficulties recruiting in computer programming, business administration, site remediation, hydrogeology and technical sales (Goss Gilroy, 1999). From interviews, hiring difficulties of technical personnel were generally considered less acute than those for management and business skills. Continued difficulties in hiring are anticipated in the coming years.

In the U.S. environmental industry, skill shortages are also most pronounced for project managers and sales and marketing managers, followed by engineers, compliance specialists, hydrologists and geologists. This could become a concern if employment in the U.S. environmental industry picks up.

In the Quebec environmental industry overall, a general shortage of employees is not foreseen. However, specific shortages are expected in the following occupations: hydrogeologists, technicians in chemical analysis and chemical engineers.

In the related field of biotechnology, shortages of skilled labour are expected to arise in certain areas, such as bioprocess engineering, regulatory affairs and international business development, which could place Canada at a competitive disadvantage.

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## **RECRUITMENT, TRAINING AND DEVELOPMENT PATTERNS**

### **Recruitment and Supply of Skills**

Common recruitment practices include word of mouth (especially for experienced professionals in the private sector) and unsolicited applications, though some informal networks have been developed to access financial and management skills. In the private sector, companies hired environmental practitioners mainly through personal contact (73 percent), resumes on file (59 percent), newspaper and trade journals (57 percent) and co-op programs (31 percent). In the public sector, newspaper advertisements were the principal means of hiring (71 percent), followed by résumés on file (54 percent), personal contact (45 percent) and electronic job boards (33 percent).

In comparison with large companies, human resource management is less a part of the strategy employed by SMEs. Economies of scale mean that human resource departments are larger and more established in larger companies. When small companies face shortages of critical skills for a specific project, a common means of acquiring them is to work with another company that has these skills. However, such tactical alliances tend to be between companies in the same region or province of Canada.

Youth is seen as a critical source of supply to the industry, and efforts focussed on attracting youth are viewed as a priority by the CCHREI. The most commonly identified reasons for not hiring new graduates were insufficient hands-on experience (58 percent), unawareness of the day-to-day requirements of environmental work (35 percent), and high expectations with regard to starting salaries (30 percent).

Young women are also a group that appears to be entering the environmental industry in greater numbers. Among the 576 graduates from the Environmental Youth Corp., almost half were female compared with the proportion of 28 percent female employees in the industry overall.

No evidence has been found to suggest that a "brain drain" is occurring. Large U.S. companies do hire some people away from Canadian companies, but the phenomenon does not appear to be widespread. It should be noted, however, that the U.S. environmental industry did not exhibit high employment growth in the mid 1990s.

One reason given for the difficulties in hiring individuals with the necessary management and business skills was that MBA graduates are not attracted by the rewards from the industry in comparison with other opportunities, such as those offered in the financial sector. Business graduates may also be discouraged by the need to acquire the highly technical knowledge of the industry.

## Education and Training

The CCHREI publishes a directory of 15 000 environment-related courses and 2 500 programs currently offered by Canadian post-secondary institutions. The directory is updated on an annual basis. Core courses for environmental professionals as well as specialist courses are available at a significant number of educational institutions across Canada. Although the industry appears better served than in previous years, some concern regarding variations in the scope of courses remains.

For university-level occupations in the environmental industry, the distribution of academic subjects included engineering (27 percent of practitioners); biology (21 percent); chemistry (13 percent); geography and environmental studies (12 percent); geology, geophysics and hydrogeology (9 percent); agronomy (7 percent); and forestry (6 percent). For technicians and technologists, the academic backgrounds were environmental technologies (28 percent), forest technology (22 percent), engineering technology (20 percent), chemical technology (12 percent), agriculture (4 percent), geology and mineral technology (4 percent), and biology and bio-science technology (3 percent).

A number of partnerships between government, industry and educational institutions have been established in recent years. These include the Waterloo Centre for Groundwater Research, the University of Waterloo Earth Science program and co-operational performance programs in other educational institutions.

The CCHREI, in conjunction with Human Resources Development Canada, and with delivery assistance from local academic and industry partners, have established a number of programs providing university and college graduates with the opportunity to gain skills and experience in the environment sector. The Environment Youth Internship Program was a three-year training and employment program that aimed to facilitate the transition of 18- to 24-year-old high school graduates to entry-level technician positions in the environmental industry. It alternated classroom training with several four- to eight-month-long work terms, and was offered in Newfoundland, Nova Scotia, Quebec, Ontario, Manitoba, Alberta and British Columbia. The Environmental Youth Entrepreneurship Project was a national project to develop the managerial and entrepreneurial skills of young Canadians. It included a four-month classroom program (offered on site or through distance education) followed by an eight-month session with a mentor. Business courses included developing business plans, sales and marketing, finance, business communications, networking, and project management. The program was offered in Victoria, Vancouver, Calgary and St. John's.

The rapidly evolving technical and regulatory environment means that continual upgrading and learning are required for managers and employees in the industry. The CCHREI's research indicates that about half of the competencies of environmental practitioners need to be upgraded within five years. This is particularly important since only 42 percent of 1 500 environmental

practitioners who participated in the skill-set survey had taken upgrading courses in the previous three years.

Four of the five most commonly identified areas for training or skills upgrading were non-environmentally related skills, including written communications, computers, business management skills, and verbal communications. On the technical side, skills related to environmental risk assessment were identified in the top five areas overall. Other technical skills that were ranked high with respect to training needs included environmental monitoring, environmental auditing and pollution prevention technologies.

Educational institutions have responded to previous concerns by concentrating on technical skills. The broad consensus is that current practitioners lack the necessary business skills—which are critical for the competitiveness of companies in the industry. Future engineers and scientists will require not only specialization in an environmental area, but also a strong general education that includes management, communication, and an understanding of key players and regulatory processes. However, over the period from 1993 to 1997, most employers (between 70 and 78 percent) regarded the training of environmental practitioners as adequate (depending on the type of position for which they were hired) (Goss Gilroy, 1999).

The CCHRF<sup>1</sup> is concerned by the recent increase in the number of disparate employment and training programs and initiatives that appeared across Canada over the past two years. Such a fragmented approach may contribute to public and industry confusion, as well as to an inconsistency of skills through the duplication of efforts and resources.

Some industry participants have suggested adding a year to education programs to teach both management and employability skills to those intending to enter the environmental industry. Others believe that essential basic managerial skills can be developed while enrolled in degree or diploma programs. “Employability skills,” however, should be developed in high school and continue through college or university.

Many industry practitioners have suggested that colleges and universities should include more specialization in course offerings to provide better pre-employment skills. Those colleges and universities that adopted this suggestion would have the added benefit of differentiating themselves from other colleges and universities that do not offer such specialization.

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## **OVERVIEW: KEYS AND OBSTACLES TO SUCCESS**

### **Obstacles**

The greatest barrier to growth for the industry is the lack of follow-through from Canadian technical expertise and assets in the international market. In terms of dollars accrued on the front end, Canada is a leader in technical and consulting expertise. Where Canada falls short is in its ability to leverage large contracts on downstream activities such as manufacturing, construction and the development of environmental equipment.

Companies, particularly SMEs, do not possess the skills to leverage the technical expertise in Canada. Such skills include project management, communications, financial skills and government relations.

Without these skills, SMEs will face a threat from global companies and consolidation in international markets. Without any sales growth, the technical expertise in SMEs could be attracted to other companies and other countries.

### **Key Elements for Success**

To secure international contracts, Canadian companies will need to offer full services such as delivery and financing packages. The smaller Canadian companies lack this facility and international experience on turnkey projects. As a result, joint ventures with local firms will be necessary to penetrate international markets.

Encouraging the hiring of youth in the industry is important; it has the potential to alleviate the problem of skill shortages. The higher youth unemployment indicates a gap in the school-to-work transition and the discomfort — perceived or real — employers have in hiring less experienced, younger workers. Graduates may also be unaware of the requirements of environmental work or have high expectations for starting salaries.

Continuous learning is essential to maintaining the skill levels of workers in mid-career or beyond. It is important to identify the skills needed and to ensure that skills are continually updated. To be successful, companies need to focus their attention on partnerships and accessing skills on a national, as opposed to regional, basis. However, knowledge of such opportunities may be limited by provincial jurisdictions with respect to training and education. Thus, the role of the federal government could be as a collector and coordinator of information for the environmental industry across all provinces. This is a role that could be undertaken in conjunction with sector councils and where a concerted approach can lead to successful human resource development.

## BEST PRACTICES

The CCHREI has developed and implemented a systematic research strategy for the human resource issues facing the environmental industry. This includes the following:

- The development of a framework in which the functional areas of environmental employment were defined.
- The documentation of the skill sets of environmental practitioners. This was compiled, through focus groups and practitioner surveys, and used to produce profiles of what environmental practitioners do and what they need to know to meet the skill requirements of environmental employment.
- The establishment of national occupational standards for environmental employment. The standards identify the competencies expected of experienced environmental practitioners, and are based on a detailed occupational analysis of the various skills and knowledge needed, the degree to which they are needed and their frequency of use.
- The development of a national voluntary certification program for environmental practitioners. This credential will be granted to those who meet or exceed the national occupational standards developed by and for environmental practitioners.

With a commonly accepted standard and definition of skills, educators can use this information to assess gaps in programs. With certification, skills can be more transferable across provincial jurisdictions (which relate to training and education). SMEs can also be confident that the people they hire have the required skills.

An example of good practices designed to address the shortage of management skills is the Business Centurions Centres Inc. (BCC). This network is designed to bring together experienced executives, managers and investors and link them to SMEs. The BCC operates across all industries and is not confined to the environmental industry. It also has relationships with banks, governments, major corporations, outplacement firms and venture capital firms, upon which it also draws to facilitate the development of small business opportunities. Business practitioners and investors, with the support of an Advisory Board, manage the BCC. The BCC interviews and evaluates individuals (executives, managers and investors) for potential inclusion in the network and conducts reviews of business opportunities for SMEs. The role of the BCC is to facilitate informal networking between individuals and companies, beyond any formal networks that may exist with financial, legal and human resource companies. Specific company needs that have been addressed by the BCC include financing, export capability, management and other sophisticated expertise.

An example of a partnership to promote a provincial environmental industry is the Nova Scotia Management Consortium for Environmental Technologies. The consortium was created under the 1995 Environment Act and is composed of 20 members drawn from private business leaders, academia and environmental groups, as well as a division within the Nova Scotia Department of Environment. The consortium is committed to improving the health of the environmental

industry in Nova Scotia through the provision of technical and business expertise to companies. This includes access to a range of services, including marketing, technical, regulatory, financial, educational and management services, as well as information and support services. A number of international memorandums of understanding providing trade cooperation and development have been signed as a result of the consortium's efforts. Although the industry in the province is relatively small, it has grown substantially in recent years and employment has almost tripled from 2 500 in 1994 to just under 7 500 in 1998.

One example of an educational program designed to provide interdisciplinary knowledge for environmental managers is the Masters in Environment and Management program offered by Royal Road University in Victoria, B.C. The two-year program is aimed at mid-career professionals who already have the core competencies and some knowledge of the technical and public policy areas in their environment field. Using distance education via the Internet and two 5-week on-campus courses, the program aims to provide management and environmental skills upgrading with a minimum of disruption for these professionals.



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## **Interviews**

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