REPORT ON THE ENVIRONMENTAL TECHNOLOGY SECTOR IN WESTERN CANADA

An Assessment of the Strengths and Opportunities of the Environmental Business Sector of Western Canada

Prepared by the

November, 2003

The GLOBE Foundation of Canada
World Trade Centre
Suite 504 - 999 Canada Place
Vancouver, British Columbia
Canada V6C 3E1
www.globe.ca

Report on the Environmental Technology Sector in Western Canada

INTRODUCTION

> *The Canadian environmental industry is diverse, fragmented, dominated by SMEs, and localized with little experience of exporting but it also can be very innovative and is capable of forming international alliances and partnerships. In our opinion the industry exhibits highlights of great potential in many innovative areas.*[1]

This terse description of the Canadian environment industry is an apt summary also of the environmental business sector in Western Canada. The environment sector is an evolving sector comprised of a growing mix of private enterprises and public institutions developing or providing goods and services designed to prevent or mitigate environmental problems; to reduce risks to human health or to the environment; and to improve eco-efficiency in both the private and public sectors. Service providers rather than technology producers dominate the environmental sector in Canada although the demand for new technologies to combat climate change, increase energy efficiency and enhance sustainability in the transportation, agriculture, energy and natural resource sectors continues to escalate.

This is one of the reasons why Western Economic Diversification launched an initiative for a multi-stakeholder Environmental Technologies Forum scheduled for December 2003 in Vancouver to help build a better understanding and consensus between government and industry on the opportunities and actions necessary to develop a shared vision that will strengthen environmental technology development in western Canada.

Assessments of the Western Canadian environmental business sector undertaken as part of this initiative concluded that firms active in this sector typically are small to medium sized enterprises employing fewer than 25 people and providing specialized expertise, technologies and services to other business sectors and to governments at all levels. These assessments also noted that while many companies are noted for the high quality of their technologies and expertise, few actually produce environmental goods or products. Though companies in the environmental business sector are anxious to expand, often they lack the financial resources or managerial capacity to engage in extensive technology development or market expansion activities.

While these facts are all true, they are not the whole story. In Canada generally and in Western Canada in particular, the environmental business sector is undergoing a fundamental re-orientation and renewal. Today's trend towards pollution prevention at source not only is decreasing the demand for traditional and often more expensive end-of-pipe pollution control technologies, it is spurring the demand for more energy-efficient and cleaner technologies for application in the primary resource, manufacturing, energy and service sectors, as well as for government services at all levels.

[1] A Decade of Challenge: Industry Canada Environmental Competitiveness Study, Extract from an in-house presentation, June 19, 2003. Report is as yet unpublished.

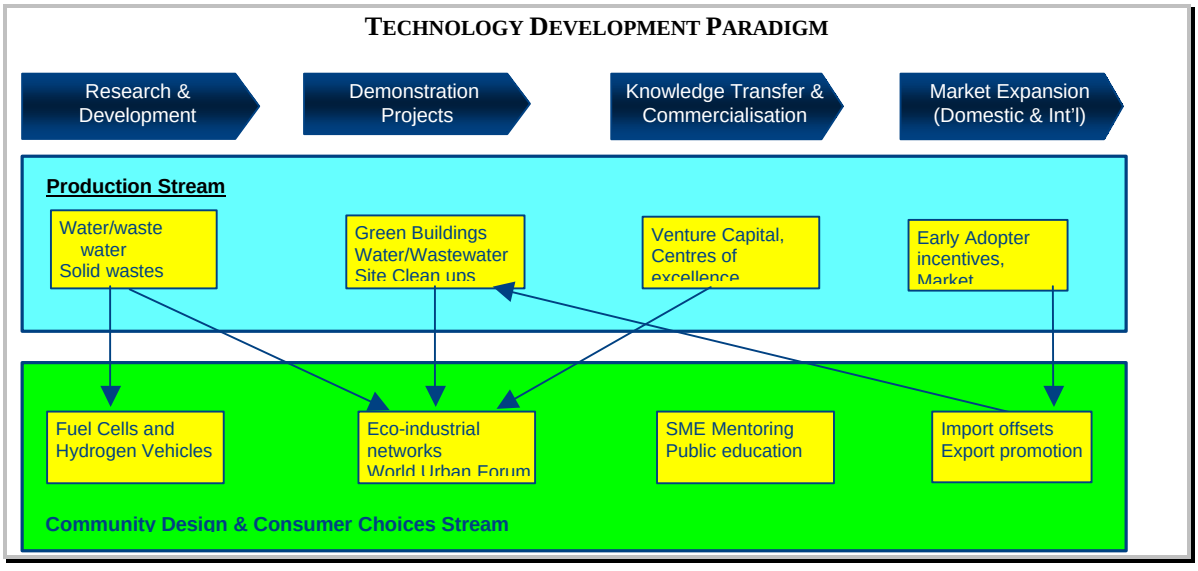
Spurred also by the exigencies of climate change and the need to reduce greenhouse gas emissions, the incentive to develop new, more efficient pollution prevention and conservation technologies is forcing the environment-related business sector to redefine itself in terms that go beyond pollution prevention, remediation or recovery, and to look to government and academia for new alliances and partnerships focussed more broadly on sustainability.

Across the West organizations were commissioned to provide a high-level summary of the overall strengths of environment-related sectors/sub-sectors or clusters in each province; a description of the key local, regional, national and international market opportunities for the technologies and/or service competencies related to the areas of strength identified: a description of key enablers facilitating or barriers impeding the realization of these market opportunities; and a summary of prioritized strategic measures that would help overcome the barriers identified and/or accelerate the development of environmental technologies, services or products needed to realize these market opportunities. This Composite Report draws from the findings of these regional reviews. It is intended to facilitate discussion at the Environmental Technologies Forum as well as to serve as a resource for possible program development activities after the event.

A TECHNOLOGY DEVELOPMENT PARADIGM

In planning for the technologies Forum and in setting out the parameters of the regional reviews, a framework was set out to follow the life cycle of an innovative technology or process. This framework was broken into two broad streams: a Community Design & Consumer Choices Stream, and an Energy & Technology or Production Stream. Both streams sought to follow the progress of a technology or process from the early R&D stage through the demonstration project and knowledge transfer & commercialization stages, to the final market expansion stage.

Graphically this Paradigm was depicted as follows.



The two streams (Production and Community Design & Consumer Choices) were depicted as tightly linked: any part of one stream could be linked to any part of the other stream - taking projects and ideas out of laboratories and into neighbourhoods. Each stage of the process was intended to correspond to at least one of Western Economic Diversification's three program pillars: Innovation, Entrepreneurship, and Sustainable Communities. The role of government in this process was seen as helping to remove obstacles and to encourage action as appropriate. Proposals from companies for concrete actions that might be taken by governments to facilitate advancement through this spectrum were intended to be collected over the course of the regional review process and brought forward for discussion at the Technologies Forum.

It was intended that this Paradigm would help in identifying demonstrable actions and deliverables at the Technologies Forum, as shown in the following Table.

Environmental Technologies Forum

	Deliverables	Risks	Actions
SMEs	• Signing new clients • Building strong network	• Too disconnected from day-to-day business	• Propose clear regulatory changes
Large companies	• Identification of service providers / acquisition targets	• Big companies will want to be the focus of sales pitches	• R&D and early adopter incentives
Capital markets	• Scope out potential investment targets	• Insufficient commercial prospects	• Easier access to non-standard investment vehicles
Communities	• Closer partnerships with resident industries	• Fear of industry pollution or ecological impacts	• Keep money in communities (tax-shifting, gas tax)
Researchers	• Direct links to companies and communities to increase relevance of applied research;	• Today, 40% of Canada's $250M energy R&D spending goes to nuclear	• R&D investment: higher levels and clearer focus
Government	• Clear messages to bring to new gov't on behalf of West	• Changes in national strategy	• More important work done by gov't – industry committees
Summary	• **No contradictory goals** • **Partnership-building**	• **Too nebulous, No clear actions points defined**	• **Various strategies recommended**

Process will lead to concrete deliverables and actions for all key players

Useful though this paradigm was in terms of the technology development process, it did not adequately reflect the changing realities of the environment sector, particularly with the increasingly important focus on sustainability issues and non-technology-based, integrated environmental solutions. To reflect this latter point, a slightly different model was introduced, based in part on a 10-Point matrix of key sustainability challenges put forward by Dr, John Robinson, of the Sustainable Development Research Initiative (SDRI) at the Institute of Resources, Environment and Sustainability, University of British Columbia. The world's urban population will increase by 50% over the next 30 years, and all cities will need to address the same ten challenges: clean air, clean water, water supply, energy,

transportation, land use, jobs, housing, health care and waste disposal.[2] Business opportunities associated with these sustainability challenges will require the development of new technologies and services. These challenges provide a useful matrix against which the various strengths, weaknesses and opportunities identified in the regional reviews can be presented.

Environmental Technologies or Business Opportunities in Each Province

	Sustainable Development Challenge	Environmental Business Opportunities	British Columbia	Alberta	Saskatchewan	Manitoba
1	**Clean Air**	Clean-Burn Technologies Green Fuels	X	X	X	
2	**Clean Water**	Water Purification	X	X	X	X
3	**Water Supply**	Water Conservation, Gray water Re-Use		X	X	X
4	**Energy**	Green Energy: Small Hydro, Biomass Waste-To-Energy	X	X	X	X
5	**Transportation**	Hybrid Vehicles, Clean Diesel	X	X		
6	**Housing**	Green Buildings, Related Technologies	X		X	
7	**Waste Disposal**	Recycling Solid Wastes; Waste-To-Energy	X	X	X	X
8	**Land Use**	Planning Sustainable Communities	X			X
9	**Employment**	Skills development and upgrading	X			X
10	**Health Care**	Technologies that reduce Health Impacts	X	X	X	X

X = indicates possible areas or activities relevant in each province to this particular challenge.

[2] Climate Change: The Opportunity, John Robinson, SDRI, Institute of Resources, Environment and Sustainability, UBC, October 25, 2001.

The report that follows provides details for each province and for the West generally:

- A summary assessment of the strengths and weaknesses of key components of environment-related business sectors;
- An overview of emerging market opportunities for the technologies and/or service competencies related to our main areas of strength;
- A description of key enablers facilitating (or barriers impeding) realization of these market opportunities; and
- Recommendations for strategic measures that will help accelerate the development of technologies, services or products needed to realize these environmental market opportunities.

These findings can then discussed at the Environmental Technologies Forum in the context of the two frameworks noted above and as the basis for the development of prioritized recommendations for actions to be taken to further the development of environmental technology and sustainable development expertise in Western Canada. It is intended that strategies recommended at the Environmental Technologies Forum will help strengthen linkages between technology developers and solution providers in Western Canada and consumers of these technologies and solutions, both at home and internationally. This could mark the beginning of a long-term process of strengthening the environmental technology, sustainable development industry in Western Canada.

GENERAL FINDINGS

The general findings that emerged from the regional reviews are as follows:

- The environment business sector in Western Canada is evolving rapidly and is undergoing a process of transformation. The drivers of this process and the demands for its technologies and expertise are as diverse as the client base of the industry itself. The main factors now influencing demand reflect an evolution in the way business and industry now approach their environmental obligations; shifting economic forces globally; and new approaches to government regulation that view the industry from a broader perspective that incorporates health, sustainability, ecological principles, and community-based solutions as the basis for industry growth.
- The environmental business sector of Western Canada has traditionally drawn strength from servicing its domestic markets, which will continue to grow mainly driven by the energy and urban sectors as Canada seeks to reduce GHG emissions and refurbish its cities. However it is the international export market to the developing economies of China and India that holds some of the greatest potential.
- Despite this growing international market, the base reality is that most firms active in this sector across Western Canada are small to medium-sized enterprises employing fewer than 25 people, providing specialized expertise, technologies and services to nearby companies in other sectors (mining, forestry, oil and gas, etc), and despite the quality of their technologies and services, they lack the money, managerial capacity or staying power needed to engage in extensive technology development and/or international market expansion activities.
- A fundamental weakness in the sector stems from the fact that the environmental industry is not a homogenous whole. It consists of a series of market segments each

with very significant differences in terms of market conditions and each with different challenges with respect to technology development and commercialization. Each market segment involves many different players, including corporations, universities, applied research organizations, government departments and specialized agencies and financing bodies.

- While in some areas these various players have come together to form mutually supportive clusters, for the most part, each market area continues to be served by small and medium sized enterprises working largely in a competitive and an uncoordinated milieu without benefit of strong industry associations or alliances. Competition for scarce government resources is a major factor in the lack of focused and cooperative activities. This lack of cohesion is a contributing factor to the lack of influence this sector has in shaping new regulatory regimes and government practices regarding the early adoption of innovative technologies developed in the West.
- Other factors cited as contributing to weaknesses in parts of the sector include scarcity of investment funding; inconsistent support from government agencies and programs; poor market intelligence; resistance to change by key players in the local and regional markets; and the lack of unified or coherent marketing of our technologies and problem-solving expertise in the international marketplace.
- Part of the difficulty affecting the sector is the limited perspective on how the business of the environment has been defined. Traditionally the sector has been seen to encompass businesses producing goods and services that measure, prevent, limit or correct environmental damage (both natural or by human activity), to water, air and soil, or which deal with problems of waste, noise reduction and ecosystems protection. Technologies that reduce material inputs and energy consumption or recover useful by-products have also been considered environmental industry offerings, though this is not consistently applied because of the lack of consistent information across jurisdictions.
- In reality the environmental business sector is no longer focused on "end-of-pipe" solutions to treat pollutants released into the air, water or soil, but rather is evolving into a complex and rapidly changing constellation of engineering, analytical and design services designed to help businesses incorporate environmental considerations into their production processes and in their dealings with client communities and customers. The sector is now much more closely linked to other sectors involved in sustainable community development; green building design and construction; energy efficiency and eco-industrial networking; sustainable urban infrastructure; and sustainable resource management.

Translating these general findings into tangible initiatives in the context of the Environmental Technologies forum requires a much more detailed commentary. In general, it is fair to say that the environmental technology and services sectors across the West are in the process of transition; are searching for a voice; are very much in need of leadership; and need help in order to realize their enormous potential. Despite these common elements emerging from the regional analyses, there are significant differences within each province (and within each industry sector) that must be noted with respect to strengths, opportunities and constraints.

FINDINGS BY REGION

BRITISH COLUMBIA[3]

The British Columbia environmental business sector involves over 800 firms employing in excess of 22,000 people; generating annual revenues of $1.8 billion. Firms in the BC environment sector vary in size and revenues, from lone operators with revenues of less than $100,000 to large firms employing over 500 people and operating income in excess of $200 million. Most are small enterprises employing fewer than 25 people clustered in two main regions of the province - the Lower Mainland and the Vancouver Island/Coast area. The United States remains the largest export market for BC-based environment companies, though many are now venturing out to markets in the Asia Pacific, Central and South American and Western and Central Europe. Over 75% of the environmental companies surveyed in 2000 reported some form of basic, applied or developmental research with respect to processes, services or technologies. These ranged from environmental instrumentation and monitoring systems to incineration, water and wastewater technologies, fuel cells, and complex industrial close loop manufacturing processes to minimize the impact of solid waste, wastewater and emissions on the environment.

STRENGTHS:

The major areas of strengths most often cited with respect to the environmental technologies and services sector in British Columbia relate to: Water and wastewater services and technologies; Alternative energy systems, including fuel cells, clean fuels technologies and biomass/co-generation systems; Sustainable resource management, specifically related to forestry and mining reclamation; and Environmental instrumentation technologies. Another emerging source of strength is the presence of supportive clusters enabling smaller firms in the industry to work together and with select government agencies, academic and other research institutions. Such clusters are present in the fuel cell technologies sector, the water/wastewater sector, and increasingly in the green building sector. They in turn are supported by a growing milieu of innovation in the industry, fostered in part by excellent university programs, skilled patent and trademark law firms, a growing number of research laboratories and technology testing facilities, as well as readily available expertise in market intelligence and environmental marketing.

EMERGING OPPORTUNITIES:

The most promising opportunity areas for British Columbia's environmental technology and related sectors appear to be:

- Alternative energy systems, including fuel cells, clean fuel technologies, small scale hydro and biomass co-generation systems;
- Contaminated site remediation and brownfield reclamation;
- Green building design, technologies and products;
- Sustainable communities and integrated environmental solutions;

[3] Taken from An Assessment of British Columbia's Environmental Business Sector, prepared by the GLOBE Foundation of Canada for Western Economic Diversification Canada, October, 2003

- Urban environmental management systems; and
- Water/wastewater technologies, services and solutions.

IMPEDIMENTS TO OVERCOME:

However, there are impediments that must be dealt with before these potential opportunities can be fully realized. These include:

- Establishing supportive industry clusters;
- Providing consistent technology development and commercialization support;
- Overcoming problems associated with the large number of small and medium sized enterprises in the sector;
- Promoting venture capital financing and investment for innovative technologies developed in BC;
- Overcoming resistance to change factors in key domestic markets; and
- Developing international recognition of British Columbia's environmental excellence.

ALBERTA[4]

The environmental business sector in Alberta has experienced strong growth over the past two decades, with revenues growing from roughly $650 Million in 1992 to $3.2 billion a decade later. It is comprised of over 800 Small to Medium-sized Enterprises (SMEs), with roughly half these firms having less than 15 employees. Over 80% of Alberta's environmental firms provide services as their primary business; just over 15% are in the equipment and supply business, primarily developing and marketing technology-based products. Although the majority of the industry's sales are in the Canadian market, the equipment and supply companies are more export market oriented, taking advantage of niche opportunities and their technical expertise.

STRENGTHS:

The roots of Alberta's environmental industry are in the province's significant endowment of natural resources, its concentration of technical expertise and its entrepreneurial culture. Environmental issues traditionally have been seen as a cost to users; therefore, a strong regulatory framework has been and continues to be essential to the development of the environmental industry in the province.

EMERGING OPPORTUNITIES:

The environmental industry's access to a thriving energy sector has provided opportunities for the SMEs to develop innovative solutions to local environmental problems. The combination of market access, strong technical skills and risk-taking culture has enabled the industry to strengthen its competitive capabilities and to transfer

[4] An Assessment of Alberta's Environmental Technologies Industry: Final Report, Prepared for Western Economic Diversification Canada by CETAC-West, November, 2003

this expertise to international markets and to other sectors such as petrochemical, agriculture, urban and transportation sectors.

The further development of Alberta's natural resources (e.g. oil sands, coal) combined with the strong intellectual assets in the province will continue to provide opportunities for environmental SMEs to create innovative local solutions and to apply these to other sectors such as the urban water management and agriculture wastes sectors. Nevertheless the major growth opportunities will be in export markets and these are considerably more difficult and costly to penetrate.

Substantial growth for environmental services companies is expected to come from sales to markets outside of Canada in specific niches where Alberta companies possess specialized competitive advantages. The opportunity is to create a world-class environmental technology industry in Alberta. The province's resource endowments, entrepreneurial culture and technical skills provide a necessary but not sufficient foundation for growth in a highly competitive global environment.

IMPEDIMENTS TO OVERCOME:

While Alberta's environmental SME's compete well at home, in the international marketplace they face very strong competition against better capitalized and larger corporations with sophisticated marketing and business capabilities and considerable support from their governments. In Alberta, while government programs for launching new technologies in the environmental sector are available, they are not competitive with programs available in other countries. The programs available are also viewed by many as cumbersome, bureaucratic and, in some instances, counterproductive.

The future growth and success of Alberta's environmental industry cannot be taken for granted. Even after competencies in local markets are earned, the very small size of most SME's, the long distances to export markets and the competitive market conditions in international markets, make entry very costly and at a risk level that these companies cannot tolerate on their own. Alberta's strong technical expertise and entrepreneurial culture are increasingly being applied to other sectors than the energy sector, both locally and globally.

However, substantial growth in the environmental technology industry will only be achieved with stronger and more effective government programs and incentives for business skills development and for private capital investment than are currently available to the small companies in the environmental sector.

While Alberta is a relatively rich province with significant private capital, only in very exceptional cases is this capital accessible to fledgling companies in the environmental sector to support their innovation, development and commercialization activities. The smaller SME's in the services sector are particularly challenged in capturing significant global market share since they are much more limited in terms of resources for acquiring market intelligence, carrying out marketing activities, managing growth, and securing the capital necessary to support marketing and growth initiatives. There is a need for a stronger technology commercialization infrastructure. This involves access to market research, business strategy development, management, access to capital and networking with peers and experienced business professionals.

SASKATCHEWAN[5]

The environment sector in Saskatchewan is composed of approximately 286 companies generating nearly a quarter billion dollars per year in revenues. Over the last two years 66% of the firms have seen an increase in sales and the future holds excellent prospects for more growth. Firms tend to be small in this sector, with 66% having less than 15 full time employees and 18% with greater than 50 employees. Total employment is roughly 3700 people. Technology and equipment manufacturing companies represent a small percentage of the industry but generate nearly 50% of the total environmental revenues. Oil and gas and mining are the largest sectors serviced by the environmental industry, which is reasonable considering they represent 14% of Saskatchewan's GDP. Agriculture, forestry, transportation and utilities are the next largest sectors serviced. In the environmental sector the primary market is local (provincially), though for some companies their primary markets are outside of the province and outside Canada. Seven market areas account for almost all of Saskatchewan's environment industry activity. The local market accounts for 82% of business, followed by Western Canada, Central Canada, Atlantic Canada, the Northern Territories, the United States and Mexico. The United States and Mexico stand out significantly from the other export markets in terms of rate of return on investment and market potential.

STRENGTHS:

The top areas of expertise are in ecosystem management, audit and site assessments, and environmental remediation. Saskatchewan's arid environment has resulted in a cluster of world-renowned expertise in the area of water supply, wastewater treatment and groundwater. With 60% of the world experiencing similar arid conditions and environmental challenges this is also a marketable strength within Saskatchewan's environmental technology. Eighty five percent of environmental technology activity in Saskatchewan comes from small businesses, which tend to be more flexible when seeking out opportunities. This flexibility is seen as a key driver of innovation. In Saskatchewan 35% - 40% of the exporting market is now non-traditional. This includes environmental knowledge, services and technology.

EMERGING OPPORTUNITIES:

Saskatchewan's size and limited resources have often been considered as barriers to economic growth. However out of these challenges have emerged the talent and ability for industry, government and research institutions to collaborate. There are a number of collaborative projects occurring in Saskatchewan that have an environmental focus. These include:

- Communities of Tomorrow, a collaboration project between federal, provincial and municipal governments will focus on using Regina as a demonstration site for environmental technology, initially in the water sector. The University of Regina has created an Environment Chair and is host to a new research facility, the national CO2 Sequestration Centre with a demonstration site at Weyburn. The National Research Council Institute for Research in Construction - a $10 million

[5] Saskatchewan Regional Analysis for the Environmental Industry, Prepared For Western Economic Diversification by SEIMA, Saskatchewan Environmental Industry and Managers Association, November, 2003

Centre for Sustainable Infrastructure Research is the second partner and the City of Regina is the third partner.

- The Canadian Light Source (Synchrotron) Project at the University of Saskatchewan, Canada's largest science project will be in operation in 2004. The environmental sector is one of three priorities for the Canadian Light Source.
- The Forestry Centre in Northern Saskatchewan is a partnership between the Saskatchewan Department of the Environment and the Department of Industry and Resources to support development of the Forestry Industry.
- An Eco-village being developed in Craik, a rural Saskatchewan community is an excellent example of economic vision and collaboration.
- Saskatchewan BioProducts, an organization mandated to build the bio-products industry. Environmental technology is seen as a key component to this emerging sector.

IMPEDIMENTS TO OVERCOME:

Three key strategies that Saskatchewan environmental companies see as possible tools to overcome impediments to growth include; developmental financing to meet the needs of SME's; program development to assist with stakeholder education; and more self regulation of the industry by the industry.

- There needs to be better cooperation and coordination amongst Government departments and agencies to ensure environment industry companies know of and have better access to programs. Greater consistency in orientation (the focus of programs regularly change), and simplified access and processes for these programs (funding caps are too high for Saskatchewan SME's) must be developed. A tax credit system for environmental technology development would help provide affordable financing so that companies can leverage developmental funding as required.
- A unified voice is required to enable the Western Canadian environment industry to develop local preference policies that would promote adoption of home grown technology locally. Companies and government in Saskatchewan need to see the advantages of being early adopters of technology and solutions developed locally.
- The certification or verification of environmental technologies needs to be done internally by the environmental industry to minimize the customer's risk.

MANITOBA[6]

There are over 360 companies operating in Manitoba's environmental sector, most of which are providing goods or services related to the measurement, prevention or remediation of environmental damage to water, air, soil, as well as for dealing with problems related to waste, noise and eco-systems management. The sector also includes companies developing or marketing resource-efficient technologies that

[6] Manitoba Environmental Sector Study SWOT Analysis, Prepared for Western Economic Diversification and others by the Prairie Centre for Business Intelligence, March, 2003, supplemented by notes from stakeholder review meetings held in Winnipeg provided by Western Economic Diversification Canada.

reduce material inputs, energy consumption, emissions and waste, when compared to traditional technologies.

Industry revenues related specifically to environmental activities in 2002 are estimated to be $360.4 million. (Total revenues of firms operating in the environmental industry are estimated to be $664.0 million). Most participants in the industry earn the majority of their revenue outside of the environmental sector. This makes the firms well able to manage the vagaries of environmental revenue. The industry employs 5,370 persons (full-time equivalent). Major export markets include the USA, Europe, South America, Central America and Asia.

STRENGTHS:

The industry in Manitoba has strengths in Environmental Monitoring and information processing, Laboratory analysis and services, Solid waste management and recycling, Waste and wastewater treatment, Soil reclamation and remediation, Hazardous waste management and Air monitoring and control. The industry has more breadth than depth and covers many areas in the sector, but none with the same critical mass as fuel cells in British Columbia or oil and gas in Alberta. The willingness of Manitoba firms to cooperate with other players (even competitors) to advance the common cause is seen as a distinct Manitoba strength. The possibilities for consortia formation that could leverage the strength of existing (often competing firms) and work with companies such as Manitoba Hydro, already working on large export projects related to dams etc. overseas, is a solid asset for the industry.

EMERGING OPPORTUNITIES:

Three distinct areas of opportunity that hold particular promise are:

- Green Buildings, which offers the opportunity to bring together a number of Manitoba areas of expertise in energy efficient buildings and components;
- Creating consortia, creating opportunities for aligning players involved with environmental technologies in Manitoba; and
- The agriculture sector in Manitoba provides significant opportunities for environmental remediation of wastes and processing as well as the utilisation of crops and crop residues that are not only energy efficient but also reduce consumption of virgin material and sequester carbon/GHG.

IMPEDIMENTS TO OVERCOME:

As is the case in all Western provinces, Manitoba's environment industry must overcome a host of problems and constraints associated with the fact that most companies in this sector are small in size, with revenues of less than $100,000 and have difficulty in obtaining and retaining sufficient staff particularly at the senior level needed to launch new technology or market development activities. The small size of firms also hinders each company's capacity for R&D, training and market development. Financing is always a concern, but in Manitoba the key issue is one of market access and opportunity awareness. Most Manitoba companies lack product launch strategies and have little understanding of important regulations or legislation that could affect their industry.

These are major obstacles to innovation and market development that must be dealt with before any real progress in the realization of these opportunities can be achieved.

BUSINESS DRIVERS

Although there are significant differences from one jurisdiction to the next across Western Canada with respect to the strengths, weaknesses and opportunities for environmental technology development, there are a number of common business drivers that must be noted. These include adaptation to climate change; the need to conserve energy and to reduce greenhouse gas emissions; changing corporate perspectives with respect to environmental management, compliance and liability; growing demand in the global environmental marketplace for integrated solutions to environmental problems; and increased demands for sustainable communities and improved quality of life. These factors are not peculiar to Western Canada, but they do affect how the environmental business sector is adapting to changing market demands.

CLIMATE CHANGE:

Climate change will emerge as the major driving force affecting the business of the environment in Western Canada. Described as the ultimate sustainable development issue, climate change represents both an environmental challenge and an economic opportunity. Reducing greenhouse gas emissions and introducing sustainable development principles into all aspects of society without causing major disruption to our economic and social well being is the challenge. Achieving the benefits of sustainable development technological innovation and energy efficiency in our transportation, agriculture, manufacturing and primary resource sectors, as well as creating more sustainable cities represents the opportunity. Many impacts of climate change are already evident, such as altered weather patterns and severe weather events including fires, floods and droughts. These will continue to impact significantly on economic sectors of importance to Western Canada.

Every province as well as the federal government has developed strategies and programs to deal with climate change and the business opportunities related to adaptation. These range from public education programs on the need to reduce greenhouse gas emissions, through to ambitious initiatives to develop alternative energy technologies such as fuel cells, small/micro hydro-electricity generation systems, wind energy, solar and photovoltaic energy systems, exploitation of geothermal heat sources, tidal and wave power generation in British Columbia and biomass and cogeneration of heat and power from landfill gases, wood residue and municipal solid wastes. The compelling point is that all areas of human activity will be affected by the impacts of climate change and virtually every aspect of business and economic development is open for innovative technologies and environment-related solutions.

ALTERNATE ENERGY SOURCES:

Climate change and the rising costs of energy have also sparked renewed interest in energy alternatives and energy efficiency measures. While alternatives to fossil fuels are many, on a global scale no one source has the capacity to replace our dependency on oil and gas in the near term. Fossil fuel reserves according to most long-range forecasts

appear adequate to meet anticipated energy demands for at least the next three decades. But continued dependency on hydrocarbons raises concerns about future investment in energy infrastructure; the potential environmental damage caused by fossil fuel energy production and use; and perpetuation of unequal access of most of the world's population to adequate energy supplies. In Western Canada today there is a shift taking place from conventional oil production to such non conventional sources as oil sands; to a greater emphasis on natural gas exploration and production (natural gas is seen as a transition fuel); the exploitation of methane from deep coal reserves; integration of wind power into energy grids; the utilization of carbon dioxide as a commodity for hydrocarbon energy extraction; integrating hydrocarbon resource development with the petrochemical industry to produce saleable petrochemicals, oil, gas, electricity and hydrogen as by-products; and addressing a wide range of environmental issues to protect air, land and water ecosystems associated with the oil and gas sector. Technologies to reduce waste generation, to measure low flow and flares, to eliminate natural gas venting at well sites, to prevent fuel spills, to harness alternate power sources generated from wastes, or to deal with the bio-treatment of drilling fluid wastes are of particular importance in this sector.

As noted, while alternatives to fossil fuels are many, on a global scale no one source has the capacity to replace our dependency on oil and gas in the near term. Western Canada does have a competitive advantage with respect to fuel cell technology. British Columbia has the largest concentration of fuel cell expertise in Canada, including companies developing hydrogen-fuelling infrastructure. Despite optimistic growth predictions of 60% and more over the next decade, many fuel cell companies in Western Canada are focusing on knowledge development and support technologies market areas as opposed to becoming major manufacturers of fuel cell stacks. In part this is in recognition of the enormous market power of competing jurisdictions, the main challengers being Japan, the European Community and the United States.

CLEAN PRODUCTION:

Growing concerns about resource scarcity, damage to the ecosystem and human health risks are affecting market demands for environmental technologies and services across the West. These have given rise to new regulatory requirements which in turn are stimulating businesses large and small to develop new approaches to environmental responsibility and to implement management systems and integrated process technologies that reduce or eliminate pollution problems at the source rather than relying on end of the pipe solutions or costly remediation efforts. The next generation of environmental technologies will serve both environmental and economic objectives. Clean production/processes decrease input, resource and energy requirements, and reduce the dispersion of toxic substances into the environment. Because significant cost savings are involved, investments in clean production processes essentially pay for themselves over time, with demonstrable commensurate impacts on domestic and international competitiveness. This area of environmental technology development is expected to eventually dominate the growing international market for environmental goods and services.

GREEN BUILDINGS/SUSTAINABLE CONSTRUCTION:

Sustainable communities and quality of life issues will also be major factors influencing technology development in the environment sectors of Western Canada. With respect to green building, British Columbia is one of the foremost centres of excellence in green building design and construction in North America. There is a readily available pool of expertise, as well as the resources to support the expansion of green building in the region and to export this business expertise to other markets. The newly established Communities of Tomorrow in Regina will help Saskatchewan to become a centre of excellence in environmental sustainability, community development and urban-related technology commercialization. The EcoSmart Partnership Initiative in British Columbia holds equal potential in terms of introducing sustainable construction practices in this sector.

WATER/WASTEWATER:

Global market opportunities for water-related technologies are huge - estimated by the World Bank to be in excess of $600 Billion. The Western Canadian water and wastewater technologies market is relatively small in comparison to the world-market demand. The US is undergoing major infrastructure renewal programs related to water and in order for smaller Western Canadian companies to be successful in the US marketplace (or elsewhere), they must develop partnerships and collaborations with larger players in this sector and consolidate their hold on local water/wastewater niche markets, which as of present are largely dependent on imported goods and technologies.

HAZARDOUS AND TOXIC WASTE TREATMENT:

New funding is being directed toward the remediation of contaminated sites across the country and for the recovery of brownfield sites in or adjacent to major urban areas. The clean up of toxic waste sites across Canada (estimated at over 10,000), suggests the hazardous wastes component of the national environmental marketplace also will become increasingly important. This is particularly important in Western Canada with respect to abandoned sites associated with mining and energy sectors.

CONCLUSIONS

As indicated earlier and as demonstrated by the Technologies & Opportunities table each province has capacity and demand in almost every sector. The challenge is to identify where comparative and competitive advantage lies particularly when it comes to new technology development.

The environment sector is not consensus driven and service providers will always be linked to defined problems and needs in the service area. As noted most of the environment sector in western Canada is made up of small to medium sized service providers that respond to local conditions and requirements. For the most part, these will be implemented in the context of provincial strategies, as the jurisdictional basis for key problem areas (water, wastes, contaminated sites, air quality, land use, urban planning, etc.), are largely – though not exclusively – within provincial jurisdiction.

On the other hand Technological solutions that have broad application nationally and internationally will require capital, perseverance, extensive product development and verification activity, as well as market development and promotion. These opportunities require focus as well as strategic partnerships involving private companies, governmental agencies, as well as academic and research institutions. To successfully develop such technologies in a nexus of support it would appear logical to support centers of excellence where such a coalition of interests and comparative and competitive advantage exist.

RECOMMENDATIONS

The following actions are recommended:

1. A comprehensive initiative to support the establishment or strengthening sector-specific centres of excellence and/or government-industry industry clusters in each province to foster the development of innovative environmental technology solutions to global environmental problems. Such centres should bring together the academic, marketing, business development and financial management competencies needed to facilitate the development and commercialization of innovative technologies, services and environmental solutions required in the national and international marketplace. These centres and clusters should be established only where there is a clearly defined, actual or potential critical mass, and a market sufficient to warrant any required investment. For the most part, these centres should be industry led. Green Buildings/Sustainable Construction, Water/Wastewater, Alternative Energy Sources and Contaminated Site/Brownfield Remediation are the most obvious new candidates in this regard. Existing centres and initiatives targeted to this or similar ends should be reviewed to gauge their actual effectiveness.
2. A comprehensive research program specific to each province be launched to identify barriers limiting the adoption of innovative technologies and related environmental solutions by municipalities, government departments and agencies and by major industry players in each sector. This should be followed by risk reduction strategies and/or the provision of incentives for the early adoption of innovative technologies, and such industry capacity building measures as:
    - Business leaders' forums to build industry understanding of the importance of supporting enabling technologies and solutions upon which future commercial success depends.
    - Targeted programs to support the re-design, re-engineering, and retrofitting of production processes and product lines to increase business resource efficiency and waste reduction in specific sectors, particularly those that face intense competition or that compromise local liveability standards;
    - Linking infrastructure renewal dollars to the degree of innovation and local content an organization (i.e. municipality) has included in its funding submission. This could create a stronger presence for local entrepreneurs in local markets without being perceived as being an industry hand-out.
    - Targeted strategies for import substitution in those environment-related areas where Western Canada is dependent upon imported products and technologies, primarily in the water/wastewater, solid waste management, air quality management, contaminated site remediation and energy sectors.

3. The creation of a comprehensive marketing program to build national and international recognition of Western Canada's environmental excellence through collaborative programs involving technology demonstration projects; market development and networking activities; and national and international promotional efforts designed to attract new customers and new investment to the sector. This initiative must be carefully choreographed so as to reach the right market audiences in languages that they understand and be supplemented by site visits, focused trade fair/conference presentations, sponsored buyer missions, demonstration projects and on-line and printed materials.
4. A program to support demonstration projects, particularly involving large scale, real-world urban showcase sites where Western Canadian environmental technologies, products and services can be tested, verified and displayed in order to attract new national and international customers, and to foster their adoption by local industries and municipalities.
5. A pan-Western initiative to encourage venture capital and investment financing in the environmental technologies sector by removing or reducing the risk factors associated with technology verification and commercialization; by providing fiscal incentives to stimulate capital investment in the environmental business sector; and by supporting specialized technical conferences and venture capital venues where investors and potential customers can interact with government agencies, technology research and development organizations, and industry and professional associations. This program could involve an annual venture capital fair in western Canada. Such measures are essential to close the R&D innovation/adoption gap that is behind the inability of environmental firms in Western Canada to attract early stage, proof of concept funding.
6. A review should be carried out of the merits of adopting financial incentives similar to those used in other sectors (e.g. fiscal regimes for oil sands development) in the environmental business sector. Financial incentives such as provincial R&D tax credits, renewable energy incentives etc., and other fiscal measures should be examined to determine their overall economic impacts and technology development potential.
7. The provision of on-going mentoring for small and medium-sized enterprises in environmental business sectors by working with individual firms and industry associations to improve environmental technology development and commercialization; to provide the tools and up to date intelligence needed to penetrate new markets; and to establish mutually supportive networks to promote the delivery of flexible solutions and technologies for local, regional and international customers.
8. A comprehensive review of current government funding programs that support small and medium sized enterprises in the continuum of activities from research and development through to technology development and commercialization. This would include such federal programs as IRAP's Pre-commercialization Assistance Program and the Program for Export Market Development (PEMD). This review should bring forward recommendations on:
   - Improved coordination between available programs;
   - Providing more consistency in focus from one jurisdiction to the other;

- Simplifying access to and administrative processes associated with these programs; and
- Instituting provisions for affordable, repayable financing for early stage product development.

9. A comprehensive review of government policies, federally, provincially and municipally to ensure that public policy supports private initiative in developing the environmental technology sector. E.g. procurement policies, regulations that impact on demonstration projects etc.

Finally one of the most important elements of any strategy to energize the Western Canadian environmental business sector is the need for all key stakeholders involved to believe in the potential of the sector and to champion its causes. This means that all levels of government and in particular key agencies such as the overseas missions of DFAIT, the on-line services of Industry Canada and other Departments, must recognize and help to promote Western Canada as a source of innovative expertise and technologies for a world very much in need of what we have to offer.

At the Environmental Technologies Forum it is hoped that one or more strategic initiatives recommended herein will be adopted to help enterprises across Western Canada to pursue the business of the environment.

Appendix: The Environmental Business Sector Assessment Process

The Manitoba SWOT analysis was undertaken as part of an industry study that Western Economic Diversification funded in 2002. Acumen Research undertook an in depth analysis of the industry and the Prairie Centre for Business Intelligence was then retained to develop a SWOT analysis out of this in early 2003. The studies were proposed and directed by the Manitoba Environmental Industries Association and Western Economic Diversification was one of a number of funds providers. The Industry was seeking this information as part of a re-strategizing of Association activities and how the Association could better respond to the needs and requirements of their membership. The results of the study and SWOT were shared with all industry members at an Association meeting. The study has been the basis of much of the work since that time that the department has undertaken in consultation with the Association.

The Saskatchewan Environmental Industry and Managers Association (SEIMA) was asked to do a survey and SWOT analysis of the Environmental Industry in Saskatchewan. Funding Partners include the International Trade Centre, the Saskatchewan Departments of the Environment and Industry and Resources, IRAP and Industry Canada. A phone and e-mail survey was conducted in October and November. Two Stakeholder Sessions - one involving consumers of environmental technology and another with producers of environmental technology were held as well in Saskatoon.

CETAC-West was asked to complete the assessment of Alberta's environmental technologies industry with particular focus on identifying challenges and opportunities as well as recommendations for collaborative action. The report, produced in the form of a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats), focuses on the technical and business capabilities of local companies and industry in general. The CETAC-West study includes: a review of existing literature and studies; an analysis of industry structure and performance characteristics based on the industry database maintained by the Environmental Services Association of Alberta; a focus-group survey of CETAC-West clients; and an additional focus-group survey of Alberta environmental product and service providers. The final report provides an analysis of existing sector studies and offers a comparison to national data to identify areas where the Alberta environmental industry is particularly strong.

The GLOBE Foundation of Canada undertook the assessment of the British Columbia environmental business sector. Information was gathered from many sources including government departments and agencies; joint government-industry partnerships in the environmental sector; universities and applied technology research organizations; private companies; and other organizations with links to key environmental markets. As requested by Western Economic Diversification, the BC review was not based on any new surveys. Rather, it built on the conclusions of work already completed to articulate a number of action-oriented strategic recommendations at the Environmental Technologies Forum. Two stakeholder meetings were held during the preparation of the report. The first involved a select contact group drawn from government, industry and academia helped to set the parameters for the analysis. The second held on October 28th 2003 involved a larger group of business leaders, industry experts and government officials and provided invaluable assistance in focusing attention on the most critical issues affecting the business of the environment in British Columbia.