

strategic audit of
victorian industry



A Report On Victoria's
Environmental Management and Renewable Energy Industries
October 2001



Table of Contents

1	EXECUTIVE SUMMARY	6
1.1	Background	6
1.2	Industry Structure	7
1.3	Strategic Directions for the Industry	7
	1.3.1 <i>Creating Industry Coherence</i>	8
	1.3.2 <i>Building Business Capability and Expertise</i>	9
	1.3.3 <i>Promoting R & D and Commercialisation</i>	10
	1.3.3.1 <i>Private Sector</i>	10
	1.3.3.2 <i>Universities</i>	10
	1.3.4 <i>Building Demand for Industry Products and Services</i>	10
2	SUMMARY OF RECOMMENDATIONS	12
3	INTRODUCTION	17
3.1	Why Audit the Environmental Management and Renewable Energy Industries?	17
3.2	Scope and Objective of the Strategic Audit	18
	3.2.1 <i>Renewable Energy Action Agenda</i>	18
	3.2.2 <i>Environment Industry Action Agenda</i>	19
3.3	Strategic Audit Process	19
4	BACKGROUND	23
4.1	Introduction	23
4.2	Industry Definition	24
4.3	Industry Structure	25
	4.3.1 <i>Industry Organisations</i>	27
	4.3.2 <i>Other Stakeholders</i>	27
5	STRUCTURE, CONDUCT AND PERFORMANCE	29
5.1	The Global Environment Market	29
5.2	The Australian Environment Market	30
	5.2.1 <i>Environment Protection Expenditure by Users</i>	30
	5.2.2 <i>Environment Protection Expenditure by Category</i>	31
	5.2.3 <i>Environment Protection Industry Producers</i>	32
	5.2.4 <i>Environment Industry Operation</i>	34
	5.2.5 <i>Expenditure on Environmental R & D</i>	36
	5.2.6 <i>Trade in Environmental Goods & Services</i>	37
	5.2.6.1 <i>Exports of Environmental Goods</i>	37
	5.2.6.2 <i>Imports of Environmental Goods</i>	39
	5.2.6.3 <i>Major Markets and Suppliers</i>	41
	5.2.7 <i>Renewable Energy</i>	45

6	RESEARCH AND PRODUCT DEVELOPMENT	47
6.1	Research Centres	47
6.2	R & D Commercialisation	48
6.2.1	<i>Environmental Technology Verification (ETV)</i>	49
6.2.2	<i>Demonstration Sites</i>	50
6.2.3	<i>Small Business Access to R & D Grants</i>	51
6.2.4	<i>Lack of Investment Capital</i>	52
6.2.5	<i>Protection of Intellectual Property</i>	52
6.3	Barriers to Commercialisation in Universities	53
6.3.1	<i>Research Entrepreneurship</i>	53
6.3.2	<i>Funding Gaps</i>	54
6.3.3	<i>Technology Incubators</i>	54
6.3.4	<i>Poor Links Between the Environmental Management and Renewable Energy Industry and Universities</i>	55
6.4	Cooperative Research Centres	55
7	KEY INDUSTRY DRIVERS	57
7.1	Growing Awareness of Environmental Issues	58
7.1.1	<i>Water Quality and Groundwater</i>	59
7.1.2	<i>Greenhouse</i>	59
7.1.3	<i>Oil Depletion</i>	61
7.1.4	<i>Air Quality</i>	62
7.1.5	<i>Noise</i>	63
7.1.6	<i>Salinity</i>	63
7.1.7	<i>Contaminated Sites</i>	64
7.1.8	<i>Bio-diversity</i>	64
7.1.9	<i>Litter</i>	65
7.1.10	<i>Municipal and Industrial Waste</i>	65
7.2	Government Legislative and Policy Priorities	65
7.3	Economic Growth	66
7.4	Business Best Practice	68
7.5	Regulation	68
7.5.1	<i>State Government</i>	69
7.5.2	<i>Federal Government</i>	70
7.6	Technological Developments	70
7.7	Other Drivers	71
7.7.1	<i>Environmental Management Industry</i>	71
7.7.2	<i>Renewable Energy Industry</i>	72
8	OPPORTUNITIES AND IMPEDIMENTS, STRENGTHS AND WEAKNESSES	73
8.1	INDUSTRY WIDE FACTORS	73
8.1.1	<i>Industry Fragmentation</i>	73
8.1.2	<i>Technology Activities</i>	73
8.1.3	<i>Environmental Awareness</i>	74

8.1.4	<i>Government of Victoria – Providing A Level Playing Field/Solving Environmental Problems</i>	74
8.1.5	<i>Networks and Leadership</i>	75
8.1.6	<i>Good Technology But Little International Marketing</i>	76
8.1.7	<i>Technical Assistance – Breaking the International Barriers</i>	77
8.1.8	<i>Standards of Measurement & Certified Reference Materials</i>	77
8.2	Specific Sectors	78
8.2.1	<i>Water and Wastewater</i>	78
8.2.2	<i>Waste and Recyclables Management</i>	79
8.2.2.1	<i>Waste Avoidance</i>	79
8.2.2.2	<i>Recycling Practices and Solutions</i>	79
8.2.2.3	<i>Refuse Management</i>	80
8.2.2.4	<i>Refuse to Energy</i>	80
8.2.2.5	<i>Methane Extraction</i>	81
8.2.3	<i>Air Quality Monitoring Solutions and Equipment</i>	81
8.2.4	<i>Noise and Vibration Monitoring and Abatement Equipment</i>	82
8.2.5	<i>Energy Conservation / Energy Efficiency</i>	82
8.2.6	<i>Solar Hot Water and Photovoltaics</i>	82
8.2.7	<i>Wind Energy</i>	83
8.2.8	<i>Mini and Micro Hydropower</i>	84
8.2.9	<i>Fuel Cells</i>	84
9	ADDRESSING THE CHALLENGES	85
9.1	<i>Main Challenges Faced by the Industry</i>	85
9.2	<i>Key Directions to Face Industry Challenges</i>	85
9.2.1	<i>Create a Vision for the Future of the Industry</i>	86
9.2.2	<i>Establish Structures and Mechanisms to Create Greater Industry Coherence</i>	88
9.2.2.1	<i>Victorian Environment Industry Round Table</i>	88
9.2.2.2	<i>Environment Industry Development Council</i>	89
9.2.2.3	<i>A Centre of Environment Industry Excellence</i>	90
9.2.3	<i>Developing Business Skills</i>	91
9.2.3.1	<i>Product Development and Marketing</i>	92
9.2.3.2	<i>Management and Finance</i>	93
9.2.3.3	<i>Exports</i>	94
9.2.3.4	<i>Networking</i>	94
9.2.4	<i>Improving Access to Business Finance</i>	96
9.2.5	<i>Promoting Research, Development and Commercialisation</i>	98
9.2.6	<i>Government Providing Leadership and Support</i>	100
9.2.6.1	<i>Establishing A Policy Framework</i>	100
9.2.6.2	<i>Facilitating Access to Grants</i>	101
9.2.6.3	<i>Government Procurement Policies</i>	101
9.2.6.4	<i>Linking Industry with Government Environmental Programs</i>	102
9.2.6.5	<i>Making Victorian Manufactures Environmentally Competitive</i>	103
9.2.6.6	<i>Internalising Externalities</i>	104
9.2.7	<i>Promoting Community and Business Awareness of Sustainable Development Issues</i>	107

10 CONCLUSION	109
APPENDICES	110
APPENDIX 1	111
SUMMARY OF CONSULTATIONS	112
Scope of the Consultation Process	112
General Issues Raised during the Consultation Process	112
<i>Green Taxes</i>	113
<i>Tenders and Contracts</i>	113
<i>Regulations</i>	113
<i>Intellectual Property</i>	114
<i>Technology Verification</i>	114
<i>Research and Development</i>	114
<i>Education and Training</i>	115
<i>The Role of Industry Associations</i>	115
<i>Access to Government Grants</i>	115
<i>Finance</i>	116
<i>Certified Reference Materials (CRMs)</i>	116
Specific Issues Raised during the Consultation Process	117
<i>Recycling and Waste Management Issues</i>	117
<i>Critical Mass</i>	117
<i>Transport Costs</i>	117
<i>Green Waste</i>	117
<i>Fuel Subsidies</i>	118
<i>Education</i>	118
<i>Costs of Waste Disposal</i>	118
<i>Environmental Consulting and Engineering Issues</i>	118
<i>Drivers</i>	118
<i>Regulations</i>	119
<i>Contaminated Soil</i>	119
<i>Profile</i>	119
<i>Competitive Environment</i>	120
<i>Solar & Renewable Energy Issues</i>	120
<i>Definition</i>	120
<i>Energy Efficiency</i>	120
<i>Grid Interactive</i>	121
<i>Photovoltaics Rebate Scheme</i>	121
<i>Education</i>	121
<i>Green Power</i>	122
<i>Energy Market Reform</i>	122
<i>Energy from Waste</i>	123
<i>Carbon Trading & Kyoto</i>	123
Consultation Participants	124

APPENDIX 2	128
DATA PROBLEMS	129
APPENDIX 3	131
INDUSTRY SECTORS	132
Air Quality Management	132
Water and Wastewater Management	132
Solid Waste and Recyclables Management (including Industrial Waste and Recyclables Management)	134
Remediation / Clean Up of Soil and Water	136
Noise and Vibration Monitoring, Modelling and Abatement	136
Cleaner Production Systems and Technology	137
Renewable Energy	138

EXECUTIVE SUMMARY

1.1 Background

The strategic audit of the Environmental Management and Renewable Energy industries has been conducted as part of the Victorian Government's commitment to industries with potential for growth and to develop strategies needed to pursue that growth potential.

For the purposes of this audit we have consulted businesses that can be placed within the following OECD definition:

“The environmental goods and services industry consists of activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and (ensure that) resource use (is sustainable).”¹

This strategic audit has been complicated by the lack of data on the industries, as activity in these industries is allocated to other industries as for instance to the plumbing industry, the professional and technical services industries, and manufacturing industry. The ABS is preparing a new survey of environment expenditure, due in 2001 or 2002 which may address some of these shortcomings.

Estimates put expenditure on Environmental Management in Australia at \$8.6 billion in 1996-97, which represents approximately 1.6% of GDP. National employment is estimated at 123 000 people. The Federal Government's Action Agenda aims to boost the annual turnover within the Australian environment industry to over \$40 billion by 2011².

The global market was estimated to be around \$US513 billion in 2000 and is growing at a greater rate than the global economy.

The Renewable Energy sector is separate from and considerably smaller than the Environmental Management sector. Total Renewable Energy sector sales in Australia in 1998 were \$1.2 billion. The Commonwealth Government's Renewable Energy Action Agenda estimates that the industry has the potential to grow to about \$4 billion in the next 10 years.

¹ OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, p9.

² Environment Industry Action Agenda

1.2 Industry Structure

The Environmental Management and Renewable Energy sectors are structurally different and, in many cases, face different issues. However the demand for the products and solutions provided by either of these industries is derived from efforts to avoid, mitigate or solve environmental issues.

The Victorian industry is fragmented, making it difficult to compete in domestic and export markets.

The majority of the companies in these industries are small to medium sized firms, which have emerged over the last 25 years. The majority of the companies are located in the Melbourne metropolitan area. A proportionally larger number of Renewable Energy sector companies are located in regional Victoria. Government ownership is predominant in the corporatized water and waste-water industry.

The application of technology in these industries is constrained by the relatively small size of the Australian market. Technology providers have achieved less market penetration than competitors in Europe and the US, though there are some excellent niche providers. As average household income in an economy increases, individual demand for a clean environment increases, as does public pressure to do more to protect the environment. This is an important driver of the industry.

The Government is also a key industry driver through environmental policy and regulation established to avoid, mitigate or solve environmental issues. Regulations create and increase demand for Environmental Management and Renewable Energy products and solutions (as for instance, the Commonwealth's Mandated Renewable Energy Target set in place to reduce the dependence on and growth of fossil fuels and associated greenhouse emissions).

A vibrant local industry would ensure that local skills are available to develop and implement the best environmental solutions for local problems.

1.3 Strategic Directions for the Industry

The Consultation identified four key strategic directions for the industry that are comprised of a number of specific elements. In summary the strategic directions are:

- Creating industry coherence.
- Building business capability and expertise.
- Promoting R & D and commercialisation.
- Building demand for industry products and services

In some cases, the directions and initiatives identified by the consultations are in part, being addressed or considered, by Government. However, the views expressed and the directions identified by the consultations may serve to reinforce or have Government reflect on its directions and priorities.

1.3.1 Creating Industry Coherence

The industry is fragmented into many sub-sectors with little formal or informal connection between them. There is a lack of vision for the future of the industry both within the membership of the industry and within Government.

Industry see the development of a long term plan as a means of crystallising this vision and creating some certainty about the social and economic parameters, especially the demand parameters, in which the industry is likely to be operating in the longer term.

Government is perceived by the industry as primarily determining or influencing these parameters by reflecting community expectations in environmental policies and programs and in influencing demand for products and services through its legislative and regulatory powers

A stable framework allows the industry to better forecast future demand for its products and services and establish a more certain and stable domestic market base. While stability of the regulatory and policy framework is important it also needs to be flexible enough to respond to rapidly changing circumstances.

With a more stable domestic market base, the Victorian industry can pursue more risky and uncertain markets in Asia, Russia and South America and target large, highly competitive markets in Europe and the US.

Consequently industry wants to work closely with the Victorian Government to develop a long-term plan for the industry.

Industry also sees a pressing need to establish greater coherence across the sub-sectors in order to:

- Better represent their interests and views to Government,
- Establish alliances and joint ventures to pursue export opportunities.
- Address challenges and shortcomings commonly experienced across the industry.

Three key actions have been identified by the industry to increase industry coherence:

- Industry establishing a Victorian industry round table.
- Industry and government establishing a Centre for Environment Industry Excellence.
- Government establishing an Environment Industry Development Council to promote the development of the environmental management and renewable energy industry in Victoria.

1.3.2 Building Business Capability and Expertise

Many enterprises within the industry, while offering high quality products and services, lack business capacity and skills to:

- Access finance.
- Develop and implement business plans.
- Develop and market their products or services.
- Develop export markets.
- Develop industry and export networks.

As a consequence many enterprises in the industry fail to think and act strategically, to assess and pursue business opportunities and in some cases to build a strong profitable business. Many are highly risk averse because of a lack of skills and business systems that would allow them to better assess and manage risk.

In this industry, where new opportunities and challenges are continually emerging and where access to finance is limited by the financial market's ignorance of the risk profile, a lack of business skills severely limits access to seed and working capital and the growth potential of many enterprises.

These shortcomings are magnified in export markets where competition is vigorous and most industry members lack knowledge of market dynamics and do not have the contacts or the networks to pursue opportunities.

1.3.3 Promoting R & D and Commercialisation

1.3.3.1 Private Sector

Innovation through the commercialisation of R & D provides the industry with an important competitive edge.

However private sector R & D is constrained by a lack of access to research funding, inadequate pilot and demonstration facilities, a lack of technology verification mechanisms and a degree of market failure to take up new technologies.

Lack of protection of intellectual property in some key Asian markets is also a disincentive to commercialisation of products designed primarily for these markets.

1.3.3.2 Universities

There are significant opportunities for industry development by building on the research and commercialisation capabilities of the universities through cooperation between industry, government and the universities.

1.3.4 Building Demand for Industry Products and Services

The total domestic demand for the products and services of the industry is comprised of business, household and government demand.

The industry sees government action to establish a strong base of domestic demand as supporting and enabling greater risk taking, innovation and export market penetration.

Household and business demand can be increased by:

- Raising community and business awareness of environmental issues and values.
- Promoting the take up by Victorian business of triple bottom line goals, action plans and reporting consistent with best practice standards set by the Global Reporting Initiative.
- Establish triple bottom line accounting standards or the introduction of environmental accounting (increasingly required from suppliers by global manufacturers).
- Further regulating for and informing business on cleaner production methods.

- Using Government programs to promote business pursuit of environmental objectives through the use of policy and funding guidelines.
- More broadly pursuing “polluter pays” principles.
- Communicating the cost of poor environmental performance to business and the community including the cost of resource wastage, abatement and treatment and the loss of shareholder value in companies that are not environmentally sustainable.

Government demand can be increased through the application of sustainable development principles to government procurement.

2 SUMMARY OF RECOMMENDATIONS

The following priority initiatives are recommended to develop the Environmental Management and Renewable Energy industries.

KEY DIRECTIONS TO FACE INDUSTRY CHALLENGES

Create A Vision for the Future of the Industry

Recommendation 1

That members of the Environmental Management and Renewable Energy sectors

- Establish working groups within the proposed new industry round table (*see Recommendation 2*) to develop a vision for the sectors.
- Work with Government to develop a long term planning framework for the sectors.
- Work cooperatively with emerging national industry bodies to integrate the vision and planning framework into a national context.

Establish Structures and Mechanisms to Create Greater Industry Coherence

Recommendation 2

That members of the Environmental Management and Renewable Energy sectors in conjunction with the Victorian Government:

- Establish an industry round table to act as a facilitator and coordinator for the whole sector.
- Investigate the feasibility of establishing:
 - An independent Environment Industry Development Council to promote the development of the Environmental Management and Renewable Energy industry in Victoria.
 - A Centre of Environmental Excellence.
- Investigate the feasibility of establishing a funded secretariat for the round table.

Developing Business Skills

Recommendation 3

That the Victorian Government consider means of providing improved access of enterprises with the industry to business development programs to:

- Support business diagnostics and business planning, and develop financial strategies.
- Enhance marketing and product development expertise in the industry especially in shifting firms from the current “technology focus” to a “consumer requirement” focus.
- Develop export market expertise, knowledge and capability.
- Identify key environment industry trade fairs and missions in targeted international markets and technology development centres.
- Undertake detailed, practical research into key markets for the greatest export opportunities for each industry sub sector.
- Assist and encourage networking and collaboration.
- Create clusters and networks of firms, especially SMEs, to penetrate export markets together.
- Establish networks of experienced and successful firms that would act as lead contractors and smaller, sub-contracting firms to penetrate export markets together.
- Use of e-commerce and the Internet to build networks into export markets.

Recommendation 4

The industry with the support of the Victorian Government promote greater opportunities in and industry up take of business training especially in relation to:

- Understanding the business opportunities arising out of moves towards environmental sustainability.
- Understanding environmental sustainability as a business objective.
- Management.
- Marketing.
- Entrepreneurship.

Recommendation 5

The industry, with the support of the Victorian Government, promotes the establishment of *Enviro 2000* in Victoria.

Improving Access to Business Finance

Recommendation 6

That the industry, with the support of the Victorian Government:

- Inform potential financiers on opportunities in the environment industry and in realistically assessing risk in the industry.
- Investigate opportunities to pursue financing opportunities through ethical investment or environmental risk assessment.
- Investigate opportunities to pursue financing opportunities through the Technology Commercialisation Program.
- Liaise with Victorian EPA on work it is doing with the finance sector in relation to the MOU with UNEP.

Recommendation 7

That the Victorian Government explore means of facilitating access to private sector:

- Seed capital for commercialisation and product development.
- Market development capital.

Promoting Research, Development and Commercialisation

Recommendation 8

The Victorian Government promote R & D and commercialisation in the industry by:

- Supporting or creating initiatives to further strengthen the rapid uptake of new technologies by business.
- Supporting the establishment of a national Environmental Technology Verification facility in Victoria.

- Supporting the establishment of facilities to demonstrate the effectiveness of new technologies.
- Facilitating access of environmental industry firms to funds for commercialisation of technologies.
- Supporting and implementing coordinated industry access to Federal and State Government R & D grants, especially to assist SME access.
- Consult with the Federal Government on means of developing stronger science and technology treaties (GATS) with key markets for the industry's products and services where protection of intellectual property is a problem for the Victorian industry.

Recommendation 9

The Victorian Government with the industry promote R & D and commercialisation in Victorian universities by:

- Negotiating with universities, means of establishing incentives to encourage commercialisation and entrepreneurial activity by university researchers.
- Supporting university initiatives to increase their access to funding for commercialisation of their intellectual property and seek new models for capital provision.
- Establishing mechanisms for creating and sustaining close links between university R & D activities and the Environmental Management and Renewable Energy sectors.

Government Providing Leadership and Support

Recommendation 10

That the Victorian Government provide support for the industry by:

- Working with industry to lift, over a 10 year period, the environmental performance of Victorian elaborately transformed manufactures (ie. the products) to match the performance standards expected in northern Europe (eg. Germany, the Netherlands, Denmark, Sweden) by 2010
- Implementing environmentally sustainable solutions (especially in government owned enterprises like Melbourne Water)

- Facilitating rapid uptake of new technologies by promoting the benefit of setting goals and establishing action plans for and reporting on triple bottom line objectives.
- Publishing government initiatives and progress in implementing environmentally sustainable solutions
- Facilitating rapid uptake of new technologies by including sustainable development considerations and principles in government procurement and in appropriate government funded business development initiatives.
- Recognising environmental and lifecycle costs in all government programs and tenders.
- Initiating or strengthening regulatory and financial incentives to increase industry uptake of cleaner production methods and promoting a more rapid move to sustainable production methods.
- Pursuing wherever possible the internalising of external costs (ie put a price on pollution or on resource use where the current market price does not reflect the true cost of using the resource or of polluting the environment)

Promoting Community and Business Awareness of Sustainable Development Issues

Recommendation 11

That the industry in cooperation with the Victorian Government:

- Raise community awareness of the importance of environmental sustainability and of solutions provided by the industries.
- Educate business and the community about the cost-benefits of cleaner production methods and the pursuit of sustainable development.

3 INTRODUCTION

3.1 Why Audit the Environmental Management and Renewable Energy Industries?

The Government is undertaking a series of strategic audits of Victorian industries to identify the areas of greatest potential and the strategies needed to develop this potential. The strategic audits will lead to the development and implementation of a series of sectoral plans for the industries.

The Environmental Management and Renewable Energy industries are seen as having considerable emerging prospects with good growth and exporting potential.

“As environmental standards develop across the globe, the environment technologies and services industry will provide one of the biggest opportunities for enterprise and technical innovation that the world has seen. It will generate profits, trade, employment and technological advances in both rural and urban settings as well as protect the environment.”³

“The impact (of sustainability) on business modes will be as far reaching in its affect as steam power and railways were in the past and as the revolution in information technology is in the present day.”⁴

Supporting the development of these industries can contribute to providing better solutions to environmental problems and in growing export markets for these products and services.

The consultation process clearly indicated that the industry does not perceive itself as “emerging”, but rather as relatively mature with well-developed technologies.

The rate of uptake of Environmental Management solutions and products has not been as high in Australia as in Europe and North America, except perhaps in recycling services. In this context there is considerable potential for market development in Australia and overseas.

There is a general agreement within the industry that there is good growth potential, especially given the global focus on environmental issues including global warming, urban environment, soil degradation (salinity) and the health of bays and waterways.

³ Merlin Hyman in the UK quoted by Fiona Wain CEO, Environment Business Australia Presentation to the National Trade Consultations Inter-sessional Meeting 10 May 2001. DFAT. Canberra

⁴ Environment Industry Action Agenda quoted by Fiona Wain CEO, Environment Business Australia Presentation to the National Trade Consultations Inter-sessional Meeting 10 May 2001. DFAT. Canberra

The rate of uptake of Environmental Management solutions and products drives the growth of the industry.

3.2 Scope and Objective of the Strategic Audit

The strategic audit has explored key strategic questions and has gathered inputs for shaping the future direction of the industry.

The objective of the strategic audit has been to assess the industries' capabilities and prospects in a way that:

- Can inform the Victorian Government's policy positions and program initiatives;
- Stimulate complementary initiatives by firms, industry associations, unions, environment groups and the Commonwealth Government;
- Strengthen the relationship between the Department of State and Regional Development and the industry; and
- Assists in building an effective and cooperative relationship between the Government and the industries and related institutions.

The findings of this Audit of the Environmental Management and Renewable Energy industries are consistent with the directions identified in the Federal Government's Renewable Energy Action Agenda and the Environmental Management Action Agenda.

3.2.1 Renewable Energy Action Agenda

Our analysis of the Renewable Energy industry is reinforced by the findings of the Renewable Energy Action Agenda developed by the Department of Industry, Science and Resources during 1999 and 2000.

The industry has identified the following six priority actions:

- Leverage the effects of the mandated renewable energy requirements into business opportunities for Australian companies;
- Promote industry benefits to customers and the community;
- Remove impediments to renewable energy in the National Electricity Market;
- Form a Peak Industry Forum;
- Develop an integrated export strategy; and

- Actively engage the investment community.

Industry stakeholders believe that the greatest benefit will be conferred on Victorian industry with a concentrated national export effort, though the industry would like additional focus be directed by Victorian Government support for export development of the Environmental Management and Renewable Energy industries.

3.2.2 Environment Industry Action Agenda

The Environment Industry Action Agenda is focused on developing a sustainable and internationally competitive environmental industry in Australia, able to capitalise on both domestic and international market opportunities.

The Federal Government's Action Agenda was endorsed by industry in 2001 and forwarded for Cabinet consideration.

3.3 Strategic Audit Process

The Audit process sought to:

- Elicit a comprehensive range of industry views;
- Identify key impediments and opportunities;
- Obtain additional information about the regional aspects of the industry; and
- Identify options for future strategy and action.

The strategic audit was completed over a twelve month period, from the initial research stage, through the discussions with the Industry Reference Group and the completion of the final report.

The industry was initially defined as a single sector. However, stakeholders perceive themselves as belonging to several different sub sectors, the major sub sectors being:

- Solid and Industrial Waste Management
- Water and Waste-water
- Air Quality Management
- Monitoring and Measuring Equipment and Systems
- Renewable Energy

- Energy Management and Energy Efficiency

These segments are quite diverse and the stakeholders are usually only knowledgeable about their own sub sector.

As a result of the consultation it has become clear that the industry is most appropriately seen as comprising businesses that enable other sectors of the economy to maintain or improve their environmental performance, and as a consequence, their financial performance. While it was not intended that the Audit cover all elements of the environment industry it will be appropriate for future consideration of the industry to take a broader view of it.

As a first step a number of the recommendations of the Audit reflect the need to take this broader view of the industry.

A broader view of the industry would include sub-sectors such as:

- Green Manufacturing
- Green Design
- Repair industry
- Waste warehousing
- Green Information Industry (including Green Education and Ethical Investment)

The Environment Industry tended to be confused in the minds of some stakeholders with “the environment” because of the close interrelation between environmental problems and the solutions provided by the industry.

We have aimed to keep a strict focus on the development of the Environmental Management and Renewable Energy industries rather than on directly addressing environmental problems and promoting sustainable development.

It should be recognised however that Government, through its public legislative role, will make decisions which impact on environmental issues and values and therefore on the Environmental Management and Renewable Energy industries.

Striving for a better balance in the development of the economy is a mark of developed nations, and it can be expected that the public will increasingly demand from governments a better environment and sustainable development practice.

By undertaking this audit, we attempted to illuminate the driving factors and the interdependencies between environmental problems and the industries audited in order to better inform policy makers.

The lack of industry statistics and industry information has meant that the strategic audit was a discovery process, relying heavily on qualitative information from stakeholders and organisations.

The initial steps in the audit involved desktop research supported by introductory interviews with a small subset of stakeholders. These interviews provided qualitative data and an indication of what issues were generally important to industry stakeholders. The background to the industry and industry issues were summarised in a short discussion paper, which prior to publication was circulated to and refined in conjunction with a number of Government Departments and Authorities.

The discussion paper was mailed to approximately 750 industry participants, comprising:

- About 250 distributed to businesses in regional and rural areas, representing almost all such businesses;
- 300 mailed to existing DSRD contacts in the industry, mainly in metropolitan Melbourne; and
- Other industry stakeholders such as industry associations, environment groups, finance institutions with a specific interest in the sectors and energy retailers interested in renewable energy.

During the consultation period, which lasted from September to November 2000, we received fifty-one written submissions. The consultations involved a combination of individual interviews in metropolitan and regional and rural areas, regional workshops in Portland, Traralgon and Ballarat (8–12 industry stakeholders) and larger workshops in Flemington, Forest Hills and Attwood (15–40 participants at each).

Individual interviews were conducted in Shepparton and Bendigo.

Each interview and workshop covered different ground depending on the interest and background of the participants, but surprisingly all three regional workshops were dominated by a discussion of the renewable energy industry. A summary of the consultations is provided in Appendix 1.

An Industry Reference Group was convened in November 2000 with members from major industry associations, environment groups, academia and representative companies. The Industry Reference Group acted as a sounding board on the final recommendations.

Industry Reference Group members who participated in the consultations included:

- Ms Catherine Wilson, Clean Air Society of Australia and New Zealand
- Mr Barry Bowles, EBA (now EBA), Victoria
- Mr Rob Lorenzen, Australian Industry Group
- Mr Rod Menzies, Sustainable Energy Industry Association of Australia, Victorian Chapter
- Professor Frank Fisher, Monash University
- Mr Philip Sutton, Environment Victoria
- Mr Andrew Roy, Egis Consulting Australia Pty Ltd
- Mr Peter Voigt, CleanTeq Pty Ltd
- Mr Brett Thomas, Energetics Pty Ltd
- Mr Raphael Geminder, VISY Recycling

Initially the Audit Team was Ms Marianne Støttrup and Mr Paul Jancys. The Audit Report was finalised by Ken Strahan and Rachel Perkin.

4 BACKGROUND

4.1 Introduction

Environmental Management and Renewable Energy firms cover a broad range of activities including equipment and material supply, design, manufacture, logistics, service, and retail. The sector includes consulting services which comprises a large group, though often as part of a broader consulting practice.

The industry is a key enabler of business sustainability especially in the areas of agriculture, tourism, manufacturing and mining. It assists these and other sectors of the economy to become more effective and competitive in a global market that is increasingly demanding environmentally sustainable production and practices.

The industry assists business by:

- Reducing business costs and increasing efficiency through the use of environmentally sustainable products and practices.
- Broadening access to markets demanding goods and services provided in an environmentally sustainable manner.

The industry also produces important external economies by increasing external benefits and reducing external costs of environmental damage. For example, the WorldWatch Institute has estimated that over 40% of health problems worldwide have environmental causes and that this will increase to 50% by 2010. By addressing environmental impacts the industry can contribute to reducing the public and private cost of health problems.

However the industry and the community generally does not have a clear view of how environmental sustainability is best achieved. Currently a systemic framework for analysing the overall environmental impact of policies and actions by government, business and the community is not generally applied.

Rather, assessments and decisions at all levels, including within the environment industry, are largely made with a short, or at best, medium term view on a piece-meal basis. While business and the community may believe that they are acting in an environmentally responsible manner, a failure to take a long-term systemic view can result in second-best outcomes or in outcomes that are not environmentally sustainable.

Consequently, greater societal understanding of the factors and the processes that generate environmentally sustainable outcomes is required. As a key enabler of environmental sustainability, upgrading the “environmental literacy” of members of the environment industry is of utmost importance.

4.2 Industry Definition

“The environmental goods and services industry consists of activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and (ensure that) resource use (is sustainable).”⁵

The industry is comprised of a variety of sectors and specialised sub sectors making a definition of the “industry” difficult. In particular the environmental management industry and the renewable energy industry are separate and quite different industries in a number of ways and are driven by diverse factors.

There is also no “industry” specific data available to describe the activities of this “industry”. ABS collects data on environment expenditure on an *ad hoc* basis, with the next survey of environment expenditure due in 2001. This lack of specific data is reflected in the limited analysis, based largely on national data, that follows.

The industry can however, be classified into several groups with different drivers and impediments. The main groups are:

- Waste Management (mostly solid and industrial waste);
- Water and waste-water Management;
- Agricultural and Land Management; and
- Renewable Energy Supply and Installation and other specialty suppliers.

In addition to these major groups, there are a number of established niche sectors including environmental business strategies, management systems, energy management services and energy efficient technologies. There are also a number of emerging areas including green manufacturing and design.

These niche sectors have not been extensively addressed by the Audit although a number of those in the energy management sub sector are relevant to greenhouse policy.

There is a need therefore for the Industry Plan stage that will follow this Audit to consider the Environmental Management and Renewable Energy Industries separately and to include the niche energy management sub sectors in this consideration.

⁵ OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, p9.

4.3 Industry Structure

The majority of companies are small⁶ to medium-sized⁷ firms, which have emerged over the last 25 years in Victoria. There are many creative, innovative and entrepreneurial firms providing a range of solutions to environmental issues.

The majority of the companies are located in the metropolitan Melbourne area. Waste and recyclables management companies and renewable energy businesses and installations mostly operate in regional areas.

Within Melbourne a CBD or CBD-fringe location was identified as being important for consultants, though no other industry clusters were identified.

Some Local Councils had strong environmental profiles, but company location was mainly driven by facility costs and zoning.

Data on the Renewable Energy industry is not clearly separated from the Energy and Plumbing industry. These data problems are discussed in more detail in Appendix 2.

The core activities of the Environmental Management and Renewable Energy “industries” in Victoria include the sectors, products and services outlined in Table 4.1 on the following page.

The industries encompass a broad range of stakeholders, including the firms comprising innovative technology companies, manufacturing companies, construction companies, component manufacturers and consultants.

Stakeholders also include:

- Client firms – generally domestic and international manufacturers (often with in-house environmental expertise who provide direction to environmental issues and applications);
- The Government (for waste and recyclables management, water and wastewater, infrastructure and consulting);
- Other sections of Government that set environmental regulations;
- Local Government;
- Industry associations; and
- Individuals in the community who demand a clean, green and efficient environment to live in.

⁶ Less than 20 employees according to Year Book Australia, 1997 (ABS Catalogue No. 1301.0)

⁷ 20 to 100 according to Year Book Australia, 1997 (ABS Catalogue No. 1301.0)

Table 4.1 Market Segments

Segment	Services	Products	Infrastructure
Air Quality Management	Consulting, testing, computer modelling	Scrubbers, filters, air scouring equipment, computer programs	
Water and Wastewater Management	Consulting, sewage collection, treatment	Purification units, filtering equipment, bio filters, water recycling systems	Treatment plants
Stormwater Management	Consulting, treatment	Purification units, filtering equipment, bio filters, water recycling systems	Treatment units
Solid Waste and Recyclables Management	Refuse collection	Bins, compacters	Landfills, transfer stations, composting facilities
Industrial Waste and Recyclables Management (including oily waste management)	Collection, disposal, consulting	On-site/off-site processing equipment	Processing plants, sewage systems, landfills, holding tanks
Remediation, Soil & Water Clean Up	Consulting, labs, on-site remediation	Bio-scrubbers, test kits	Landfills
Noise/ Vibration Abatement	Consulting, designs	Noise control equipment, software, jet engine test cells	Reverberation testing chambers
Monitoring & Measurement Equipment	Design	Equipment	
Recycling and Resource Recovery	Collection, sorting	Processing equipment	Transfer stations
Cleaner Technology/Systems & Products	Consulting, engineering	Energy/input efficient equipment, fuel cells, rechargeable batteries	
Ecosystem Management	Consulting, replanting services		
Environmental Management Systems and Institutional Strengthening	Consulting, legislation		
Energy Management and Efficiency	Consulting, engineering	Management systems, monitoring and load management equipment	
Renewable Energy	Design, installation, sales facilitating services	Solar panels (hot water), wind turbines, PV panels, hydro generators, rechargeable batteries, inverters, enabling technologies, biogas systems (methane), fuel cells	Grids, connection lines, wind farm infrastructure

Note: Stakeholders who have provided submissions have contributed to the completion of this table.

4.3.1 Industry Organisations

Due to its fragmented nature, members of the Environmental Management and Renewable Energy sector belong to a range of industry and professional associations.

In the Environmental Management area twenty four industry associations were identified. A number of these have national coverage including the Clean Air Society of Australia and New Zealand, the Environmental Business Australia (EBA), Australian Water Association (AWA) and the Waste Management Association of Australia (WMAA).

Most of the associations represent a specific industry sub sector. Many, such as the Stormwater Industry Association of Victoria, only have statewide membership but have sister-associations in the other States.

There are fewer industry associations representing the Renewable Energy sector because it is smaller and because a number of associations amalgamated into the Sustainable Energy Industry Association in 1999.

4.3.2 Other Stakeholders

Industry associations include:

- Association of Noise Control Engineers
- Australian Acoustical Society
- Australian Association of Acoustical Consultants
- Australian Association of Natural Resource Management
- Australian Council of Recyclers
- Australian Industry Greenhouse Network
- Australian Industry Group
- Australian Institute of Energy
- Australian Water Association Inc.
- Beverage Industry Environment Council
- Buy Recycled Business Alliance
- Clean Air Society of Australia and New Zealand

- Environment Institute of Australia
- Environment Business Australia
- National Environmental Law Association
- Recycling Association of Victoria
- Stormwater Industry Association of Victoria
- The Air Pollution Control Equipment Manufacturers Association
- Victorian Association for Environmental Education Inc.
- Victorian Environment Planning and Law Association
- Victorian Water Industry Association
- Waste Management Association of Australia

In addition there are branches or chapters within the environment or energy/renewable energy area in other associations such as:

- Association of Consulting Engineers Australia
(branch: Environmental)
- Association of Professional Engineers, Scientists and Managers,
Australia (division: water, power)
- RACI

There are a number of other associations with a stakeholder role including Environment Victoria, the Alternative Technology Association (ATA), the Sustainable Energy Foundation (SEF), Australian Conservation Foundation (ACF) and Greenpeace. These professional, national and global community-based environmental organisations have memberships including industry and to private individuals and provide important community perspectives.

5 STRUCTURE, CONDUCT AND PERFORMANCE

5.1 The Global Environment Market

The global market is comprised of two distinct parts: developed economies where demand is relatively sophisticated; and developing economies where demand is dominated by the need for environmental infrastructure, for example water treatment and solid waste and recyclables disposal.

The following analysis draws heavily on work recently completed by the Centre for Strategic Economic Studies.⁸

The best overall data on the global market at the present time is that assembled by Environmental Business International Inc (EBI) and published by the U.S. Department of Commerce in *US Trade and Industry Outlook 2000*.⁹

Table 5.1 The Global Environmental Market (US\$ billion)

	1996	1997	1998 ¹	1999 ²	2000 ²	2001 ²	Change 97-02 ³ %
United States	171.8	175.5	179.4	183.4	187.4	191.5	2.2
Canada	11.6	11.9	12.2	12.5	12.8	13.1	3.0
Latin America	8.8	9.8	11.0	12.3	13.8	15.5	11.0
Western Europe	133.6	137.3	141.2	145.1	149.2	153.4	2.6
Eastern Europe/CIS	7.1	7.7	8.3	9.0	9.7	10.5	8.0
Japan	87.1	88.8	90.6	92.4	94.3	96.2	1.6
Rest of Asia	20.0	22.0	24.2	26.6	29.3	32.2	10.0
Australia/New Zealand	6.8	7.1	7.4	7.6	8.0	8.3	4.0
Middle East	4.3	4.7	5.0	5.4	5.9	6.3	5.0
Africa	2.2	2.4	2.6	2.9	3.2	3.5	10.0
Total	453	467	482	497	514	531	–

Notes: ¹Estimate. ² Forecast. ³ Compound annual rate of change.

Source: Environmental Business International (EBI) cited in U.S. Industry and Trade Outlook 2000, Department of Commerce, Washington D.C.

⁸ Centre for Strategic Economic Studies (2001) *National Capability Statement on Australia's Environment Industry*, CSES, Melbourne.

⁹ U.S. Department of Commerce (2000) *U.S. Industry and Trade Outlook 2000*, Department of Commerce, Washington D.C. See www.ntis.gov/product/industry-trade.htm

EBI put the total global environment market at an estimated US\$ 513 billion in 2000 with:

- 84 percent of revenues being earned in the United States, Western Europe and Japan; and
- The Australasian environment market worth US\$ 7.1 billion in 1997 (1.5%). It is estimated to be worth approximately US\$ 8.3 billion this year.

EBI forecasts the Australasian market will grow at a compound annual rate of four percent between 1997 and 2002.

The largest environmental markets are currently in developed countries such as Japan, the US and Western Europe. There is great potential in Asian countries where emerging economies are developing regulatory frameworks to manage the effects of rapid development on local environmental systems.

According to the analysis by the Action Agenda's joint agency team, industrialised countries remain the most important overseas markets for Australian environmental goods and services, but companies must be open to future developments and growth in the developing markets.

The analysis also concludes that to expand the Environmental Management industry, key sub sectors must reach critical mass, especially those with export potential including Environment Monitoring and Measurement and Instrumentation and Equipment¹⁰.

The segments of the Environmental Management industry are described in detail in Appendix 3.

5.2 The Australian Environment Market

5.2.1 Environment Protection Expenditure by Users

Environment protection expenditure by users shows who is using environment protection products and services.

In 1996 – 97, total environment protection expenditure was \$8.6 billion and comprised the following¹¹:

- Households were the largest end use consumers of environment protection products and services, spending \$2.64 billion. Most of this expenditure was for wastewater management (approximately 70%).

¹⁰ These together with water and waste water management are the key growth and export opportunities, according to Environment Industry Development Network Pty Ltd, 25.07.2000.

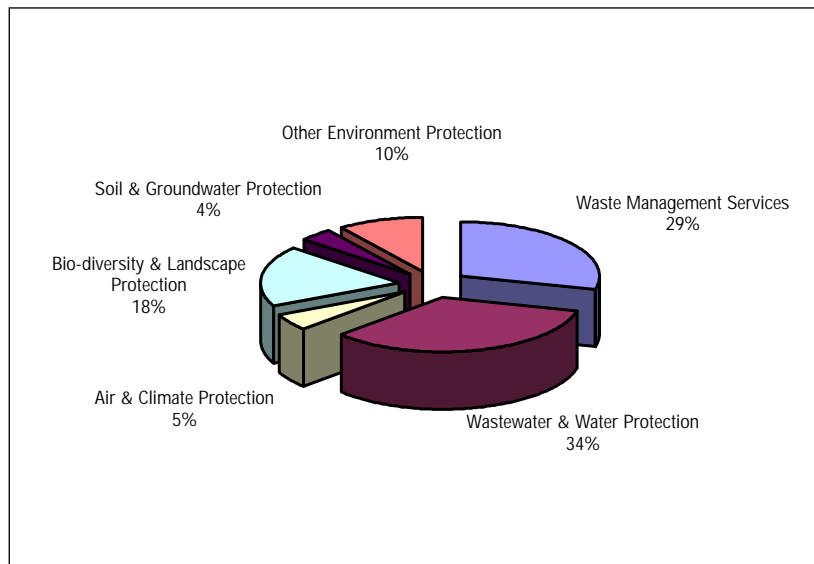
¹¹ ABS Environment Protection Expenditure (EPE) surveys.

- General government spent approximately \$2.2 billion on environment protection.
- Industry and business spent:
 - \$1.5 billion on environment protection products and services in the market;
 - \$747 million on own account expenditures to mitigate the environmental impacts of their production activities; and
 - investments \$787 million (gross fixed capital formation) in environment protection activities.

5.2.2 Environment Protection Expenditure by Category

Environment protection expenditure by product or service category indicates which products and services are in demand.

Figure 5.1 Environment Protection Expenditure by Category, 1996 – 97 (%)



Source: ABS 4603.0. CSES analysis.

The majority of national environment protection expenditure was on wastewater management and water protection (\$3 billion) and waste management activities (\$2.5 billion) (combining to represent approximately 63 percent of all environment protection expenditure).

Other expenditure on national environment protection included:

- Protection of biodiversity and landscape (18%);
- Protection of ambient air and climate (6%); and
- Protection of soil and groundwater (4%).

Less than ten percent of expenditure was for research and development.

5.2.3 Environment Protection Industry Producers

Table 5.2 Environment Protection Industry Production, 1996–97 (\$m)

	Specialist Producers			Secondary Producers	Ancillary Producers
	Government	Private	Total		
Waste Management	998	1 177	2 175	317	342
Wastewater & Water	906	2 152	3 058	118	132
Air & Climate	50	0	50	6	17
Biodiversity & Landscape	1 200	0	1 200	0	79
Soil & Groundwater	224	0	224	0	42
Other	455	0	455	108	135
Total	3 833	3 329	7 162	549	747

Source: ABS 4603.0. CSES analysis.

In 1996–97 specialist environment industry producers provided environment protection services worth \$7.2 billion which included:

- \$3.8 billion provided by government operations; and
- \$3.3 billion provided by private and trading businesses.

Secondary producers supplied environment protection products and services worth \$550 million.

Table 5.3 Listed Environment Industry Operations by Category, January 2001

Goods and Services Classes	Production of Equipment & Materials	Provision of Services	Construction & Installation of Facilities	Total
Pollution Management Group	2 013	1 603	–	3 616
Air Pollution Control	253			253
Wastewater Management	439			439
Solid Waste Management	611	209		820
Remediation/Clean-up of Soil & Water	132			132
Noise/Vibration Abatement	131			131
Monitoring/Analysis/Assessment	302	447		749
Other Services				
– Environmental R & D		137		137
– Environmental Contracting & Engineering		111		111
– Education, Training & Information		309		309
Other	145	390		535
Cleaner Technologies & Products Group	424		–	424
Cleaner/Resource-Efficient Technologies & Processes	187			187
Cleaner/Resource-Efficient Products	237			237
Other				
Resource Management Group	333*		–	333
Indoor Air Pollution Control				
Water Supply				
Recycled Materials	176*			176
Renewable Energy Plant	17*			17
Heat/Energy Saving & Management	106*			106
Sustainable Agriculture & Fisheries				
Sustainable Forestry				
Natural Risk Management				
Eco-Tourism				
Other (eg. Conservation, Habitats & Biodiversity)	34*			34
Total	2 770	1 603		4 373

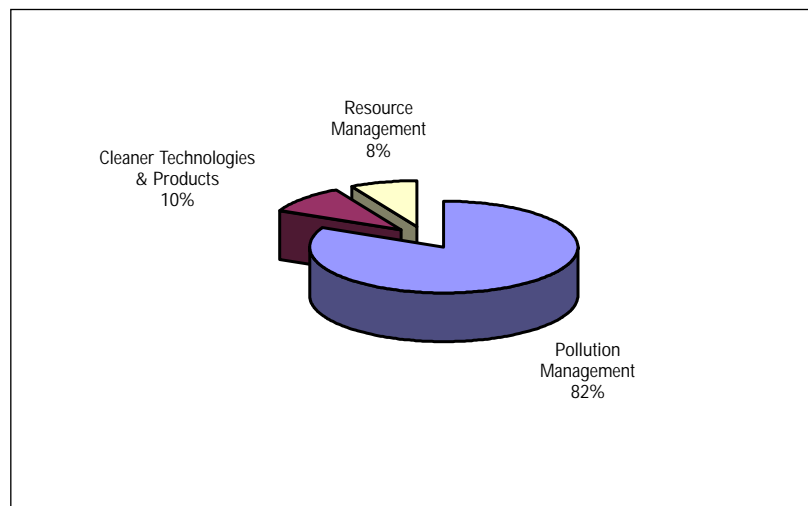
Note: *Includes equipment and services.

Source: Australia's EnviroNET, January 2001. <http://www.environet.gov.au>. CSES analysis.

5.2.4 Environment Industry Operation

In January 2001 there were 3 616 operations (entity-capability/activity registrations)¹² matching activities listed under the Pollution Management group (82%), a further 424 matching activities under the Cleaner Technologies and Products group (10%), and 333 matching activities under the Resource Management group (8%).

Figure 5.2 Distribution of Environment Industry Activities/ Capabilities, January 2001 (%)



Source: Australia's EnviroNET, January 2001. CSES analysis.

Looking at specific categories:

- The largest number of operations are listed under Solid Waste Management (almost 19% of total);
- The second largest number of operations are listed under Monitoring, Analysis and Assessment (just over 17%); and
- The third largest number of operations are listed under Wastewater Management (approximately 10%).

¹² An *operation* is an entity with an associated activity or capability. For example, if firm A lists a waste collection activity, landfill site management activities in three cities, and an engineering services office it would be counted as five operations. Similarly, a firm with branch offices in three major cities would be counted as three operations.

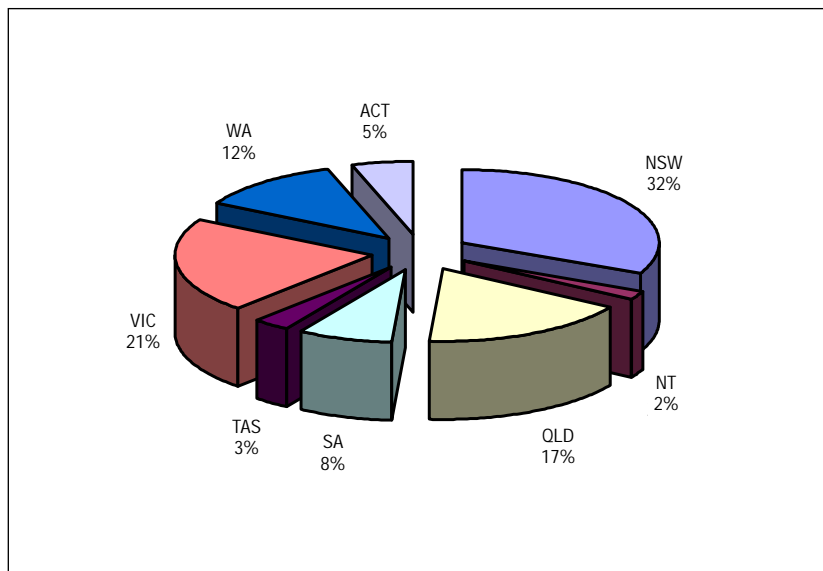
Table 5.4 Environment Industry Operations by State and Category, January 2001 (% of Responses)

	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	AUST
Pollution Management	7%	43%	3%	24%	11%	4%	29%	17%	138%
Cleaner Technologies & Products	8%	40%	4%	24%	10%	4%	30%	17%	137%
Resource Management	11%	44%	2%	23%	13%	5%	33%	17%	148%
Total	26%	127%	9%	71%	34%	13%	92%	51%	423%

Note: Multiple listings mean that totals do not equal 100%.
 Source: Australia’s EnviroNET, January 2001. <http://www.environet.gov.au>. CSES analysis.

NSW and Victoria have the largest number of enterprises within all industry sub sectors – pollution management (43% and 29%), cleaner technologies and products (40% and 30%) and resource management (44% and 33%).

Figure 5.3 Environment Industry Operations by State, January 2001 (%)



Source: Australia’s EnviroNET, January 2001. CSES analysis.

Approximately one third of the environment industry’s operations are based in New South Wales (32%).

The second largest number of environment industry operations, just over one fifth, are based in Victoria (21%).

Over one in six environment industry operations are based in Queensland (17%).

5.2.5 Expenditure on Environmental R & D

In 1998 – 99 a total of \$727 million was spent on environment related R & D.¹³ These activities involved 7 300 person years.

Table 5.5 R & D Expenditure on Environmental Issues, 1998–99 (\$m)

	Business	Federal	State Education	Higher Non- Profit	Private	Total
Expenditure						
Environmental Knowledge	16	210	81	120	2.0	429
Environmental Aspects of Economic Development	48	40	19	34	0.1	141
Environmental Management and Other Aspects	43	26	53	34	0.1	156
Total	107	276	153	188	2.2	726
Total Expenditure of All Areas	3 992	1 193	879	2 603	184	8 851
Environment Share	2.7	23.1	17.4	7.2	1.2	8.2
Human Resources (Person Years)						
Environmental Knowledge	81	1 424	736	2 107	31	4 379
Environmental Aspects of Economic Development	262	326	223	612	1	1 424
Environmental Management and Other Aspects	209	207	493	587	1	1 497
Total	552	1 957	1 452	3 306	33	7 300
All Areas	24 201	9 449	9 497	45 502	2 068	90 717
Environment Share	2.3	20.7	15.3	7.3	1.6	8.0

Note: By socio-economic objective.
Source: ABS 8112.0.0

¹³ ABS (various years) *Research and Experimental Development, Australia: All Sector Summary*, 8112.0, Canberra.

Expenditure on environment related R & D constituted 8.2 percent of all R & D expenditure by socio-economic objective and occupied 8 percent of the total person years involved in R & D.

The Commonwealth Government spent \$276 million on environmental R & D in 1998–99 (38% of the total expenditure on environmental R & D).

Other sources of expenditure on environmental R & D included:

- Higher Education – \$188 million (26%)
- State Government – \$153 million (21%)
- Business – \$107 million (15%)

Higher Education provided 3 306 person years to environmental R & D in 1998–99 – the largest number (45% of the total person years dedicated to environmental R & D).

Other sources of person years on environmental R & D included:

- Federal Government – 1 957 person years (27%)
- State Government – 1 452 person years (20%)
- Business – 552 person years (8%)

5.2.6 Trade in Environmental Goods & Services

Many environmental goods are dual purpose – they may be used for environmental and/or non-environmental purposes.

The OECD puts a number of Harmonised System (HS) codes in multiple categories.¹⁴ The data presented here place these according to their first occurrence. Hence there is some bias towards the Pollution Management group. The data also includes dual-purpose goods.

5.2.6.1 Exports of Environmental Goods

Australia's exports of environmental goods reached almost \$1.3 billion in 1999–2000, up by 28 percent from just over \$1 billion in 1994–95.

¹⁴ The Harmonised System (HS) to OECD concordance is published in OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, Annex 2.

Table 5.6 Exports of Environmental Goods, 1994–95 to 1999–2000 (\$m)

	1994–95 \$m	1996–97 \$m	1999–00 \$m	CAGR %
Pollution Management	937	1 159	1 215	5.4
Air Pollution Control	166	190	139	–3.5
Wastewater Management	307	327	400	5.5
Solid Waste Management	159	259	176	2.0
Remediation & Clean-up	0	25	102	–
Noise & Vibration Abatement	173	209	153	–2.4
Monitoring & Analysis	132	149	245	13.2
Cleaner Technologies & Products	13	23	23	12.7
Cleaner Processes	0	0	0	–
Cleaner Products	13	23	23	12.7
Resource Management	62	81	57	–1.7
Indoor Air Pollution Control	0	0	0	–
Water Supply	2	1	1	–11.0
Recycled Materials	0	0	0	–
Renewable Energy Plant	24	31	2	–38.3
Heat/Energy Saving	36	49	54	8.1
Total	1 012	1 263	1 295	5.1

Notes: Compiled using the HS to OECD concordance published in OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, Annex 2. Exports are f.o.b.

CAGR = compound annual growth rate.

Source: TradeData (www.tradedata.net).

Exports for the period 1999–2000 were largely comprised of environmental goods from the following groups:

- Pollution Management (94%);
- Resource Management (4%); and
- Cleaner Technologies and Products (2%).

Major export categories for the period 1999–2000 included:

- Water and Wastewater Management Equipment and Materials – \$400 million (31%);
- Monitoring and Analysis Equipment and Materials – \$245 million (19%);
- Solid Waste Management Equipment and Materials – \$176 million (14%); and
- Noise and Vibration Abatement Equipment and Materials – \$153 million (12%).

Environmental goods exports grew at a compound annual rate of 5.1 percent between 1994–95 and 1999–2000.

The fastest growing export group was Cleaner Technologies and Products (12.7%).¹⁵

Exports in the Pollution Management Group grew at a compound annual 5.4 percent.

Monitoring and Analysis Equipment and Materials have been major growth areas with exports growing at a compound annual 13.2 percent since 1994–95.

5.2.6.2 Imports of Environmental Goods

Australia's environmental goods imports are significantly larger than exports and during the late 1990s have been growing slightly faster than exports.

Total environmental goods imports reached almost \$5.4 billion in 1999–2000 up by one third from \$4.1 billion in 1994 – 95 and was comprised in the following way:

- Pollution Management group (95.3%);
- Resource Management group (4.2%); and
- Cleaner Technologies and Products group (0.5%).

Major categories of imported environmental goods in the 1999–2000 period include:

- Water and Wastewater Management Equipment and Materials (35%);

¹⁵ CAGR

- Monitoring and Analysis Equipment and Materials (18%);
- Air Pollution Control Equipment and Materials (14%); and
- Solid Waste Management Equipment and Materials (14%).

Table 5.7 Imports of Environmental Goods, 1994 – 95 to 1999 – 2000 (\$m)

	1994–95 \$m	1996–97 \$m	1999–00 \$m	CAGR %
Pollution Management	3 883	4 658	5 125	5.7
Air Pollution Control	696	725	774	2.2
Wastewater Management	1 513	1 631	1 884	4.5
Solid Waste Management	501	773	724	7.7
Remediation & Clean-up	0	344	307	–
Noise & Vibration Abatement	457	420	445	–0.5
Monitoring & Analysis	716	765	991	6.7
Cleaner Technologies & Products	18	20	27	8.3
Cleaner Processes	0	0	0	–
Cleaner Products	18	20	27	8.3
Resource Management	159	206	227	7.2
Indoor Air Pollution Control	0	0	0	–
Water Supply	6	6	7	0.1
Recycled Materials	0	0	0	–
Renewable Energy Plant	29	15	30	0.5
Heat/Energy Saving	124	185	190	8.9
Total	4 060	4 884	5 379	5.8

Notes: Compiled using the HS to OECD concordance published in OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, Annex 2. Imports are c.i.f.

CAGR = compound annual growth rate.

Source: TradeData (www.tradedata.net).

5.2.6.3 Major Markets and Suppliers

The top ten markets take more than 72 percent of Australia's total environmental goods exports. Major markets in 1999–2000 included:

- United States – \$290 million (22.4%);
- New Zealand – \$153 million (11.8%);
- Japan – \$143 million (11.0%); and
- United Kingdom – \$65 million (5.0%).

Table 5.8 Top 10 Environmental Goods Export Markets, 1999–2000

Destination	Exports \$M	Share of Total %
United States	290	22.4
New Zealand	153	11.8
Japan	143	11.0
United Kingdom	65	5.0
Germany	59	4.6
Singapore	57	4.4
China	51	3.9
PNG	44	3.4
Indonesia	40	3.1
Taiwan	36	2.8
<i>Other</i>	358	27.6
Total	1 296	72.4

Notes: Compiled using the HS to OECD concordance published in OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, Annex 2. China excludes Hong Kong.

Source: TradeData (www.tradedata.net).

Table 5.9 Top 10 Environmental Goods Import Sources, 1999–2000

Source	Imports \$M	Share of Total %
United States	1 642	30.5
Germany	483	9.0
Japan	460	8.6
United Kingdom	370	6.9
Italy	226	4.2
China	190	3.5
New Zealand	160	3.0
Sweden	140	2.6
Taiwan	131	2.4
France	97	1.8
<i>Other</i>	<i>1480</i>	<i>27.5</i>
Total	5 379	72.5

Notes: Compiled using the HS to OECD concordance published in OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, Annex 2. China excludes Hong Kong. Imports c.i.f. Source: TradeData (www.tradedata.net).

The top ten suppliers accounted for 72 percent of total environmental goods imports in 1999–2000.

The major sources for Australia’s environmental goods imports include:

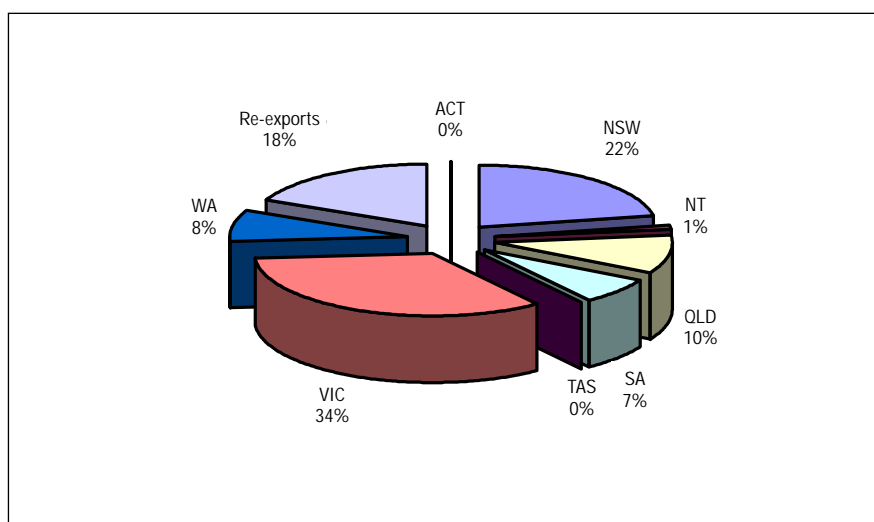
- United States – \$1.6 billion (30.5%);
- Germany – \$483 million (9.0%);
- Japan – \$460 million (8.6%); and
- United Kingdom – \$370 million (6.9%).

Table 5.10 Exports of Environmental Goods by State, 1999–2000 (\$m)

	Pollution Management	Cleaner Technologies	Resource Management	Total \$m	Share %
ACT	1.1	0.0	0.0	1.1	0.1
NSW	260.0	6.3	24.7	291.0	22.4
NT	16.4	0.3	0.0	16.7	1.3
QLD	114.0	9.0	3.4	126.4	9.7
SA	89.7	2.2	2.1	94.0	7.2
TAS	0.9	0.0	0.1	1.0	0.1
VIC	409.3	2.9	15.2	427.4	32.9
WA	99.9	0.8	6.7	107.4	8.3
Re-exports	226.8	2.1	4.0	232.9	18.0
Total	1 218.1	23.6	56.2	1 297.9	100.0

Notes: Compiled using the HS to OECD concordance published in OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, Annex 2. Exports are f.o.b.

Source: TradeData (www.tradedata.net).

Figure 5.4 Exports of Environmental Goods by State, 1999–2000 (%)

Source: TradeData (www.tradedata.net). CSES analysis.

Victoria accounted for the largest share of environmental goods exports nearly a third (32.9%), and imports (40.1% – *See following table*) in 1999–2000.

New South Wales accounted for the second largest share of environmental goods exports in the period (22.4%).

Nearly one in ten environmental goods exports were produced in Queensland (9.7%).

Services in the water, wastewater management and waste and recyclables collection and recycling area are domestically focused. There are limited, exports of services in water, waste and recyclables management (for instance services in hydrology, geology, engineering, management, training, policy development and regulation) and of equipment including specially designed garbage trucks and air monitoring equipment¹⁶.

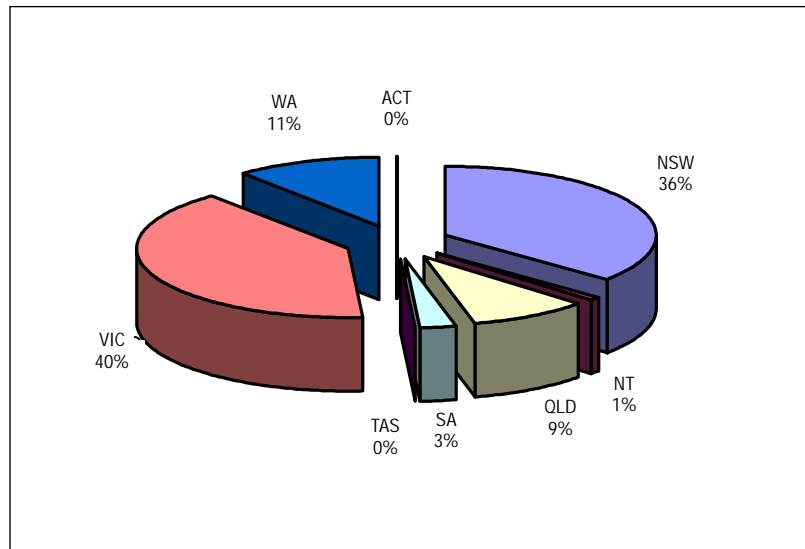
Table 5.11 Imports of Environmental Goods by State, 1999–2000 (\$m)

	Pollution Management	Cleaner Technologies	Resource Management	Total \$m	Share %
ACT	0.0	0.0	0.0	0.0	0.0
NSW	1 762.4	9.1	74.6	1 846.1	36.4
NT	31.4	0.0	0.3	31.7	0.6
QLD	407.0	2.0	37.6	446.6	8.8
SA	149.3	0.6	2.4	152.3	3.0
TAS	5.6	0.0	0.0	5.6	0.1
VIC	1 933.1	7.7	93.6	2 034.4	40.1
WA	537.2	0.7	18.7	556.6	11.0
Total	4 826.0	20.1	227.2	5 073.3	100.0

Notes: Compiled using the HS to OECD concordance published in OECD (1999) *The Environmental Goods and Services Industry: Manual for Data Collection and Analysis*, OECD, Paris, Annex 2. Imports are c.i.f.

Source: TradeData (www.tradedata.net).

¹⁶ No official data is available but companies like Fisher Stewart, CSR Humes, Egis, Shearwater, MacDonald Johnston and GeoEng state that they export goods and/or services in these areas.

Figure 5.5 Imports of Environmental Goods by State, 1999–2000 (\$m)

Source: TradeData (www.tradedata.net). CSES analysis.

Victoria accounted for four in ten environmental goods imports in the 1999–2000 period (40.1%).

New South Wales accounted for over a third of environmental goods imports, in the period (36.4%).

Over one in ten environmental goods imports were imported into WA (11.0%).

5.2.7 Renewable Energy

The Renewable Energy industry is small (approximately 10%) compared to the Environmental Management industry.

Total industry sales in Australia (including hydro-electricity) in 1998 were \$1.2 billion¹⁷.

In 1997 the industry employed around 6 400 people, but 4 000 were in manufacturing, sales and servicing of wood heaters¹⁸ and 1 000 were in hydro-electricity generation¹⁹.

¹⁷ Renewable Energy Industry Survey On Present and Future Contribution to the Australian Economy, Department of Primary Industries and Energy, May 1997.

¹⁸ Emissions from wood heaters in winter are the main cause of particle pollution, although renewable, this source of energy is detrimental to air quality.

¹⁹ <http://www.isr.gov.au/agendas/sectors/energy.html>

The Commonwealth Government's Renewable Energy Action Agenda estimates that the industry has the potential to grow to about \$4 billion in the next 10 years²⁰.

The bulk of the companies in the sector develop and manufacture renewable energy systems (mostly photovoltaic and hydro systems). The balance produce systems equipment (inverters and batteries) or products using photovoltaic panels or cells (streetlights, gate-openers etc).

There are also many consultants, designers and installers of systems. Most of these are small businesses and the total employment in this area is small.

A relatively high proportion of employment and revenue is generated in rural and regional areas in the renewable energy industry.

More details on the companies in the renewable energy industry are contained in Appendix 3.

²⁰ Target set in Renewable Energy Action Agenda, Department of Industry, Science and Resources, March 2000.

6 RESEARCH AND PRODUCT DEVELOPMENT

Research, development and commercialisation provide the basis for innovation in the Environmental Management and Renewable Energy Industry.

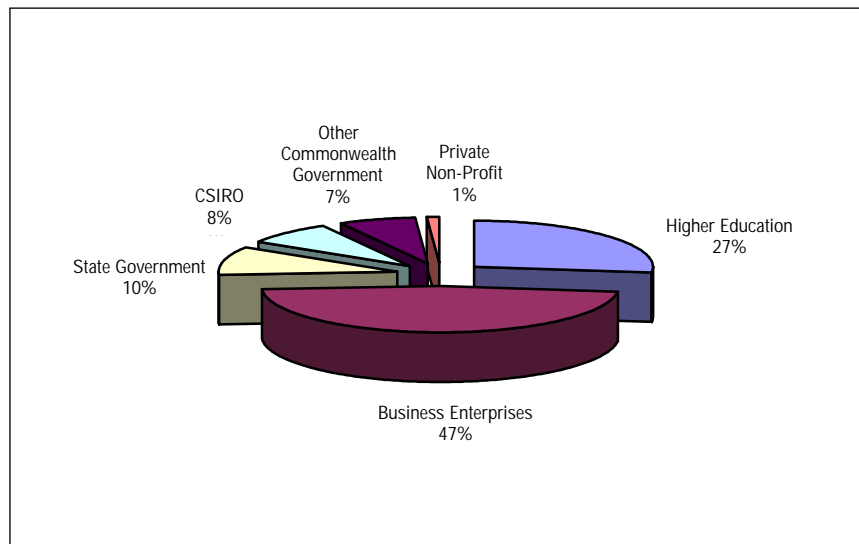
Innovation is a major contributor to international competitiveness and will be central to the substantial changes that will be generated by the move from a world economy based on oil to one based on hydrogen.

Innovation requires a strong base of research skills and infrastructure and of product development, design and commercialisation capability.

6.1 Research Centres

Research to develop new technologies and products occurs within companies, universities and other research institutions. Figure 6.1 illustrates total expenditure on research and experimental development as follows:

Figure 6.1 Expenditure on Research and Experimental Development



Data: ABS Survey of Research and Experimental Development 1996-97, sourced from <http://www.csiro.au/csiro/about3.htm>

We have been unable to quantify all Environmental Management and Renewable Energy research at the equivalent level of detail. At interviews most companies indicated that they did undertake research, generally directed at product development.

In 1998, Victorian universities spent \$24.4 million on R & D with an environmental socio-economic objective representing 12.8% of the total Australian R & D expenditure of this type²¹. This represents a reduction in Victoria's share of expenditure from 15.2% of total expenditure in 1996²².

Both State and Federal Governments channel the majority of their R & D funding towards universities through General University Funds and National Competitive Research Grants. Private sector funding of university research represents around 5–7% of total funding for R & D with environmental socio-economic objectives.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is the main federal research organisation. It has links to universities and other federal and state R & D bodies and with industry. The CSIRO is a major contributor to the Cooperative Research Centres.

CSIRO's total income for 1998–99 was \$728.3 million. Of that amount 65.3 percent was provided directly by the Commonwealth Government and the remainder was derived from external sources, including competitive grant schemes, research funded by industry and other users, and earned revenue.

About 20%²³ of CSIRO's research effort in 1998–99 was within the area of environment and natural resources, including the Division of Atmospheric Research.

Though not included here, research in other areas also contributes to the solving of environmental problems or building of environment industry. Research into cleaner production methods, new products (like the development of low emission motor vehicle designs), new materials as well as better environmental planning and urban design all contribute in this manner.

6.2 R & D Commercialisation

Following the identification and verifying of new technologies, they must be effectively commercialised, ie. developed into new products, marketed and the final product sold. Consultation with the industry suggested that "Victoria and Australia in general are poor at managing the interface between R & D and commercialisation"²⁴.

²¹ ABS Catalogue 8111, Research and Experimental Development, Higher Education Organisations, Australia, 1998.

²² Department of Employment, Education, Training and Youth Affairs, Selected Higher Education Research Expenditure Statistics, 1996.

²³ CSIRO web-site, accessed 02.01.00, <http://www.csiro.au/csiro/about3.htm>

²⁴ Please refer to The Development of the Environmental Management and Renewable Energy Industries – Summary of Consultations, November 2000 (available at <http://www.strategicaudit.dsrd.vic.gov.au/dir164/DSRDSavi2.nsf/frameet/SAVI?OpenDocument>) for stakeholder comments on Research and Development in section 2.6, page 5.

Commercialisation issues raised through the consultation with industry include:

- Lack of an Environmental Technology Verification Program;
- Lack of funding for the establishment of demonstration sites for new technologies;
- Difficulty for small business in accessing R & D grants;
- Lack of investment capital; and
- Problems with protecting intellectual property.

6.2.1 Environmental Technology Verification (ETV)

While innovation and technology proliferation is highly desirable, unsubstantiated claims about technologies are undoubtedly made in some cases. This problem is compounded with Internet marketing where no peer review of technologies takes place.

While the industry wants to encourage the take-up of proven cutting-edge technologies, there has been a market backlash over false and misleading claims. The consequence is that the market rejects many excellent technologies, as they seem too radical in their approach.

It is considered by industry that a sectoral expert peer review would have a great deal of credibility in verifying technologies.

Environmental Technology Verification is a voluntary peer review system that measures manufacturer claims against recognised protocols²⁵. ETV was pioneered in the US in 1995 to provide validation and independent verification of performance claims of Environmental Management goods and services and their underlying technologies.

An ETV scheme would benefit Australian industry in cases where companies with little or no financial backing seek to sell their product on international markets. Without funds to have their claims externally verified and without an existing customer track record, the ETV system provides independent verification.

An independent ETV program review allows government to more overtly support or endorse proven goods and services. This in turn can lead to the fast tracking of benefit to the economy, the community and the environment.

²⁵ Department of Industry Science and Resources, www.isr.gov.au/industry/environ/EnviroMngmnt/ETV/index.html, accessed 15.11.2000.

The ETV program also creates closer communication amongst industry stakeholders leading to better linkages within the industry.

As an early entrant into ETV, there would also be a potential for strengthening Victoria's international reputation and system export opportunities.

Disadvantages include the costs of running such a program and uncertainty over whether the system adopted by Australia and Victoria would be accepted internationally.

The Environmental Industries Section of the Department of ISR has convened a round table meeting and formed a Working Group with representation from industry and Commonwealth and State Government bodies (DSRD in Victoria) to develop a coordinated approach to the introduction of ETV in Australia.

This working group is partially hosted by the Cooperative Centre for Waste Management and Pollution Control at the University of New South Wales. A new working group is being considered in Victoria, but so far no decision has been made on the actual establishment and location of a national ETV facility.

Industry expressed the view that new technologies have to be formally and independently verified so potential users can get an objective verification of claims made by the manufacturer. The Federal Government is considering the effectiveness of introducing Environmental Technology Verification, a voluntary system currently used in Canada and the US.

Should such a program be implemented and located in Victoria, it would be a major strategic advantage for the industry, demonstrate government commitment to the industry, effect a centralisation of knowledge in Victoria and assist with building up critical mass needed for a Centre of Excellence, thus helping to achieve industry growth and exports.

6.2.2 Demonstration Sites

The ability to show interested parties facilities that are working and to demonstrate pilot or full-scale technology at work is regarded by industry stakeholders as being a very important tool in commercialising new technology. Purchasers and investors want to see integrated technologies and systems at work.

Demonstration sites are also very useful in an educational context. Visy Recycling provides access to its facilities to a varied interested audience ranging from school children to visiting foreign dignitaries. "The inclusion of demonstration capabilities within facilities can assist industry confidence, understanding and development."²⁶

²⁶ Visy Recycling comment, January 2001.

The EPA's Cleaner Production Partnership Program assists with the introduction of new cleaner production technology. The results of demonstration projects are used to drive change in other units within that industrial sector and to promote cleaner production in general. This is achieved by making the information available to EPA operations staff, posting the data on the EPA web site and developing promotional material and awareness programs.

Industry stakeholders and Industry Reference Group members have identified the financing of pilot plants as a problem. The only program, which assists at the pilot plant stage, is the federal R & D START.

R & D START is a co-financing program, through which the Federal Government contributes a percentage to the total costs. As such, it is only useful for companies that are able to secure other financing for the pilot plant.

Innovative small to medium sized companies have problems securing such financing and are generally unable to access the program.

6.2.3 Small Business Access to R & D Grants

Small companies that conduct research and product development experience barriers to accessing government research and development grants²⁷.

The application process for Federal research grants is seen as “onerous” and “costly in terms of time and money”, acting as a disincentive to small companies.

SMEs also lack knowledge of the Federal programs, such as the Technology Diffusion Program and the Technology Transfer program that target them.

Commonwealth support for industrial R & D and innovation in the business sector, including both direct support and estimated effects of tax revenue foregone, is expected to be \$851 million, which corresponds to 18.7% of Commonwealth support for major science and innovation programs in 2000–2001²⁸. Federal Government research funds are directed at major research agencies (\$1191 million), with targeted research at universities alone receiving \$455 million.

Universities report that small business rarely approach them for joint ventures because they are tied up in running business on a day-to-day basis.

²⁷ Problems with access to government grants and a suggestion for a “one stop shop” for government grants is outlined in Summary of Consultations, November 2000, available on <http://www.strategicaudit.dsr.gov.au/dir164/DSRDSavi2.nsf/frameset/SAVI?OpenDocument>.

²⁸ In 2000-01 Commonwealth support for major science and innovation programs is expected to be \$4538 million according to the Science and Technology Budget Statement 2000-01m Department of Industry, Science and Resource, Canberra 2000 (<http://www.isr.gov.au/science/analysis/budget2000/statement.pdf>, accessed 25.01.01).

Universities believe that medium sized businesses benefit the most from collaborative R & D projects.

6.2.4 Lack of Investment Capital

Venture capital finance is seen by many operators as vital to the development of new, or the extension of existing technology. However most SMEs reported great difficulties in accessing finance because potential investors have little knowledge of the sector and see the risk as too great.

Some SMEs were also reluctant to subject themselves to the level of scrutiny by investors that they believed would be necessary.

However other industry stakeholders see an improving picture for the industry's access to finance. Westpac and Monash University for the HESTA superannuation fund are making a broader assessment of risk and using eco-screens to evaluate overall business performance.

During the first half of 2001 a number of other fund managers, including AMP Henderson Global Investors, Rothschild and IOOF have also launched funds which have an ethical or environmental screening process in place.

The growth of Socially Responsible Investment and of funds under management that become available for investing, combined with EPA Victoria's role as promoter of the United Nations Environment Programme Finance Initiatives in Australasia, should generate more opportunities for SMEs to access venture capital.

This approach will not only indirectly generate new opportunities for the environment industry by increasing demand for its products and services but also provide more ready access to finance through "ethical investors".

6.2.5 Protection of Intellectual Property

The development and application of new technology is regarded as essential to developing new markets and creating opportunities for firms. However development and commercialisation is costly, especially for SMEs, and carries considerable risk.

To minimise risk and encourage innovation the existing laws protecting intellectual property need to be more rigorously enforced. The development of strong science and technology treaties (ensuring enforcement) to offer better intellectual property protection with trading partners would assist companies that seek to market their technology overseas and would provide incentives to reinvest in technology.

6.3 Barriers to Commercialisation in Universities

The barriers to commercialisation of Environmental and Renewable Energy research in Australian universities include²⁹:

- Lack of incentives and human resource policies including award structures to encourage entrepreneurial behaviour by university researchers and research students;
- Gaps in access to capital to support research commercialisation at the seed and very early stages;
- A lack of adequate technology incubators; and
- Poor links between the Environmental Management and Renewable Energy industry and universities.

6.3.1 Research Entrepreneurship

A culture of entrepreneurship strengthens the capacity to utilise and commercialise the outcomes of pure and applied research and to develop these as new, vibrant business opportunities.

The University of NSW has recently introduced a scheme modelled on a Stanford Business School Program in which MBA students work with science and technology research students to identify and explore possibilities for the commercialisation of their research. This program has proved highly successful in starting up new businesses in the USA.

Award and incentive structures could be instituted by government and industry to encourage entrepreneurship by academic researchers and their students and, in the process, support more entrepreneurial role models for research students³⁰.

The Merrill Lynch Innovation Grants Competition (USA) awards up to US\$150 000 to the PhD candidate who best explains the commercial application of their dissertation topic. The stated aim of the competition is to encourage entrepreneurial literacy among the academic research community, foster greater awareness of market opportunities and highlight the wealth of intellectual capital being created in the world's institutions of higher learning.

The increasingly decentralised industrial relations environment in universities may allow institutions to tailor terms and conditions of employment and reward structures to suit the particular requirements of collaborative ventures involving

²⁹ For further background, please refer to *Research in the National Interest: Commercialising University Research in Australia*, Commonwealth of Australia 1998.

³⁰ *Interactions Between Universities and Industry*, CCST University – Industry Interaction Working Group, 1999.

institutions and business partners. In particular, there is a need for universities to have flexible employment arrangements for academics who want to get involved in a spin-off company or in consultancy work.

The networking approach taken by CARnet in Geelong could also provide a model for promoting entrepreneurship by creating closer links between industry and university and its research students.

6.3.2 Funding Gaps

Commercialisation is becoming increasingly important for universities that are seeking alternative sources of funding. Commercialising technology at an early stage greatly increases the chances of its success.

Comments by a Victorian university during consultations suggests that Australia lacks the cultural attributes of the US in providing the desire, incentives and facilitation of processes for academic researchers to establish knowledge and technology-based enterprises. They suggest that Australian business culture does not accept that research and new technology-based companies sometimes fail, in contrast with the American approach that views failure as a learning experience³¹.

Universities are addressing these cultural and external funding issues by establishing commercial arms to ensure that intellectual property developed by the university is recognised, its value maximised and that commercial opportunities are actively sought and effectively negotiated.

Melbourne Enterprises International (MEI) is one example. The University of Melbourne owns MEI and it exists to provide support for the development of commercial ventures within the university and for the commercialisation of the university's intellectual property. MEI has also established a joint venture seed capital fund with Uniquet (Queensland) to invest in early stage projects.

External funding is also sought through the establishment of spin off companies since the business risk and returns are more apparent. Decisions to establish spin-off companies as a vehicle for commercialising university research needs to be taken on a case by case basis, bearing in mind the long and short term considerations and the associated risks.

6.3.3 Technology Incubators

Technology incubators specialise in supporting high technology-based start-up companies. They are closely managed, supportive environments where entrepreneurial companies can develop essential management skills and systems that enable them to grow and succeed.

³¹ Research in the national Interest: Commercialising University Research in Australia, Commonwealth of Australia 1998, section 3.3, p. 13.

Technology incubators are often located within technology parks or are linked to university centres or research institutes. Much of the new technologies and many of the entrepreneurs come from universities.

Victoria does not have a technology incubator or technology park for Environmental Management and Renewable Energy industries, but does have a business development unit – Green Inc. – at Monash University in Gippsland, which has the objective of promoting sustainable development across industries in the Gippsland Region.

6.3.4 Poor Links Between the Environmental Management and Renewable Energy Industry and Universities

Universities are attempting to address weak linkages between departments, and faculties and individuals and organisations external to the university who are developing new technologies.

For example Monash University’s Monash Environment Institute is moving to become a key player and facilitator of a network of environment industry members in the south east region of Melbourne.

By making research more relevant to business applications, universities also hope to attract more business funding for their research programs.

6.4 Cooperative Research Centres

The Cooperative Research Centre (CRC) program was initiated by the Federal Government in 1990 to strengthen collaborative links between industry, research organisations, educational institutes and government agencies.³²

CRCs are engaged in “joint venture” research efforts involving a research organisation and industry. Total Federal funding for CRCs is about \$140 million per year.

There are currently sixty three active CRCs.

The CRCs relevant to the Environmental Management industry include:

- Waste Management and Pollution Control (NSW)
- Water Quality and Treatment (SA)
- Greenhouse Accounting (ACT)
- Catchment Hydrology (VIC)

³² <http://www.dist.gov.au/crc/index.html>, accessed 03.01.2001.

- CRC for Freshwater Ecology (ACT)
- Renewable Energy (WA)

The location of the CRCs suggests that Victoria lacks a strong cluster in research in the Environmental Management and Renewable Energy industries.

7 KEY INDUSTRY DRIVERS

The growth of the Environmental Management and Renewable Energy industries is governed by the rate of uptake of Environmental Management solutions and products.

The rate of uptake, whether slow, medium or rapid is determined by the pursuit of environmental quality within the community and within business. The following key drivers, reflecting this pursuit of environmental quality and driving demand for the industry's goods and services, include:

- Growing community awareness of environmental issues resulting in pressure for action;
- Government legislative and policy priorities;
- Environmental regulations, including international environmental standards and their enforcement through incentives and economic instruments;
- Application of best practice to environmental issues by business;
- Technological developments;
- Municipal and industrial waste;
- Rate of economic growth and business cycles;
- Business focus on cost reductions delivered through greater efficiency in the use, reuse and recycling of raw materials and improved treatment of waste and use of by-products; and
- Other industry specific drivers.

The impact of the drivers are reflected in industry and consumer uptake scenarios outlined in the table following:

Table 7.1 Industry and Consumer Uptake Scenarios

	Slow Uptake	Medium Uptake	Rapid Uptake
Possible Drivers	Moral motivation	Moral motivation	Moral motivation
	Risk management	Risk management	Risk management
	Corporate environmental governance	Corporate environmental governance	Corporate environmental governance
	Economic slowdown	International pressures such as targets for reduced Greenhouse gas emissions	International pressures such as targets for reduced Greenhouse gas emissions
		International supply chain eligibility based on ISO 14001 certification	International supply chain eligibility based on ISO 14001 certification
		Economic prosperity	Economic prosperity
			Legislation and regulations
			Taxes and incentives
			Cost competitiveness
			Social demand

These drivers are discussed in greater detail below.

7.1 Growing Awareness of Environmental Issues

Growth in the Environmental Management and Renewable Energy industries is driven by the rate of uptake by industry and individual consumers, of environmental solutions and products which is itself influenced by community awareness of environmental issues.

Actions that increase community awareness that environmentally sensitive solutions are not necessarily more expensive, can lead to savings and will provide for sustainable development.

Education was the key action that was identified through the consultations to increase this awareness. It was strongly felt that actions throughout the education system and within all curricula were needed to significantly increase knowledge of environmental sustainability and to change perceptions and attitudes to achieving a balance between economic and environmental objectives.

It was felt that environmental education should be a significant part of primary school curricula but should be a particular focus at secondary and tertiary level.

It should be embedded in all curricula in order that analysis of environmental issues and impacts are undertaken from every perspective including engineering, management, health and law.

In any case it is expected that future demand for environment management³³ and renewable energy products and services will grow strongly as societies become more aware of global environmental problems and wish to solve them.

³³ In 1996, The World Bank estimated the demand for environmental services to be US\$453 billion and predicted substantial growth.

There are a number of environmental issues facing Victoria, as well as the rest of the world. Addressing such issues and improving the environment drives the demand for the solutions and products provided by the industry.

An example of a consumer-driven demand for environmental services is the recycling of household waste. Though consumers must pay through rates for recycling services, they chose to do this on environmental grounds and many would be “up in arms” if opportunities for recycling were removed.

This section lists some of the environmental issues faced by Victorians. Awareness of these problems and the desire to address them partly drives the demand for solutions and products provided by the Environmental Management and Renewable Energy industry.

7.1.1 Water Quality and Groundwater

There are increased pressures on water resources as a result of population growth and economic activity (particularly from irrigation industries). Every part of the water cycle is affected – the quantity and quality of groundwater³⁴ and surface water, the quality of drinking water and the health of oceans and rivers³⁵.

There is a need to get the right balance between short term and long term economic and community benefits of using water resources and maintaining healthy rivers and catchments by ensuring adequate flows. The Victorian Catchment Management authorities are responsible for the management of waterways to ensure that water is clean and healthy.

The sustainable management of our water resources is a major issue for Victoria, Australia and globally. Water treatment, means of minimisation of water use and water recycling processes are increasing in demand locally and globally.

7.1.2 Greenhouse

The “Greenhouse effect” refers to the warming of the earth’s surface caused by certain gases in the lower atmosphere. Small quantities of these gases regulate the earth’s temperature by allowing incoming sunlight to pass through while retaining some of the heat the earth would otherwise radiate back into space. As a result of this natural greenhouse effect, average temperatures on earth are around 33 degrees warmer than they would otherwise be – without the greenhouse effect the earth would be too cold for life as we know it.

Over the past 100 years, human activities – particularly the burning of fossil fuels and land clearing – have resulted in a steady rise in the level of human-induced greenhouse gas emissions. This has significantly increased the atmospheric

³⁴ <http://www.clw.csiro.au/CGS/research/ground.htm>

³⁵ <http://www.affa.gov.au/nwqms/overview.html>

concentration of these gases, resulting in an “enhanced greenhouse effect” – ie. more of the sun’s heat is trapped, with consequential impacts on global climate systems. The enhanced greenhouse effect is a global environmental issue. All countries contribute greenhouse gas emissions, and all countries are vulnerable to the impacts of climate change.

The IPCC’s Third Assessment Report suggests that some level of climate change is inevitable. Key findings in this report include:

- Climate has changed over the past century;
- The balance of evidence suggests a discernible human influence on global climate;
- Climate is expected to change in the future as concentrations of greenhouse gases in the atmosphere increase;
- For many regions and systems, the effects of climate change are likely to be adverse;
- Globally averaged surface temperatures are projected to increase by 1.4 to 5.8 C° from 1990 to 2100;
- Since 1750, atmospheric concentrations of carbon dioxide increased by 31 percent. The present CO₂ concentration has not been exceeded during the past 420 000 years and likely not during the past 20 million years;
- Data for the past 1 000 years suggests that warming over the past 100 years was unusual and unlikely to be natural in origin;
- The 1990’s were the warmest decade and 1998 the warmest year in the instrumental record since 1861; and
- Sea levels are projected to rise by 0.09 to 0.88 metres from 1990 to 2100.

Victoria’s greenhouse gas emissions per capita are very high, partly due to our reliance on electricity generated by brown coal fired power plants.

The international discussions that are taking place under the *Kyoto Protocol*³⁶, with the participation of mainly developed countries (Australia included), are aimed at establishing firm international commitments to reduce greenhouse emissions which may have an impact on commitments in Australia.

³⁶ An international agreement reached in 1997 in Kyoto, Japan, which extends the commitments of the United Nations Framework Convention on Climate Change, sets targets for future emissions by each developed country. Australia has an agreement that enables it to exceed it’s 1990 emission levels by 8% to 2010.

Australia's production of greenhouse gas emissions in 1998 was 16.9% higher than 1990 levels³⁷. While it is likely that the US Government's decision not to become a signatory to the Kyoto Protocol means that it may not proceed, Australia is still likely to commit to a reduction to a maximum of 8% above the base 1990-level by 2010. Fulfilling Australia's commitments by 2010 would require a substantial effort. Experts³⁸ suggest that it can be achieved if every household and business introduces energy-saving measures. Better resource management and increased recycling are also important steps needed to reduce greenhouse gas emissions.

Without further policy action, a greenhouse gas abatement of at least 50 million tonnes of CO₂ equivalent (around 10%) above total target emissions would be required in Australia in 2008–12, the target commitment period. Fuel switching, reductions in land clearing, improvement in waste and recyclables management and improved agricultural and forestry practices are all part of a feasible but difficult path to attain the Kyoto target.

The Victorian Government is developing a Victorian Greenhouse Strategy which is intended, among other objectives, to “create an environment in which Victorian industry can take advantage of national and international business opportunities in greenhouse gas mitigation”. A Discussion Paper was released in August 2000 and a final Strategy is expected in late 2001.

7.1.3 Oil Depletion

In 1973, and then again in 1979, the OPEC countries took advantage of the peaking of US oil production to dramatically increase oil prices. The OPEC cartel was able to hold prices high for about 10 years but after that oil prices declined and public concern over oil depletion evaporated.

In March 1998, however, the issue of oil depletion was put back onto the agenda when the International Energy Agency said that it believed that a peaking of conventional oil production could occur between the years of 2010 and 2020, depending on the assumed level of reserves³⁹. The International Energy Agency forecasts that the world production of conventional oil outside OPEC would plateau between 1998–2000 and, thereafter, decline.

Indeed this scenario has taken place and has, in conjunction with a reduction of oil supply through OPEC, resulted in significantly higher world oil prices.

Australian oil production was also expected to peak at roughly the same time.

Furthermore, the ability to utilise non-conventional oil supplies is likely to be constrained by the need to avoid big increases in greenhouse gas emissions.

³⁷ The Age, Saturday July 15th, Greenhouse Emissions Special.

³⁸ Sustainable Energy Authority of Victoria.

³⁹ <http://www.iea.org/g8/world/oilsup.htm>.

Hence, over time, major adjustments will need to be made in Victoria's economy to take account of the changes within the energy market.

7.1.4 Air Quality

Urban air pollution is a public concern, though Melbourne enjoys very good air quality compared to similar sized cities elsewhere.

The majority of the population is exposed to a range of pollutants. These include carbon monoxide (CO), nitrogen dioxide (NO₂), photochemical oxidants (such as ozone), airborne lead, particles, sulfur dioxide (SO₂)⁴⁰, volatile organic compounds and other hazardous air pollutants. Airborne lead is a declining presence in the air due to the phasing out of leaded petrol. Sulfur dioxide levels are low due to low sulfur content in Australian fuels.

Currently, the main areas of concern are, oxides of nitrogen, ozone and other smog precursors such as hydrocarbons and, increasingly, a wider range of air toxins.

Motor vehicles are the largest source of human-caused pollutant emissions in urban air sheds. In Melbourne, motor vehicles are responsible for about 63% of NO₂ emissions, 41% of volatile organic compounds, 83% of carbon monoxide, virtually all the airborne lead (97%) and 16% of particulates⁴¹. The contributions made by industry have been significantly reduced over the last two decades. However domestic sources, such as wood heating, contribute up to 60% of particles during the winter months.

There are many options for addressing urban air pollution, for example banning the sale or use of non-compliant wood heaters and open fires, improved vehicle emission control technology, motor vehicle engine inspections, higher standards for fuel and engine efficiency (planned for Australia and already introduced in Europe), improved public transport and higher usage rates, urban design, higher petrol costs and other disincentives such as higher parking costs to limit the amount of car-based travel or completely new technology as used in fuel cell powered vehicles.

Current drivers for these changes include:

- National legislation setting air quality standards;
- Fuel quality standards and motor vehicle legislation;
- Proposed Air Quality Improvement Program and revised policies – State Environment Protection Policy (Ambient Air Quality) and SEPP (Air Quality Management)⁴²; and

⁴⁰ <http://www.nht.gov.au/programs/airqual.html>.

⁴¹ EPA 1998 Air Quality Management – Emissions inventory, pub. no. 632, Government of Victoria.

⁴² Draft Air Quality Improvement Program available from EPA at <http://www.epa.vic.gov.au/legislation/policies.htm#air>.

- Growing awareness of the links between health and air quality both in Australia and internationally.

7.1.5 Noise

Noise pollution can be defined as unwanted or offensive sounds that unreasonably intrude our daily activities. It has many sources. Most are associated with urban development: road, air and rail transport, industrial noise, neighbourhood and recreational noise.

The World Health Organization suggests that noise can affect human health and well-being in a number of ways, including annoyance, sleep disturbance, interference with communication, performance effects, effects on social behaviour and hearing loss.

Noise in urban areas has been increasing with growing urbanisation and traffic levels. The dominant source of noise in urban areas is traffic noise, followed by aircraft and general industry noise. There are no standards for general traffic noise in Victoria and a policy limits only apply to freeway noise and are administered by Vic Roads.

Control of noise in the workplace (to limit hearing damage) is regulated through Occupational Health & Safety regulations and Workcover Victoria.

The EPA in Victoria coordinates the control of environmental noise in Victoria. The most recent noise policy is the Residential Noise Policy of 1997, which covers noise from lawn-mowers and wall-mounted air conditioning. Noise control policy in Victoria is based on SEPP N1, which regulates noise from commerce, trade and industry, and SEPP N2, which regulates music noise from bars, restaurants, hotels, nightclubs, and outdoor concerts.

7.1.6 Salinity

‘Dry-land salinity’ involves salt rising to the surface from underlying mineral deposits. Many plants do not tolerate higher salt levels therefore affecting agriculture and pastures.

About 260 000 hectares of Victoria’s farming land is presently suffering significant damage from soil salting, with 140 000 hectares located in Victoria’s northern irrigation districts. A further 120 000 hectares of non-irrigated (dry-land) grazing and cropping land throughout the state is also affected⁴³.

⁴³ http://www.nre.vic.gov.au/web/root/domino/cm_da/nrenlwm.nsf/frameset/NRE+Land+and+Water

Rising levels of salinity is also a growing problem in river systems affecting water quality. As many plants do not tolerate the higher salt level, the salinity makes the water less useful for irrigation purposes (or more treatment is needed).

The main sources of the salinity in the river systems are the surrounding areas and industrial processes.

The Federal Government announced a national action plan for Salinity and Water Quality in Australia on 10 October 2000⁴⁴. The announcement was accompanied by \$700 million in funding to address the issue nationally.

This funding is expected to be matched dollar for dollar by the participating states. The action plan should be a major driver for implementing new technology to combat salinity. Four areas in Victoria (out of twenty nationally) were initially targeted: Goulburn-Broken, Avoca-Loddon-Campaspe, Glenelg-Corangamite and Lower-Murray.

7.1.7 Contaminated Sites

Increased pressure on urban development has led to growing demand for remediation of contaminated urban sites. To date, cost factors have led to contaminated soil being removed and deposited elsewhere, but environmental pressures may lead to demands for the actual cleaning of the soil.

Growing international awareness and high degrees of urbanisation may also lead to increased demand for Australian remediation services overseas.

Remediating the Homebush site for the Sydney Olympics has been a highly visible international success. The Melbourne Docklands development is of similar nature but has not been marketed as such. There are several other examples in Melbourne of remediation and subsequent residential development on a smaller scale, as for instance the Beacon Cove Development in Port Melbourne. These could be used to promote Victoria's services and skills in this area.

7.1.8 Bio-diversity

Victoria has a rich diversity of native species and ecosystems, a strong culture of concern for nature and some of the most stringent protective legislation in Australia.

As a consequence it has a well-developed skill-base and business infrastructure for managing forestry, fishing, agriculture, eco-tourism and land development to minimise impacts on native flora and fauna. In addition, increasing interest is being shown for the design of products (eg. buildings, office products, garden products) that take into account bio-diversity.

⁴⁴http://www.pm.gov.au/news/media_releases/2000/media_rel_474_sup.htm accessed on 17/11/00.

Analogous to carbon trading, there is also an emerging opportunity due to market support for bio-diversity and the legislated requirements to meet bio-diversity standards.

These developments position Victoria to offer products and services to other bio-diversity aware markets, such as the rest of Australia, Europe and North America.

7.1.9 Litter

There is a substantial and growing cost attached to removing litter from streets and waterways, protecting the bays, coastal areas and marine life.

The City of Melbourne annually spends about \$14 million on street cleaning and litter removal.

The development of labour saving technology has turned the street sweeper of old into the Green Man with his purpose-built machine.

Other new technology include in-stream and stormwater drain litter and pollutant traps.

7.1.10 Municipal and Industrial Waste

The collection, disposal and recycling of municipal and industrial waste has been traditionally an important driver for the Environmental Management and Renewable Energy industries.

Landfill management and requirements for the prescribed disposal and treatment of waste drive the demand for products and services from the environmental management and renewable energy industries.

Government waste policy, which ultimately aims to eliminate waste and maximise the efficient use of resources through cleaner production, waste avoidance, increased re-use and recycling, will generate major opportunities for the industry.

7.2 Government Legislative and Policy Priorities

Legislative action and other policy initiatives undertaken by national and state governments and through international agreements also play a large part in the demand for products and services provided by the environmental management and renewable energy industry.

For example, the mandatory introduction of catalytic converters in 1986 aimed at diminishing motor vehicle emissions reduced airborne lead and other common air pollutants despite an enormous increase in motor vehicle usage.

In order to try to address some instances of the market's failure to reflect environmental cost and to raise tax revenue, some countries have introduced a wide range of environmental taxes in accordance with OECD's recommended best practices⁴⁵.

7.3 Economic Growth

In recent years economists have extensively studied the connection between a growing economy and its effects on environmental quality. "Some researchers claim that higher levels of income increase environmental degradation. Others suggest that higher levels of income reduce environmental degradation"⁴⁶. A number of empirical studies have made the claim that in certain income ranges there is a positive relation between per capita income and environmental quality. Initially as income increases, the environmental quality decreases until a turning point is reached. Subsequently as income increases, environmental quality increases. This results in a u-shaped relationship between "environmental quality" and GNP per capita – the "Environmental Kuznets Curve".

A possible explanation for this pattern is seen in the economic development progression based from "clean" agrarian economies to "polluting" industrial economies to "clean" service economies. This trend is enhanced by the transfer of cleaner technology from high-income countries to low-income countries and the tendency of people with higher income to have a higher preference for environmental quality.

It is unclear whether such a u-shaped curve actually exists. The European Environmental Agency recently summarised the situation as follows; "no overall positive trends can be depicted within the scope of the outlooks. For most of the issues there has either been insufficient progress towards recovery of a healthy environment, or unfavourable underlying developments. Adverse developments are expected concerning impacts from climate change and waste generation."⁴⁷

⁴⁵ Implementing Environmental Taxes in OECD Countries, Mr. Jean-Philippe Barde, http://www.env.cebin.cz/akce/pruhonice_e/barde.html.

⁴⁶ This section builds extensively on a summary paper by Sigrid Stagl "Delinking economic growth from environmental degradation; a literature survey on the environmental Kuznets Curve hypothesis", from Wirtschaftsuniversität Wien, August 1999 (www.wu-wien.ac.at/inst/vw1/gee/papers).

⁴⁷ European Environment Agency (1999), Environment in the European Union at the turn of the century (pp.500). Copenhagen: EEA.

Explanations put forward for the existence of an Environmental Kuznets Curve have two main elements: the composition effect and the displacement effect. The composition effect is the movement of the economy from subsistence to more material and energy intensive patterns of agriculture to industrialisation and then to more service-based economies. The displacement effect is the displacement of pollution to developing countries so rich countries become net importers of pollution-intensive goods. It reflects the increasing demand for environmental quality as a consequence of increased income.

The Victorian economy is presently at the point where it is industrialised, but is moving towards greater reliance on knowledge and service-based activities. As income grows, the demand for environmental quality increases, increasing the demand for pollution abatement and clean-up services.

If the manufacturing base is maintained, there will be an increasing demand for cleaner production methods – or “polluting” manufacturing may be displaced to poorer regions/countries.

The relationship between spending on “environmental quality” and economic cycles may also have a short-term impact on the demand for Environmental Management and Renewable Energy products and services:

- A recession results in lower GDP per capita, thus moving the economy “back down” on the Environmental Kuznets Curve (if the economy is past the bottom of the u).
- Investment in capital goods correlates with economic cycles being very high in upswing periods and declining sharply after the economy turns into a downswing period. Putting this into the context of the Victorian economy, we should expect less investment in “environmental quality”, thus Environmental Management products and solutions, if the Victorian economy moves into an economic downswing.

Aside from the environmental benefits, the economic benefits of pursuing environmental sustainability were assessed in an article on green taxes in the Australian Financial Review [Tuesday, 14 November 2000]. This article refers to an Australian Conservation Foundation paper that suggests that environmental tax reform has helped Denmark to develop new exports.

Despite high expenditure on improving the environment, the Danish economy has a strong foundation – a GDP growth of 2.0–2.5%, an unemployment rate of 5.25%, a current account surplus, limited inflation and a budget surplus of about 3% of GDP⁴⁸.

⁴⁸ <http://www.fm.dk/uk/pubuk/TheDanishEconomy2000/frmChapter01.htm>.

7.4 Business Best Practice

New environmental technology is introduced by business, without regulatory or legislative, imposition when there are clear signs of good payback periods and an effective reduction of environmental impacts.

Government assistance or incentives can strengthen this driver by improving the payback period further⁴⁹.

Amory Lovins has proposed principles of “Natural Capitalism” in his book with the same title,⁵⁰ which provide a theoretical underpinning for incorporating sustainability into good business practice.

An example of regulation-driven innovation is the standard for refrigerators in Denmark, where there are two major manufacturers

When the Montreal Protocol was discussed, the government was pro-active in mandating stricter standards than the Protocol prescribed, to be introduced in Denmark within a shorter timeframe.

In some industries, this resulted in disquiet but the two major manufacturers complied. The government co-funded some of the technology and innovation needed to develop new technology and modernise production. Manufacturers in other countries did not follow suit (small market, no requirement from their government) and it effectively resulted in the market being protected from outside manufacturers. When other countries slowly implemented the Montreal Protocol standards at the mandated pace, the two manufacturers had perfected the new technology and could supply refrigerators without CFCs and without HFCs, creating a significant competitive advantage.

7.5 Regulation

While in most cases a freely functioning market is the best means of allocating goods and services, Government regulatory actions may be necessary where the market fails or where government wishes to achieve social objectives that offset economic efficiency objectives.

Regulations are enacted to preserve and protect environmental resources for these reasons.

⁴⁹ Incentives such as EPA’s Cleaner Production Partnership Program, which offers grants and loans, is not directed at reducing payback periods, but to demonstrate the environmental and economic advantages of cleaner production.

⁵⁰ Principles and information available from Rocky Mountain Institute, <http://www.rmi.org/> accessed 04.01.2001.

Regulatory actions impact on almost every aspect of life from the water quality of tap water, the level of noise allowed in suburban areas, to what can be disposed of in domestic rubbish bins. Similarly, there are many environmental restrictions or parameters within which companies are required to conduct business.

Unfortunately environmental regulations are not uniform between Australian States and territories and make it difficult for industry to readily provide products and services that meet all these differing requirements. Consultations raised the need for the development of uniform minimum national regulations.

The various State and Federal Government regulations that reflect the objective of protecting and preserving environmental resources are listed below.

7.5.1 State Government

Key State Government or State Government Authorities environmental regulations include:

- Hazardous waste management
- Industrial waste management
- Water catchment and water use including water recycling
- Sewage processing and discharge
- Building regulations (in connection with councils)
- Biodiversity conservation
- Air emissions from industry
- Noise from industry and residents
- Landfill levies
- Some environmental taxes and incentives⁵¹

7.5.2 Federal Government

Key Federal Government or Federal Government Agencies environmental regulations that also play an important part in driving demand for the industry's products and services include:

- Incentives connected with business income tax (R & D expenditure tax concessions)

⁵¹ One such incentive is the Victorian Solar Water Heater Rebate program.

- Energy measures (supporting additional energy from renewable sources⁵²)
- United Nations Framework Convention on Climate Change commitments
- International trade measures
- Ozone protection
- Building regulations
- Motor vehicle emission regulations and standards

The Victorian Government is currently undertaking “A Preliminary Review of Regulatory Issues on the Environmental Management and Renewable Energy Industry” which will inform its approach to the industry through regulation.

7.6 Technological Developments

Technological developments act as a supply push factor allowing companies and individuals to more readily pursue environmental sustainability.

It is increasingly possible for companies to actively pursue profitable outcomes while at the same time improving their efficiency and reducing costs while implementing environmentally sustainable solutions.

Technological developments are allowing companies to implement sustainable environmental solutions as “best practice.”

Environmental taxes and regulations used to change company and consumer behaviour and improve the environment also drive the rate of introduction of new technology.

In Denmark high registration fees on petrol/diesel-driven automobiles created a market for a locally developed and produced electric vehicle (and bicycle).

New European regulations that stipulate that lead must be phased out (batteries are already recycled), will result in a reduction of 30% in lead used (Denmark will be the first country to introduce this legislation)⁵³. The regulations act as a signal to the EU, who generally introduces a slightly more lenient regulation after a lag period.

⁵² There are several National Greenhouse Strategy initiatives, including the Mandated Renewable Electricity Target (now the official name of the 2% measure), the Renewable Energy Commercialisation Program and the Photovoltaic Rebate program.

⁵³ <http://www.mem.dk/nyheder/presse/Dep/141100.htm>

7.7 Other Drivers

Other drivers of demand in Australia and Victoria for the following sectors include:

7.7.1 Environmental Management Industry

- Montreal Protocol commitments
- Phase out of prescribed waste to land-fills (new methods must be invented or implemented)
- EPA's Cleaner Production Partnership Program
- The suite of Sustainable Energy Authority Programs
- Business risks associated with pollution and/or accidental pollution (liability and litigation driving this)
- Establish triple bottom line goals, action plans and reporting accounting standards or introduction of environmental accounting (increasingly required from suppliers by global manufacturers)
- Inclusion of triple bottom line reporting in company Annual Reports at the best practice standard set by the global Reporting Initiative⁵⁴
- ISO 14000 Environmental Management systems (likewise increasingly required higher up in the supply chain)
- Manufacturing costs (energy, waste, resources)
- Access to finance through debt and equity markets.
- Availability of suitable insurance products.

7.7.2 Renewable Energy Industry

- National Greenhouse Strategy initiatives, including the Mandated Renewable Electricity Target, the Renewable Energy Commercialisation program, the Photovoltaic Rebate program and various state programs such as the Victorian Solar Water Heater Rebate program

⁵⁴ <http://www.globalreporting.org/>

- Improvements in renewable energy technologies
- Rising prices of electricity
- Triple bottom line accounting standards or introduction of environmental accounting
- Concerns about security of electricity supply from coal-fired power plants
- Access to finance through debt and equity markets.
- Availability of suitable insurance products.

8 OPPORTUNITIES AND IMPEDIMENTS, STRENGTHS AND WEAKNESSES

The Environmental Management and Renewable Energy Industry has a range of strengths, weaknesses, opportunities and challenges that need to be addressed if it is to become internationally competitive and build new markets.

The following first discusses the industry wide factors that apply to all sub sectors of the industry.

The factors relevant to specific sub sectors of the industry are then discussed.

8.1 Industry Wide Factors

8.1.1 Industry Fragmentation

The industry incorporated in this strategic audit is fragmented. Each sub sector has quite different characteristics. It is not possible to treat it as a single industry.

Though most stakeholders regard themselves as belonging to the Environmental Management and Renewable Energy industry, they more clearly align themselves with a sub sector.

Many sub sectors have their own representation in the form of an industry association.

Many of these industry associations are under-resourced⁵⁵ and their roles are constrained.

8.1.2 Technology Activities

Generally a high level of technology is applied in these industries. There are pockets of advanced technology in water treatment (ozone treatment and biological filters) and air quality (regional computerised air quality models, advanced air monitoring and emission control technology).

The waste and re-cyclables management industry is generally characterised by a low level of technology, as much of the refuse is disposed in land-fills (though there are pockets of advanced technology in recycling). Even medical waste is usually shredded, disinfected and disposed of in land-fills (small amounts and poses no health risks to the general public).

⁵⁵ The vast majority rely on subscriptions and revenue from conferences and are run by volunteers.

Within an economic framework where the polluter rarely pays the full cost, these industries have not always reached their full technological potential. This is the case for example in water recycling, wastewater treatment, soil remediation and renewable energy.

8.1.3 Environmental Awareness

Increasing the environmental consciousness of the general public and businesses drives the uptake of environmental solutions and products. Raising awareness therefore provides environmental businesses with an opportunity to grow and be profitable.

Expanding business domestically provides reference clients and sites, critical mass and experience with which to tackle export markets.

Some larger businesses are aware of their environmental impact and image, but most smaller businesses have yet to take up good environmental practices on as wide a scale.

Ongoing public information campaigns can increase environmental awareness and education and direct consumer and business demand to more environmentally friendly products and services.

EPA has a major role in promoting public information on a range of environmental issues.

8.1.4 Government of Victoria – Providing A Level Playing Field/Solving Environmental Problems

A major driver of the rate of uptake of the industry's products and services is government regulatory action and policy initiatives.

Many environmental problems are caused by market failure where the market players do not receive market signals to address environmental problems. Therefore, in many cases government seeks to internalise external costs. This creates demand for the solutions and products provided by the industry. A recent example is the increased demand for solar panels, which resulted from federal grants partially funding the installation of this product.

Government regulations establish a minimum environmental requirement for business and the community. Business is free to exceed the minimum requirement but few do because of the perceived potential impact on competitiveness. On the other hand some business apply higher environmental standards for idealistic or risk management reasons.

Some government regulations including EPA Victoria's accredited licensee program create incentives for industry to exceed the minimum environmental standards set.

The Victorian Government aims to establish regulatory regimes that allow and encourage innovation so the best environmental outcomes are achieved.

It can also be profitable for businesses to exceed minimum regulatory requirements. Economic savings are a key motivation for implementation of cleaner production and eco-efficiency initiatives.

Greater emphasis on targeted mandatory rather than voluntary provisions can address more environmental concerns and internalise externalities by requiring and specifying quantified standards. This would increase the demand for products and services from the companies in this field.

During the consultation process industry stakeholders called on government to raise the bar on environmental issues and provide a long term planning framework (with key performance indicators and publicised measures).

Long term directions for government policy provides a known framework to business which reduces risk and provides a base for sound long term business investment decisions.

Significant government leadership can also be provided through guidance, good example and education – including early adoption by government of new environmental management systems, environmental reporting and wide publication of the results. The Government's Greener Cities policy states their commitment to lead by example by requiring annual environmental reporting by all government agencies and setting waste reduction targets. Agencies including EPA Victoria, Treasury & Finance and DNRE are working on implementing these commitments. EPA Victoria itself is setting waste reduction targets and has an EMS that it is progressively implementing throughout the organisation.

8.1.5 Networks and Leadership

Numerous informal networks exist in the Environmental Management and Renewable Energy industries. But often the companies in the industries lack the formal networks to ensure good outcomes in the areas of marketing, development of integrated products and product packages, product development or access to export markets.

The lack of leadership shown in the industry is also a major weakness. Both the Environmental Management and Renewable Energy sectors look to government for leadership. The government's role is seen by the sectors to be:

- Providing a framework for growth;
- Choosing winning technologies;
- Supporting these technologies;

- Addressing overseas marketing efforts; and
- Regulating and taxing to create demand for the sectors' products and services.

More cross-sectoral and cross-industry cooperation is required to provide innovative, packaged solutions that can better meet customer needs.

8.1.6 Good Technology But Little International Marketing

Generally the industry is fragmented into many smaller players who do not have the marketing expertise or marketing budgets to tackle the international marketplace.

Many firms are driven by technology rather than consumer demand and the market. Many stakeholders focus on developing a new technology per se, rather than on specific consumer needs by designing a product or solution to meet those needs.

In the renewable energy sector the relatively undeveloped state of the sector and its lack of market focus is demonstrated in the sale of photovoltaic systems (generating electricity from sunlight). Currently, each system is custom designed by an accredited installer, who signs off on the applicability of the system to the use. Systems are not available pre-packaged off the shelf. Consumers want easy options that are easily accessible but these are not available.

Providing an integrated off the shelf photovoltaic package might not be optimal in providing the exact amount of power needed to run an average three bedroom house, but it would make the technology more accessible. Product design and marketing is lacking.

The dominance of universities and CRCs in research and product development explains in part the technology focus of the industry. Research and product development is mainly driven by the academic community. Though the CRCs were established to limit this, most research at CRCs is still carried out by academic scientists.

Consultations highlighted views by some industry stakeholders that research is too theoretical, needs to be more commercially orientated and that companies need better access to research funds allocated by State and Federal Governments.

Some stakeholders believe that because most research funds go to universities the technology focus to the detriment of a market focus is exacerbated.

Some in industry argue that the allocation of research funds toward businesses would assist industry development. Monitoring of these funds to companies may be more difficult and costly (smaller grant size, more applications, more

follow-up and monitoring), but access to these funds would benefit the many small, innovative companies whose access to funding is limited.

A number of stakeholders also felt that the considerable applied research undertaken by universities and CRCs, which is accessible to and useable by SMEs, was of considerable value and should be supported.

8.1.7 Technical Assistance – Breaking the International Barriers

Victoria has much to offer in the provision of technical assistance through a body of locally based, international quality consultants. These consulting companies tend to be highly cost competitive compared to consultants from the US and Europe.

There is a large number of consultants who have left large companies and work as sole proprietors or in SMEs.

Accessing this expertise in some cases requires good networking including creating stronger links between small and larger consulting companies.

A broadening of the focus of consulting companies into international markets and toward export growth and building on competitive domestic markets is required.

The export of services is growing rapidly, based on the trend to outsourcing and corporate downsizing, shifting expertise into external consultancies. Australia is geographically and temporally proximate to new Asian markets demanding environmental services.

Larger consultancies have the required export focus – often through their affiliation with a foreign parent company and the subsequent allocation of territory. Smaller consultancies benefit from this international access by acting as sub-contractors to these larger companies.

Building networks including virtual companies would improve access to skills and resources sequestered in smaller companies, use excess capacity in small companies and should benefit the consulting sector as a whole.

8.1.8 Standards of Measurement & Certified Reference Materials

Certified Reference Materials (CRMs) are used to provide reliable and consistent reference standards for chemical analysis to ensure results from different laboratories, and different analysts, are comparable.

The Environmental Management sector is heavily dependent on chemical measurements. The effective application of laws and regulations relating to environmental controls – primarily an area of state responsibility – are

dependent on chemical limits and chemical measurements.

In the case of air quality monitoring, certified primary standards are provided through the US (at a high price) and traceable secondary standards are sourced locally.

However, Australia does not have national standards for chemical measurement. To date the National Analytical Reference Laboratory is the only organisation in Australia to be accredited as a producer of CRMs. None of the accreditations are related to environmental matters.

As a consequence the legal admissibility of some chemical measurements made on environmental specimens by laboratories in Australia may be questionable.

While measurement is a federal responsibility under the National Measurement Act, the Victorian Government should support an investigation of the feasibility of establishing a laboratory certified to produce CRMs. This would assist in addressing the legal complexity and uncertainty of current arrangements.

8.2 Specific Sectors

In general a number of industry sub sectors display important strengths and opportunities but most suffer marketing, financial or exporting impediments.

Some promising segments are discussed below.

8.2.1 Water and Wastewater

Prudent management and husbandry of water resources is an area in which Australia has a competitive advantage based on technology. Australia has an advantage in addressing water issues and focusing on the development of new water efficient technology and production methods (equivalent to energy efficiency). The export potential could be substantial in the long run as water is expected to become an increasingly scarce resource and urban water recycling becomes necessary.

The water and wastewater management segment comprises the catchment management authorities, the stormwater management system, the corporatised Melbourne Water (water wholesaler and provider of sewage treatment services) and water retailers, who mostly buy water and sewage treatment services from Melbourne Water. Some private sector expertise exists but it mostly resides in the corporatised water companies that have generally not ventured outside their current sphere of business.

Government has traditionally trained staff in water and catchment management. Much of this expertise has moved into the private sector but there is not a critical

mass to justify new training. Training could be facilitated through the creation of “water management traineeships” to train and rotate staff between catchment areas and roles.

8.2.2 Waste and Recyclables Management

In the following section on waste and recyclables management the topics have been ordered in accordance with the EPA’s waste hierarchy, which ranks waste avoidance as the top priority followed by minimisation, re-use, recycling, energy recovery and only when these options are exhausted, disposal.

Waste management is regulated under the *Environment Protection Act 1970*. Victoria’s industrial waste strategy, *Zeroing in on Waste*⁵⁶ outlines its ten year strategy to protect the beneficial uses of the environment and promote and encourage ecologically sustainable development. It outlines the existing and planned strategies and programs for preventing or managing waste.

The following outline is not an evaluation of the success or otherwise of these strategies or programs, but topics which emerged through the consultation.

8.2.2.1 Waste Avoidance

The opportunities in this area are mainly in the form of alternative cleaner production methods, alternative technologies and resource management solutions and simple actions such as double-sided photocopying, use of retreaded tyres and education & awareness programs, which result in waste avoidance.

For example the EPA’s Victoria’s Cleaner Production partnership program has demonstrated the considerable economic advantages to industry from improving waste practices. The program has supported over 100 industry demonstration projects and these have shown an average pay back period of 1.4 years. Cleaner Production has a high potential for growth in the environment industry through consulting services and the development and supply of cleaner technologies.

8.2.2.2 Recycling Practices and Solutions

The collection of recyclables and resource recovery is a current strength. Kerb side pick-up of recyclables does not yet pay for itself and is subsidised by Local Councils’ rates. Cost structures do not take account of life cycle and external costs.

⁵⁶ EPA web-site, <http://www.epa.vic.gov.au/programs/iws/537.pdf>

Through consumer awareness campaigns very high recovery rates of recyclable packaging and paper have been achieved. This, combined with sorting processes (which range from the highly automated to very labour intensive), has built a critical mass in developing technology and reducing recycling costs. However, the same level of awareness and participation is not evident within commerce and industry, and therefore an opportunity exists to expand products and services to these sectors.

Recycling competes with low landfill charges, and recycled materials compete with virgin commodities, so there has been pressure on the providers to become more cost effective.

Locally developed and built refuse collecting trucks are now marketed successfully in Europe and there are opportunities for marketing services as well.

8.2.2.3 Refuse Management

New general refuse management methods are being trialed including upgrading land-fills (and closing older facilities) and turning green refuse into compost or vermicast, thus recovering resources.

Demand for collection of specialised medical waste and chemicals and construction waste/refuse is growing. This growth is fuelled by increasing awareness by business that waste must be disposed of in a prudent manner.

Industry regulations are forcing operators to upgrade their facilities and achieve economies of scale, which has resulted in large operators dominating service provision in metropolitan Melbourne. Smaller companies still operate in regional and rural areas.

Concerns were voiced during consultations about a lack of a “level playing field”, because insufficient monitoring of contract fulfilment created opportunities for low-quality operators to displace operators with better environmental practices.

8.2.2.4 Refuse to Energy

The conversion of refuse to energy using co-generation and cement kilns uses a relatively mature technology that can be adopted to suit different applications and requirements.

Cement kilns use scrapped tires, waste oil and other flammable hydrocarbon waste to fire the kilns (replacing virgin fossil fuels). Hospitals also have on-site power generation fired by hospital refuse.

New applications using a gasification method are being developed to convert biomass including timber scraps, crop biomass, green refuse, waste cooking

oil, sewage sludges and residues into clean heat and in some cases transport fuels (eg ethanol).

Generally these applications are commercially viable when premiums are paid for green energy. The introduction of the Mandated Renewable Electricity Target and the Renewable Energy Commercialisation Program are providing a significant stimulus to the establishment of waste to energy plants in Australia.

Other applications are being developed for using difficult industrial refuse as fuel for a furnace that converts refuse into a building material. The commercial viability of this application hinges on higher disposal standards raising disposal costs.

8.2.2.5 *Methane Extraction*

Methane extraction from land-fills uses a mature and locally available technology. Methane contributes significantly to the greenhouse effect (about 21 times as much as CO₂).

There are several small methane extraction plants in Victoria. Energy Developments Ltd operates plants in Broadmeadows, Berwick, Clayton, Corio and Springvale.

There are many more opportunities for small and larger land-fills to extract methane, as there are both small and larger sized plants available. Forecasts that distributed energy generation will become increasingly important in the future support methane extraction.

8.2.3 Air Quality Monitoring Solutions and Equipment

This sector is relatively mature, vibrant, active and technologically sophisticated. This is indicated by the shift in focus to health risk assessment and air toxics, which are present in much lower concentrations than the more common air pollutants such as carbon monoxide and oxides of nitrogen.

Air quality assessment tools have advanced, based on sophisticated computer models available to simulate local and regional air quality (that account for atmospheric chemistry, terrain, meteorology and an inventory of air pollution sources) and on air quality-forecasting systems.

Victoria's strong air quality legislation, which has been in place for twenty years, has driven the local industry and generated a competitive advantage for the sector.

The sector is highly competitive but it is fragmented and lacks cohesion and cooperation between key players.

8.2.4 Noise and Vibration Monitoring and Abatement Equipment

Excessive noise can lead to stress and damage hearing.

Noise monitoring and abatement, with approximately 70% of the Victorian population living in the greater Melbourne area, is an important service. In Victoria there are many acoustics consultants, some with international best practice expertise including airport noise modelling and management systems.

Noise and vibration abatement equipment is primarily concerned with various insulation materials and solutions used in the building and construction industry.

There is a strong capability within this sector in Victoria.

8.2.5 Energy Conservation / Energy Efficiency

The generation and supply of energy from fossil fuels is the largest contributor to greenhouse emissions in Australia. Energy is also a significant raw material cost to business and the community. Within Victoria, energy prices fell after market deregulation but have recently increased, placing additional cost pressure on energy users. Greenhouse and cost issues combine to place pressure on business and the community to improve the efficiency of energy use.

Energy management programs are aimed at delivering long term, sustainable reductions in energy use and energy cost. Reductions are delivered by combining education and awareness with process optimisation and efficient energy technologies. The benefits of awareness, training, process improvement and technology can be locked in by implementing an energy management system either in parallel to or within an environmental management system.

Energy efficient technologies have emerged across many areas including electricity generation, building materials, manufacturing equipment, lighting systems, load monitoring and control.

This sector is relatively small and generally consists of specialist groups. The sector is set to significantly increase in size and importance due to global concerns about the impacts of energy use on greenhouse emissions.

8.2.6 Solar Hot Water and Photovoltaics

There is a broad base of knowledge about solar hot water systems and photovoltaic systems in the Renewable Energy sector.

The demand for these systems is driven by:

- The need for stand alone systems in locations without access to the electricity grid; and
- The ongoing support from State and Federal Governments for the installation of solar systems by providing grants to reduce the cost differential between these and conventionally based systems.

There is steady demand for these types of systems in off-grid areas, especially as recreational land is purchased in such areas.

Additional demand is likely to be generated through government initiatives to reduce greenhouse gas emissions. These include the Federal Government's Mandated Renewable Electricity Target⁵⁷ requiring additional renewable energy by 2010, the Photovoltaic Rebate Program and the Victorian Solar Hot Water Rebate Program.

Without such drivers, renewable energy systems are only cost competitive where a remote location eliminates grid access (or makes it very expensive).

Another driver is consumer disenchantment with rising electricity prices and the increasing pressure on suppliers to meet peak demand by alternative means as it is unlikely that this demand will be met by new coal-fired power plants.

If the Kyoto Protocol is ratified a raft of new policy measures would be required to achieve the objectives of reducing greenhouse emissions.

The industry in Victoria is characterised by fragmentation and many small players, who appear to have little interest in increased cooperation.

8.2.7 Wind Energy

Wind turbines are generally regarded as the cheapest way to produce energy without adding to the greenhouse effect.

Wind energy is a promising market, but it is presently underdeveloped in Victoria. There is a demand for renewable energy and that is partially met by large wind farms, for example at Codrington near Portland.

However, the construction of the wind farms presently has a limited impact on the renewable energy industry, because most of the technology is imported.

Construction has a major impact on the Victorian construction industry through the building of foundations and erecting towers.

⁵⁷ The Mandated Renewable Electricity Target specifies that an additional 9,500 GWh of renewable electricity must be used of a 1997 base by year 2010.

There is an opportunity for local manufacture of blades and turbines, probably with imported know-how as it is costly to ship these parts from locations in Europe or the US, where they are manufactured.

There is also a market for individual, stand-alone wind-turbines, and some are already being assembled and installed in (usually off-grid) locations in Victoria. Turbine towers are being manufactured in Victoria.

8.2.8 Mini and Micro Hydropower

Mini and micro hydropower (electric generator driven by pressure in streams of fluid) is another promising technology. It can be used in water and sewage pipelines and other pipeline systems where there is sufficient flow and pressure. Mini and micro hydropower is currently used to generate power in locations where there is access to constant flows or a year-round stream.

8.2.9 Fuel Cells

Other promising alternate energy technologies are emerging.

Current research and development on fuel cells looks very promising. Iceland, for instance, has committed to large-scale implementation of fuel cells for transport purposes (currently being trialed in different locations⁵⁸) and a Victorian company⁵⁹ is developing fuel cells to generate distributed power at factory/house level.

Though not commercially viable yet, this could be an effective technology in the future to reduce the dependency on fossil fuels, especially in the transport and the manufacturing sectors.

⁵⁸ Daimler Chrysler has developed 16 fuel cell driven prototype and have sold their first fuel cell driven van to a commercial fleet company for delivery in 2001 (www.daimlerchrysler.com accessed 18.01.2001). General Motors is developing a range of vehicles (hybrid, fuel cell, internal combustion within the commitments undertaken under the Partnership for a New Generation of Vehicles initiated by US Government Departments to move to fuel cell powered vehicles (www.generalmotors.com accessed 18.01.2001).

⁵⁹ Ceramic Fuel Cells Ltd.

9 ADDRESSING THE CHALLENGES

9.1 Main Challenges Faced by the Industry

The Environmental Management and Renewable Energy sectors in Victoria face a number of challenges and opportunities.

The major challenges for the industry are:

- Fragmentation of the sectors into a large number of sub sectors with little connection between one another.
- A lack of industry vision for the future of the sectors.
- Lack of export market expertise and consequentially limited export market penetration.
- Lack of access to finance for commercialisation and business development.

Low levels of entrepreneurship and marketing and business skills within much of the industry.

- Failure of market mechanisms to generate adequate demand for industry products and services because of inadequate:
 - Community awareness of how industry can substantially improve its environmental performance;
 - Government incorporation of environmental values into government procurement policy and practice; and
 - Incorporation of “polluter pays” principles into market prices.

9.2 Key Directions to Face Industry Challenges

The following key directions were identified through the consultation to promote the development of the Environmental Management and Renewable Energy industries.

- 1) Establish a long term vision in the environment industry
- 2) Establish structures and mechanisms to create greater coherence in the industry:
 - a) Establish a round table of Victorian industry associations
 - b) Establish an Environment Industry Development Council
 - c) Establish a Centre of Excellence in Victoria

- 3) Develop business skills in:
 - a) Product development and marketing
 - b) Management
 - c) Export
 - d) Networking
- 4) Improve access to business finance.
- 5) Promote research, development and commercialisation.
- 6) Government provide support by:
 - a) Facilitating access to grants
 - b) Establishing an Environment Business Development Council
 - c) Government procurement policies
 - d) Linking industry with government environmental programs
 - e) Assisting in promoting the industry
 - f) Internalising externalities (ie. Using economic instruments to ensure environmental costs are internalised)
 - g) Maintaining and developing policies and regulatory regimes consistent with community expectations
- 7) Promote community and business awareness of sustainable development issues.

There are important differences between the Environmental Management and the Renewable Energy sectors. While the two sectors are clearly part of the environmental industries generally, the renewable energy sector is also grounded in the energy sector.

Therefore, while stakeholders agree that the actions discussed above are required for both sectors, some of them will be most effectively pursued separately.

The following discussion highlights issues that industry stakeholders identified as requiring attention. Some of these issues are currently addressed through existing Government programs.

In this context the discussion serves to high-light areas of industry concern where additional action might be required, including the Government better promoting its programs.

9.2.1 Create a Vision for the Future of the Industry

Throughout our consultations the industry has consistently identified the need to establish a long-term vision within which it can plan and make decisions.

A framework is needed to provide clear parameters for the industry that can guide new entrants and assist existing companies to strengthen or change the basis of their business including uptake of new research projects.

Stakeholders want a long-term industry plan that would confirm Government's commitment to developing the Environmental Management and Renewable Energy sectors in Victoria.

It would provide a relatively stable long-term framework that could be revised to reflect changing community's perceptions of environmental needs and the directions and capabilities of the Environmental Management and Renewable Energy sectors.

It is envisaged that a long-term plan would involve a 25 to 35 year time frame to make it possible to plan for and implement complex and far ranging changes.

In areas where industry innovation is very rapid and capital commitments are short-lived, action plans that are part of the long term Plan can be relatively short-term with changes guided by the long-term directions.

The Plan could build on the growing body of Victorian Government policy and initiatives including Greener Cities, Challenge Melbourne and the Victorian Greenhouse Strategy. It would also need to take account of national issues and trends.

It would need to be developed in the context of a well-developed picture of the options for a sustainable economy and the transitional issues involved.

The Plan would emphasise a long-term bipartisan approach so that its vision, objectives and actions can endure changes in government and political climate.

Recommendation 1

That members of the Environmental Management and Renewable Energy sectors:

- Establish working groups within the proposed new industry round table (*see Recommendation 2*) to develop a vision for the sectors.
- Work with Government to develop a long term planning framework for the sectors.
- Work cooperatively with emerging national industry bodies to integrate the vision and planning framework into a national context.

9.2.2 Establish Structures and Mechanisms to Create Greater Industry Coherence

The Environmental Management and Renewable Energy industry is very fragmented and less developed (except a few strong areas mentioned previously) than similar industries in other developed nations.

This fragmentation is a major barrier to international success, as there is a lack of cross-fertilisation of ideas, insufficient critical mass, and insufficient resources to bid and win larger contracts.

Fragmentation has limited the growth potential of the industry since individual companies must rely on their reputation when attempting to market products or win international recognition and acceptance of technological breakthroughs. A number of Victorian companies have significant capacity but lack this international credibility.

The industry's fragmentation has also meant that it has failed to create an organisational infrastructure to represent its interests to the community and governments.

The industry associations that currently exist tend to focus on the specific interests of their sub-sector and can only occasionally explore broader industry issues.

The development of the industry would be facilitated by greater cooperation, networking and the possible clustering of expertise, similar to that pursued by parts of the medical and scientific research industry, especially the Parkville precinct.

In order to achieve this many stakeholders saw a strong need to establish an industry round table to facilitate cooperation across the whole industry, an independent Environment Industry Development Council under the auspices of the Victorian Government and a Centre of Environment Industry Excellence.

9.2.2.1 Victorian Environment Industry Round Table

A number of industry members felt that the lack of a peak environment industry association in Victoria that represents the interests of all industry sectors makes it extremely difficult for the industry to effectively advocate its views and interests to the broader community and to government.

However a number of existing industry associations that represent various parts of the industry are concerned that another new association will further dilute the limited resources available for the representative function. A formal grouping of existing associations is seen as placing further demands on the limited and often voluntary resources of the associations.

There is therefore some disagreement between industry stakeholders about the need for a new industry association or a formal grouping of existing associations to act as a peak body for the whole industry.

Industry stakeholders do however see the need for a new Victorian industry round table of existing associations that would facilitate discussion and cooperation across the whole industry and represent generic industry views to Government.

A number of industry members also believe that a funded secretariat of the round table should be established. They see financial support being provided through an alliance of industry associations and by government.

9.2.2.2 Environment Industry Development Council

Industry stakeholders strongly advocated the establishment of an independent environmental industry council, appointed by and reporting to the Minister for State and Regional Development that would facilitate the development of the industry. It is seen as based on a strategic collaborative partnership between the industry and the Victorian Government.

It was proposed by stakeholders that it comprise an Independent Chair and representatives from peak industry bodies such as BCA or AIG, environmental industry and professional associations, tertiary institutes or CRC, conservation groups, local government, the finance sector and the State Government.

Stakeholders see it as providing a focus for action around many of the recommendations of this Audit including:

- Providing a link between the industry and Government;
- Contributing to the development of a vision for the industry that is built on a systematic analysis of the appropriate means and paths to achieve long term environmental sustainability;
- Promoting the integration of environmental awareness and learning at all levels of the public and private education and training system and across all curricula;
- Identifying the strategic directions of the market for environmental products and services and the emerging market opportunities that result;
- Liaising with business, finance, accounting and management representative organisations to make environmental sustainability a central element of best business practice; and
- Providing a basis for the establishment of a Centre of Environment Industry Excellence.

- Its role was envisaged by stakeholders to pursue the key foci for action and to advise the Minister for State and Regional Development.

It would also provide advice on:

- Progress in improving sustainable development within the business and wider community
- Market research and market activities to develop and promote the industry

Key industry stakeholders envisage that the EIDC could play an effective role if it was resourced to a level similar to that of other Government agencies involved in environmental management issues.

Stakeholders believe that the EIDC would support and complement the role currently being developed by the Premier's Business Round-table on Sustainable Development.

9.2.2.3 A Centre of Environment Industry Excellence

Clustering of firms and their expertise has the potential to consolidate an international reputation for quality and innovation, enable smaller companies to form alliances and networks, and pool resources for winning contracts nationally and internationally.

There is arguably an adequate knowledge base within the industry in Victoria to justify the existence of a cluster, but much of the knowledge is sequestered in small to medium sized companies such as inventors, installers, entrepreneurs, manufacturers, consultants, technical specialists and regulatory specialists.

Pulling together the technical, educational, business, marketing and testing facilities within the industry can address industry fragmentation and create synergies that could assist these industries to leapfrog competitors and achieve an international presence and reputation. This could be achieved by the establishment of a Centre of Excellence, possibly in conjunction with the establishment of the Environment Industry Development Council.

A multi-purpose "campus" or "precinct", where several functions, tasks and networks can be co-located to forge a vibrant cluster, would attract companies, foreign and domestic visitors, employees and students.

Such a Centre of Excellence would "pull together" technical, educational, business and testing facilities and thereby establish a cluster ... "seen by Porter and others as the new driver of competitive success in markets transformed by globalisation, on-line technologies and the increasing

significance of intangible assets such as knowledge, relationships and motivation”⁶⁰.

It could also house product development and testing facilities of national importance, tertiary education facilities, exhibition and offices for industry associations and draw together the many and varied stakeholders in the industry.

The establishment of a CRC for sustainable development within the Centre would put Victoria on the map in terms of practical research in this area and further draw industry participation.

The Centre of Excellence could also include the proposed national ETV that is likely to attract companies for testing and is most likely to be partially funded by companies using the facility.

A Centre of Excellence would benefit exports and attract foreign direct investment to Victoria and further attract companies within the Environmental Management and Renewable Energy industries to Victoria.

Recommendation 2

That members of the Environmental Management and Renewable Energy sectors in conjunction with the Victorian Government:

- Establish an industry round table to act as a facilitator and coordinator for the whole sector.
- Investigate the feasibility of establishing:
 - An independent Environment Industry Development Council to promote the development of the Environmental Management and Renewable Energy industry in Victoria.
 - A Centre of Environmental Excellence.
- Investigate the feasibility of establishing a funded secretariat for the round table.

9.2.3 Developing Business Skills

Many enterprises find it difficult to access finance, to develop and implement business plans, to export, or to form industry and export networks.

⁶⁰ Clusters drive new capitalism, Narelle Kennedy, Australian Financial Review.

Our consultation suggests that a required improvement in business skills needs to build on the industry's current strengths and take account of the likely future directions of product development in the industry.

Industry stakeholders want DSRD's suite of industry development products reassessed and renewed to address their current and future needs.

This suite of programs available to manufacturing firms includes assistance with business planning, market research, cleaner production, training audits, supply chains, establishing networks and feasibility studies. It also includes export assistance, mainly as part of trade fair or trade mission delegations. A \$10 million e-commerce plan for SMEs in Victoria has also been recently announced.

The assistance is on a shared basis and is to offset the costs of engaging a consultant to perform the required work.

9.2.3.1 Product Development and Marketing

Industry estimates put the domestic industry share of the Australian market for Environmental Management & Renewable Energy products and services at about 60–70%. Exports are at relatively low levels⁶¹. The industry needs to grow its share of the Australian market as well as expand its share of the export market.

Due to the fragmented nature of the industry and the large number of small to medium-sized enterprises, networking, collaborating and packaging a suite of products and services in an “easy to use” package is crucial to success. Encouraging and assisting the building of networks and alliances is therefore an important strategy for growing the Environmental Management and Renewable Energy industries through product and market development.

Successful alliances like the Water Industry Alliance in South Australia support SME access to a greater number of large and overseas projects than would otherwise be the case. In many cases know-how and technology exists in small companies but it is difficult for purchasers, who prefer to buy integrated solutions, to readily access them.

Developing marketing and product development skills in the industry can help to integrate the current “technology focus” of the industries with a more “consumer oriented”, market driven focus. As consumers and businesses become more informed, the industry's greater marketing and product design capabilities will make them more aware of the range of options, and provide a greater choice of the environmental issues that can be addressed and the solutions that can be used.

⁶¹ Though some high percentage rates have been achieved for a few products, for instance solar hot water heaters, where Solahart dominates, and photovoltaics, where BP Solar dominates and Pacific Solar is emerging as a player.

The Victorian Environmental Management and Renewable Energy industries are not adequately marketing their products and services and are not building strong networks.

Sales of the industry's products and services require a renewed focus on enhancing product development and marketing skills in future industry development programs.

A change in culture is also required to have the industry focus more on the sale of end products rather than solely on the development and use of technology.

The marketing of Victorian and Australian products and services can also be promoted by internationally branding similar to that provided by the Globe conference to Vancouver and Pollutec to Lyon.

Environment Business Australia, the Waste Management Association of Australia, Clean Air Society of Australia and New Zealand, and the Australian Water Association are promoting *Enviro 2000* as an internationally recognised brand name for an environmental business and technology showcase within the Asia Pacific Region similar to those in Vancouver and Lyon.

Victorian industry and government support for *Enviro 2000*'s establishment as an annual international environment industry event in Victoria has the potential to strongly brand and market Victorian environmental industry products and services.

9.2.3.2 Management and Finance

Consultations with the industry highlighted the need for increased efforts to develop the business skills of small and medium sized enterprises to improve:

- Capacity to develop and implement successful business growth strategies and plans
- Access to finance

The lack of management capacity to minimise and plan for business risk has caused many Environmental Management & Renewable Energy businesses to "study" or "wait and see" or to believe "it's too hard" to pursue business opportunities.

Failure to effectively set strategic directions, assess business opportunities and develop credible business plans also restricts access to seed and working capital. While problems with accessing finance may be partially due to lack of knowledge of the industry by finance providers, is also due to a lack of practical expertise and knowledge of capital raising strategies and requirements. While the Investment Ready Program assists firms to prepare themselves to attract investment, there is clearly a pressing need for the program to be better promoted.

A strategic, entrepreneurial, risk-managing approach which accepts setbacks but continues to pursue opportunities, also needs to be promoted within the industry if significant growth is to be achieved.

A strong focus on the development of business skills, especially for small to medium sized enterprises, in the Environmental Management & Renewable Energy industry is therefore required.

9.2.3.3 Exports

Victoria is the leading Australian source of environmental exports producing 24% of environmental goods and 34% of exports. Primary markets include the US, New Zealand and Japan and considerable opportunity exists in other European (UK and Germany) and some more developed Asian markets including Singapore. The Victorian Government has assisted several firms into Asian and US markets in recent years through trade fairs and missions.

While this Audit (consistent with the approach taken by the Government) has proposed that a national approach to exports should be taken there are a number of areas where state based reinforcement of national export programs is appropriate. These include:

- Analysing environment industry export opportunities to match these to product industry capability in Victoria.
- Use of Victorian government overseas offices in building customer and joint venture networks in key export markets.
- Actions to protect intellectual property in some export markets.
- Greater emphasis on accommodating the specific needs of the industry in existing export market programs provided by the Victorian Government including trade fairs and missions and an export manager program.
- Building of networks of export capable Victorian firms in the industry.

9.2.3.4 Networking

The strengthening of industry networks is required to:

- Build a critical mass of potential joint venturers across a range of industry sub sectors to jointly bid for contracts.
- Increase utilisation of existing workforce skills.

Shedding of excess capacity in many public and private organisations has led to many skilled individuals being only loosely connected into industry networks. One way of addressing this problem may be to support the establishment of a “virtual” company in the form of a members’ alliance.

While Government has consistently supported networking, particularly within small emerging industries including the environment industry, it has proven difficult to attract widespread interest.

Recommendation 3

That the Victorian Government consider means of providing improved access of enterprises with the industry to business development programs to:

- Support business diagnostics and business planning, and develop financial strategies.
- Enhance marketing and product development expertise in the industry especially in shifting firms from the current “technology focus” to a “consumer requirement” focus.
- Develop export market expertise, knowledge and capability.
- Identify key environment industry trade fairs and missions in targeted international markets and technology development centres.
- Undertake detailed and practical research into key markets with greatest export opportunities for each industry sub sector.
- Assist and encourage networking and collaboration.
- Create clusters and networks of firms, especially SMEs, to penetrate export markets together.
- Establish networks of experienced and successful firms that would act as lead contractors and smaller, sub-contracting firms to penetrate export markets together.
- Use of e-commerce and the Internet to build networks into export markets.

Recommendation 4

The industry with the support of the Victorian Government promote greater opportunities in and industry up take of business training especially in relation to:

- Understanding the business opportunities arising out of moves towards environmental sustainability
- Understanding environmental sustainability as a business objective
- Management
- Marketing
- Entrepreneurship

Recommendation 5

The industry with the support of the Victorian Government promote the establishment of *Enviro 2000* in Victoria.

9.2.4 Improving Access to Business Finance

Problems with accessing finance emerged through our consultation process. The reasons given by industry members included:

- A perception by financiers of the industry as high-risk; and
- Lack of knowledge about the future demand for products and services provided by the sector.

The Victorian Government's Investment Ready Program attempts to improve access to finance by assisting a firm to systematically organise itself to attract investment.

The trend toward taking account of environmental values both in investments and in risk assessment also presents an important market opportunity for industry participants.

Companies that can present themselves as candidates for “ethical investments” or as offering products and services that can improve a client company’s standing as an ethical investment or as environmentally sustainable will broaden its base for investment finance.

Market and corporate peer pressure is likely to become a major driver toward the improvement of companies’ environmental performance “potentially surpassing the effect of legislation”⁶².

EPA Victoria has demonstrated particular leadership with respect to the finance sector and sustainability.

In November 2000, EPA Victoria signed a Memorandum of Understanding (MOU) with the United Nations Environment Program (UNEP) to coordinate and promote its Finance Initiatives activities in Australasia.

One of the key initiatives under the agreement is to establish advisory committees on a number of topics. These committees will be made up of financial institution representatives and will advise EPA Victoria and UNEP on the nature of activities and programs to run in Australasia,

Four advisory committees will be established:

- Socially Responsible Investment;
- Environmental Credit Risk Assessment;
- Insurance; and
- Internal Operational Environmental Management in Companies.

It is expected that these committees will drive awareness and a better understanding of issues the finance sector faces in addressing environmental sustainability in their businesses. The higher profile of environmental sustainability issues with financial institutions should then lead to improving access to business finance for the Environmental Management and Renewable Energy sectors.

⁶² Fiona Wain CEO, Environment Business Australia Presentation to the National Trade Consultations Inter-sessional Meeting 10 May 2001. DFAT. Canberra.

Recommendation 6

That the industry, with the support of the Victorian Government:

- Inform potential financiers on opportunities in the environment industry and in realistically assessing risk in the industry.
- Investigate opportunities to pursue financing opportunities through ethical investment or environmental risk assessment.
- Liaise with Victorian EPA on work it is doing with the finance sector in relation to the MOU with UNEP.

Recommendation 7

That the Victorian Government explore means of facilitating access to private sector:

- Seed capital for commercialisation and product developments.
- Market development capital.

9.2.5 Promoting Research, Development and Commercialisation

Research and development and the commercialisation of research provide an important base for environment industry innovation and competitiveness.

Many of the companies within the industry that seek to undertake R & D and to commercialise their research (especially SMEs) are constrained by:

- Inability to access private and public sector research funding.
- A lack of Environmental Technology Verification mechanisms to verify performance claims of newly developed Victorian technology.
- Inadequate facilities to demonstrate the operation of technologies to potential customers or investors.
- Lack of protection to intellectual property embodied in new technologies especially in key Asian markets.
- Lack of take up of new technologies by domestically based companies requiring environmental management solutions.

The Victorian Government has established the Technology Commercialisation Program (TCP) to increase the rate of commercialisation of Victoria's science and technology ideas.

The TCP is aimed at encouraging business investment in new high technology industries, encouraging innovation, increasing international competitiveness and developing new export oriented technology businesses.

Recommendation 8

The Victorian Government promote R & D and commercialisation in the industry by:

- Supporting or creating initiatives to further strengthen the rapid uptake of new technologies by business.
- Supporting the establishment of a national Environmental Technology Verification facility in Victoria.
- Supporting the establishment of facilities to demonstrate the effectiveness of new technologies.
- Investigating opportunities for supporting industry participants through the Technology Commercialisation Program.
- Facilitating access of environmental industry firms to funds for commercialisation of technologies.
- Supporting and implementing coordinated industry access to Federal and State Government R & D grants, especially to assist SME access.
- Consult with the Federal Government on means of developing stronger science and technology treaties (GATS) with key markets for the industry's products and services where protection of intellectual property is a problem for the Victorian industry.

Universities provide an important knowledge base in the industry through the research, development and to a lesser extent, the commercialisation activities that are carried out there.

With the evolution of the research and academic culture and structures of the universities over the last 20 years there has been increasing emphasis on pursuing commercial opportunities generated by academic research.

There are significant opportunities to build on the universities' research and commercialisation capabilities through cooperation between industry, Government and the universities.

Recommendation 9

The Victorian Government with the industry promote R & D and commercialisation in Victorian universities by:

- Negotiating with universities means of establishing incentives to encourage commercialisation and entrepreneurial activity by university researchers.
- Supporting university initiatives to increase their access to funding for commercialisation of their intellectual property and seek new models for capital provision.
- Establishing mechanisms for creating and sustaining close links between university R & D activities and the Environmental Management and Renewable Energy sectors.

9.2.6 Government Providing Leadership and Support

9.2.6.1 Establishing A Policy Framework

A key contribution that the Victorian Government can make to the development of the industry is in the identification and support for sustainable development initiatives for the future.

This will reduce business risks in pursuing opportunities that are comparable with these initiatives.

The Victorian economy's strengths in manufacturing and services can be significantly reinforced through alignment with major international economies that are pursuing environmental sustainability.

Northern Europe, Japan and parts of the North American economy are pursuing a more environmentally sustainable basis and will increasingly demand products and services that embrace environmentally sustainable standards.

Much of Victorian business currently fails to meet such standards. A strategy to meet the needs of these progressive economies will need to set higher standards than those that apply today in order to intersect with the requirements of the future.

9.2.6.2 Facilitating Access to Grants

Many small and medium sized businesses in the EM & RE industry expressed concerns about the Federal Government's greenhouse mitigation programs provided through the Australian Greenhouse Office (AGO). They felt that they did not have ready access to grants provided by the AGO.

They see the grants as being almost exclusively accessible to large businesses. Smaller businesses preferred the program to be of similar design to the Solar Hot Water Rebate Program because:

- The application process and monitoring of outcomes is simple;
- Evaluation and selection of projects is undertaken by people with industry knowledge;
- Co-funding of equipment is provided; and
- There is an immediate environmental benefit from the program.

9.2.6.3 Government Procurement Policies

Local, State and Federal Government tendering processes were criticised for not having a sufficiently explicit environmental emphasis. Procurement decisions are generally based on a lowest dollar cost basis without regard to lifecycle costs.

The Victorian Government is committed to protecting and enhancing the environment including through:

- “Adopt(ing) purchasing and contracting policies that require a commitment to reducing greenhouse emission, waste avoidance and minimisation, protecting biological diversity and energy conservation.
- Develop(ing) Government purchasing policies that require all government departments, agencies and contractors to buy recycled products where these are available at competitive prices.”⁶³

The Government intends to provide leadership by adopting purchasing and management strategies that minimise environmental impacts.

coRecycle is currently providing government leadership in sustainable practices through the Waste Wise Government Program. This program promotes waste reduction and purchasing of recycled products. A similar program on energy efficiency within government agencies is run by the Sustainable Energy Authority of Victoria.

⁶³ Greener Cities: Labor's Plans for the urban environment p2.

The Local Government, *Buy Recycled Alliance*, funded by EcoRecycle and the Municipal Association of Victoria, is also promoting the purchase of recycled products.⁶⁴

The industry believes that there is a need for a whole of government environmentally sustainable purchasing policy encompassing all purchases. In April this year the Victorian Government launched the ‘Victorian Industry Participation Policy’ (VIPPP) which ensures local industry is given maximum opportunity to be considered for major work in Victoria. Bidders for a Government tender need to show the level of local content, the number of jobs created and the skills and technology transferred. It also includes a commitment to promoting environmental priorities through government purchasing policy.

The industry also believes that total lifecycle costs should be incorporated more fully into the tender process and the evaluation of tenders.

It was also felt that tenders should not be technologically prescriptive or adhere to outdated standards.

Assessment of proposals should focus on outcomes and achieving solutions.

Some stakeholders believe that leadership by Government in emphasising environmental sustainability is likely to flow over into greater environmental awareness by larger corporations and an adoption of similar purchasing policies by them.

9.2.6.4 *Linking Industry with Government Environmental Programs*

Industry stakeholders want stronger connections between Government’s environmental programs (including all three tiers of Government) and industry. They believe that this relationship should be as strong as the links that currently exist between the Government’s environmental programs and academic research.

By establishing closer links between the Governments’ environmental programs and the industry, industry development can be actively pursued, competitiveness enhanced and pressing environmental issues addressed.

By demonstrating the effectiveness of environmentally sustainable products and services and new technologies, through their application in government programs, their rate of up take can be enhanced, strengthening the development of the Environmental Management and Renewable Energy industries.

For example, Victorian Government owned corporations such as Melbourne Water, and three water retailers can be strategic to environmental improvement by leading the uptake of environmental technologies and solutions in the water area.

⁶⁴ www.mav.asn.au/buyrecycled/

Local Government also plays a vital grass roots role in environmental programs and also has a critical part in promoting the uptake of environmental solutions through closer links with the industry.

Industry based environmental programs have been successfully implemented in other countries. They create stronger links between industry and Government to better pursue environmental objectives throughout the economy and provide opportunities for companies in the environment industry.

Overseas experience includes:

- Environmental purchasing policy guidelines for business and government (Federal, State and Local).
- Promotion of investment in greenhouse gas mitigation in industry (some co-funding) to increase industry uptake of environment or renewable energy solutions and products
- The explicit inclusion of greenhouse considerations as an element of industry development programs
- Support of energy efficiency improvements in small to medium sized enterprises
- Targeted expansion of cleaner production programs
- The introduction of comprehensive energy strategies, which sets goals for renewable energy use

Stakeholders believe that preference should be given to environmental programs that achieve current mitigating effects in areas such as greenhouse and salinity, even though this may reduce research in new technology.

9.2.6.5 Making Victorian Manufactures Environmentally Competitive

Key overseas markets for Victorian manufactures are increasingly demanding products that reflect and incorporate environmental sustainability.

In order to be able to continue to sell into these markets Victorian manufacturers will need to improve their environmental performance to meet overseas standards, especially in Europe and the USA.

It will be extremely important for the viability of the Victorian manufacturing industry, especially for elaborately transformed manufactures (ETMs), and for the Victorian economy as a whole that the Government and industry take decisive action to ensure that its products can meet the demands of overseas markets.

Given that Victorian industry is generally starting from a low base of environmental sustainability the trajectory of improvement to meet required international standards will be steep.

9.2.6.6 Internalising Externalities

Resources in general are limited and their use in production and consumption activities may lead to their deterioration. When the cost of this deterioration is not adequately taken into account within the price system, the market fails to reflect the scarcity of such resources both at national and international levels.

Therefore public measures are necessary to achieve a better allocation of resources by ensuring that:

- Prices of goods, which impact on the quality and/or quantity of resources, reflect more closely their relative scarcity; and
- Economic agents concerned act accordingly.

To address market failure and achieve a better allocation of resources (with the additional benefit of increasing demand for Environmental Management and Renewable Energy products and solutions), greater internalisation of externalities and adoption of the polluter pays principle, is required.

The Victorian Government is committed to internalising externalities and adopting the polluter pays principle through its COAG membership (and through the encouragement of international organisations such as the OECD). A number of existing regulatory measures (such as the landfill levy) operate to internalise costs that may otherwise be externalised.

There are advantages and disadvantages of rapid rather than slow adoption of “polluter pays” principles.

Early adopters enjoy economic advantages flowing from restructuring of industries since a number of large economies value highly the recognition and internalising of environmental costs.

The short term benefits of deferring the internalisation of externalities is likely to be offset by the loss of credibility and standing of Victoria’s manufacturing capacity compared to more environmentally progressive economies.

Without implementation of the “polluter pays” principle, some businesses and individuals will reap short-term profits because they do not pay the full cost of the resources used. These costs are borne by the community now and in the future.

The growing awareness of environmental issues will drive greater acceptance and application of the “polluter pays” principle. A discussion of methods of applying the “polluter pays” principle is outside the scope of this report. However tools such as green taxes and regulations are widely discussed in the literature, including comparisons of their relative flexibility and rate of success in achieving the desired environmental and economic outcomes.

Industry stakeholders believe the government should investigate the replacement of some labour (non-polluting input) or business taxes with “green” taxes which internalise the costs of pollution/damage to the environment and contribute to more sustainable economic growth.

Through these actions stakeholders believe that the State Government can influence industry to take a more environmentally sustainable approach and increase the overall market for Environmental Management and Renewable Energy industry products and services.

Recommendation 10

That the Victorian Government provide support for the industry by:

- Working with industry to lift, over a 10 year period, the environmental performance of Victorian elaborately transformed manufactures (ie. the products) to match the performance standards expected in northern Europe (eg. Germany, the Netherlands, Denmark, Sweden) by 2010.
- Implementing environmentally sustainable solutions (especially in government owned enterprises like Melbourne Water).
- Facilitating rapid uptake of new technologies by promoting the benefit of setting goals and establishing action plans for and reporting on triple bottom line objectives.
- Publishing government initiatives and progress in implementing environmentally sustainable solutions.
- Facilitating rapid uptake of new technologies by including sustainable development considerations and principles in government procurement practices and in appropriate government funded business development initiatives.
- Recognise environmental and lifecycle costs in all government programs and tenders.
- Initiating or strengthening regulatory and financial incentives to increase industry uptake of cleaner production methods and promote a more rapid move to sustainable production methods.
- Pursuing minimum national environmental regulations with the Federal and State Governments and assisting Victorian environmental business in negotiating regulatory approval with other State Governments.
- Pursuing wherever possible the internalising of external costs (ie. put a price on pollution or on resource use where the current market price does not reflect the true cost of using the resource or polluting the environment).

9.2.7 Promoting Community and Business Awareness of Sustainable Development Issues

Growth of the Environmental Management and Renewable Energy industries is primarily driven by the rate of uptake, by industry and individual consumers, of environmental solutions and products. An accelerating uptake is largely based on a growing community awareness of environmental issues.

Better societal outcomes are achievable by raising community awareness of environmental issues and the products and solutions provided by the Environmental Management and Renewable Energy industries.

Greater understanding of the environmental cause and effect of personal, business and community decisions, and a shift towards more environmentally sustainable behaviour can increase the uptake of Environmental Management and Renewable Energy solutions and services and contribute to more environmentally sustainable outcomes.

While Victorian Government departments and agencies have striven to raise community environmental awareness for many years, continuing sustained efforts are required to inform the community about environmental issues and possible solutions to these issues.

Greater awareness of the full costs of environmental pollution and damage is necessary if the community is to make informed choices about economic activities. With better understanding of the issues the community is in a position to trade off higher present costs for better environmental outcomes. The Green Power Scheme where consumers' sign up for certified "green power" at a premium, replacing power from coal fired plants with green power is an example of such an approach.

The Victorian Government has an ongoing leadership role in enhancing community awareness and consideration of environmental issues. Industry stakeholders want increased government leadership to promote environmental improvement through community and business awareness programs. They see major benefits from such government efforts that flow through to increase demand for their products and services.

While significant efforts are being made, especially with school children, to increase their environmental awareness, industry stakeholders believe that more needs to be done to achieve long-term behavioural change. These could include:

- Increased support for organisations providing environmental education to school children such as CERES where annual student numbers equal that of the Melbourne Zoo but which receives a fraction of the funding.

- Improved mechanisms for industry input into environmental education in schools through organisations including the Curriculum Development Authority.
- Environmental and environmental management education continuing into tertiary courses.
- Direct marketing information to inform industry and community decision-makers.
- General awareness programs to update the knowledge of the wider community such as the Global Action Plan, which allows households to monitor and reduce their undesirable impact on the environment and provide feed back to the industry on their needs for goods and services which would allow them to further improve their environmental performance.⁶⁵

Recommendation 11

That the industry in cooperation with the Victorian Government:

- Raise community awareness of the importance of environmental sustainability and of solutions provided by the industries.
- Educate business and the community about the cost-benefits of cleaner production methods and pursuit of sustainable development.

⁶⁵ See “Household Ecoteam Workbook: A Six Month Program to Bring Your Household into Environmental Balance”. Gershon, D & Gilman, R. A Program of Global Action Plan for the Earth, USA, 1992.

10 CONCLUSION

Through undertaking this strategic audit it has become apparent that there are a number of areas where industry and State Government is in a position to strengthen the drivers of the Environmental Management and Renewable Energy industries.

Primarily we have identified the need to address environmental problems and move to more sustainable production methods as the strongest drivers of these industries.

Recommendations in Section 8 are few but far-reaching. Focus is on strengthening the capabilities of firms in the Environmental Management and Renewable Energy sectors, stimulating the demand for their products and services and establishing a new long-term industry framework in which they can grow.

There are many excellent Victorian companies with very good technology, but their major challenges arise not from a lack of new technology, but from difficulties with getting this technology to market and selling it successfully.

There is a strong innovative spirit within the industries but greater commercialisation is needed if they are to be nationally and internationally successful.

Failure to develop these industries will increase reliance on international specialists to solve our environmental problems with the danger of them not being able to provide solutions most suited to our values and circumstances.

APPENDICES

APPENDIX 1

SUMMARY OF CONSULTATIONS

Scope of the Consultation Process

In August 2000 the Minister Assisting in State & Regional Development, the Hon. Candy Broad, released the Development of the Environmental Management and Renewable Energy Industries, Discussion Paper.

The purpose of the paper was to provide Victorian businesses and other industry stakeholders with the opportunity to participate in the process of the strategic audit and present their views in a number of ways.

The paper was mailed to approximately 750 stakeholders involved in waste management, recycling, water and wastewater management, solar retailing, installation and manufacturing, environmental consulting and engineering. Industry associations, government departments and special interest groups received copies of the paper. The paper was also made available to the general public on the Department of State and Regional Development web site.

Written submissions were received from 51 organisations including 40 businesses, 6 peak industry bodies, 4 government entities and 1 university.

In addition to receiving submissions, the audit team held a series of workshops where stakeholders were invited to discuss a vision for the industry. Workshops were held in Traralgon, Portland and Ballarat where total attends numbered 27. Three additional workshops were held in metropolitan Melbourne where total attends numbered 53.

Individual interviews were also undertaken. The audit team interviewed about 45 stakeholders from all parts of Victoria.

The purpose of the consultation process was to identify the main impediments and opportunities relating to the development of the Environmental Management and Renewable Energy industries and to discuss the role of industry and government in addressing these issues. The key messages from this process have been summarised here. This summary of consultations has been distributed to all parties who contributed to the discussion process.

This section contains a summary of the issues and views raised during the consultation process, without any analysis of the issues raised.

General Issues Raised during the Consultation Process

The topics in this section identify issues raised throughout the consultation process, which are applicable across most industry sectors.

Green Taxes

A popular recommendation by all stakeholders in interviews and workshops was the introduction of “green taxes or environmental taxes designed to better reflect the costs of environmental damage and resources”.

Proposed taxes included “charges with respect to greenhouse, noxious gas and particulate emissions. A tax on domestic consumption of above-average rates of water, gas, electricity and other energy sources and tolls on arterial roads”.

Tenders and Contracts

Several submissions received from contractors to local government could be summed up in the following statement: “Industry would like to see the focus of government tenders and contracts being on outcomes rather than prescriptive on process”. The submissions believed that “the prescriptive process stifles innovations as credibility is only given to technologies that have a long-standing track record”.

Some contractors believe this impediment “is exacerbated by outdated Australian Standards”. Companies tendering for government contracts are finding that “innovative technologies often don’t fit the compliance criteria of existing (outdated) standards and tenders are often let to tried and tested technology, rejecting innovation”.

Regulations

All companies who are operating across states would prefer to see “identical environmental standards and regulations between states”.

“Lack of uniformity or cohesion in regulations across states makes working on technology difficult as the technology can only be applied in markets which regulate for that technology” said an environmental consultant during an interview. However EPA Victoria reports that environmental regulations in Victoria are generally based on required environmental outcomes, not specific technology. Technology can be used anywhere that it achieves the required environmental outcomes. EPA Victoria prefers this approach as it allows industry to develop new technology and approaches which improve overall environmental quality.

Some companies operate across three state borders with three sets of environmental standards. Companies in this position stated “the lack of uniformity in standards makes compliance across borders difficult and can impede competitiveness if one company has higher compliance costs”.

The path suggested by companies was “a steady convergence of environmental regulations across states”.

Intellectual Property

During an interview with an environmental engineering firm, the managing director stated that “the development and application of new technology is regarded as essential to developing new markets and creating opportunities for firms. However development and commercialisation is costly, especially for SMEs, and therefore carries much risk”.

One company who appeared to be investing heavily in developing new technology said “to minimise risk and encourage innovation there must be adequate laws to protect intellectual property”. Thus, “development of strong science and technology treaties to offer better intellectual property protection would assist companies who wish to market their technology overseas and would provide incentives to reinvest in technology”.

Technology Verification

It was mentioned in an interview with a large manufacturer that “overseas customers purchasing new technology from Australian firms generally want assurance that the technology meets manufacturer claims”.

A submission to the audit process from the same manufacturer expressed the belief “that a technology verification program, administered by an industry body with links to other overseas bodies would make it easier for Australian technology to be recognised and accepted overseas”.

Research and Development

The view from three industry submissions is that “R & D is driven by institutions such as CSIRO and universities, but the pragmatic research is happening in the SMEs”.

At the workshops participants expressed the view that “government should not invest so heavily in CRC (Co-operative Research Centres) and university research, but instead invest more in up-skilling SMEs, and in purchasing and championing new technologies”.

Mention was made at workshops that “Victoria and Australia in general are poor at managing the interface between R & D and commercialisation”. It was suggested that the government could assist by providing a bridge. For example, commercial tax incentives for R & D, easier access to funding for R & D, or linkages to research institutions as a part of the company structure”. The audit team feels it is necessary to mention however that AusIndustry and the CRCs are already running programs to address these issues.

Education and Training

All businesses interviewed regarded graduates from Australian universities as “being highly capable and of sufficient quantity that there is no shortage”.

A concern of smaller operators was that “it is difficult to attract young graduates, who prefer to work in large corporations with good super etc”.

A waste management operator viewed education and training as “being important to ensure that companies remained competitive and operated according to industry best practice”.

Some submissions held that “the definition of the Environmental Management and Renewable Energy industries could be expanded to include those institutions that provide training for these industries”.

The Role of Industry Associations

The response to the question ‘Do you belong to any industry associations?’ ranged from ‘yes, several’ to ‘none at all’. With the industry being so fragmented it was discovered in workshops that “it is difficult for operators and government to identify one industry association as being their peak body”. This was seen to put the industries as a whole in “a weak position with regards to being able to effectively lobby government”.

Workshop participants suggested “a council of industry association representatives” so that “lobbying activities may be coordinated”.

Alternatively workshop participants suggested “that a new industry association, made up of existing associations be formed with the assistance of the state government”.

Access to Government Grants

Smaller operators from all sectors reported that “grant money is difficult to access, especially in terms of what is required from small businesses and the resources small businesses have to supply what the government departments want”. Many businesses said, “If the system for accessing government funds was more user friendly then they would be more inclined to use the system. As it stands they find the process onerous and expensive”.

At the workshops the idea of a “one stop shop for government grants” was suggested. Businesses wished to “cut back on the paperwork and bureaucracy” associated with getting a government grant.

They also wanted the system changed so that from the first application they would know what their chances were of getting some funding. They reported that they often went through the process only to be turned down right at the end. This was said to be “a significant waste of resources for small operators”.

Finance

Accessing finance or finding investors for small companies across all sectors is reported to be difficult. One manufacturer of recycling equipment said, “there does not seem to be a lot of money available for environmental technology. People would rather put their money into publicly listed companies where information is more open and they feel they have more control over their investment”.

Some companies have found that venture capital is “the best way to fund new technology”. But venture capital still has its downfalls, for example, “venture capitalists concentrate only on return on investment. This has the effect of making the company work for the venture capitalists as opposed to developing the company and its concepts”.

Certified Reference Materials (CRMs)

CRMs are used to provide reliable and consistent reference standards for chemical analysis to ensure results from different laboratories, and different analysts, are comparable.

A consultant mentioned in a written submission “the area of Environmental Management is heavily dependent on chemical measurements” and “the laws and regulations relating to environmental controls – primarily an area of State responsibility – are heavily dependant on chemical limits and chemical measurements. The law requires that for a measurement to be acceptable in a court of law it must be traceable to a national standard”.

“Australia does not have any national standards for chemical measurement. To date National Analytical Reference Laboratory is the only in Australia to be accredited as a producer of Certified Reference Materials (CRMs) and none of these are related to environmental matters”.

“It is questionable if any of the chemical measurements made on environmental specimens by laboratories in Australia would be acceptable in an Australian court”. Apparently “this issue is currently a major concern to all state environmental agencies in Australia, who are concerned their regulations may not be readily enforceable in a court”.

However EPA Victoria advises that a measurement does not necessarily have to be referable to a national standard to be admissible in court. At this time, EPA Victoria is not experiencing the problems alluded to by the consultant. Nevertheless, there is some legal uncertainty regarding the admissibility of some chemical measurements in the environmental sphere, and EPA Victoria is monitoring developments in the area.

Specific Issues Raised during the Consultation Process

Recycling and Waste Management Issues

Critical Mass

A recycler visited by the audit team in the north western part of Victoria stated “recycling in rural areas is profitable, but not profitable enough for multinationals to want to expand to rural areas”.

In interviews smaller operators reported that they “lack the critical mass required for getting economies of scale from recycling” and “profits are too small to enable investment in modern recycling equipment” required to improve their operating efficiency.

One regional recycler stated that “council contracts tend to only be for the length of the election of the local council. For recyclers to make investment decisions they need to be assured of longer-term income streams. Contracts of 5–7 years would justify further investment in recycling infrastructure”.

Transport Costs

“Transporting recycled goods to Melbourne is the main way to get recycled materials to market”. During an interview, a regional recycler stated, “with rising fuel costs margins are shrinking. This is slightly offset by increases in virgin plastic prices owing to rising oil prices”.

EcoRecycle is “looking at the viability of setting up better infrastructure to store recyclable materials in rural areas with a view to decreasing the transport costs”.

Green Waste

Green waste recycling was seen as “an area of significant potential”. A parallel was drawn saying “States such as California in the US operate statewide waste diversion programs to prevent green waste going to landfill. Green waste is collected, composted and sold at a profit or burned as biomass for renewable energy”. Most waste management operators agree that “composting of green waste is an area that requires action by local councils”.

One recycler mentioned in an interview that “some companies are trying to compost without adequate knowledge as to how it should be done”, and, “Poor composting techniques can release pathogens, disease and plant contamination into the environment”. This “lowers the value consumers get from compost as companies are selling a worthless product”.

Fuel Subsidies

Two operators who operate machinery off road suggested in written submissions and interviews that “the previous fuel subsidy for certain off-road business use should be reinstated”.

“The subsidy should be restricted to those companies who do not qualify for a grant or claim under the Diesel and Alternative Fuels Grants Scheme or Extended Diesel Fuel Rebate Scheme”.

Education

It was almost unanimous amongst recyclers that “education of the public is an important factor in increasing recycling rates”.

“Waste Management operators who neglect their tender responsibilities to educate the public with regards to recycling are ‘shirking’ their responsibilities”.

Several recyclers from rural areas were interviewed. They believed that “most council tenders call for an education officer, but often the terms of the tender are poorly enforced as council resources are allocated in other areas”.

“If waste management contractors operators do not employ an education officer then they are able to make savings”.

Costs of Waste Disposal

Interviews showed that many businesses involved in waste minimisation believe “the cost of disposing of waste in landfill is too low and there are no disincentives for creating waste”.

The fact that waste disposal agreements and packaging covenants are voluntary was an issue for some companies who believe “if they (the government) are serious about waste minimisation it should be a legislative requirement”.

“By raising the cost of waste disposal and operating waste diversion programs firms would be forced to examine their waste streams and how best to avoid landfill disposal costs”.

Environmental Consulting and Engineering Issues

Drivers

During an interview, an environment equipment firm said “Drivers for ‘Environmental Engineering’, being the treatment of air water and soil are driven by regulation. ‘Resource Recovery’ taking a waste stream and turning it into a resource is driven by Return on Investment”.

A written submission, also from an environment equipment firm, backed up the views expressed above and went on to state “The most realistic options to deal with waste streams or treat natural resources are often the cheapest and most pragmatic”.

Regulations

In a submission from an environment consultant, the statement was made that “Regulation should not focus on waste minimisation but resource recovery. However as Australian regulation is often based on what is successful in other countries Australia finds itself in the position of importing the technology”.

The same submission went on to state “from a technology point of view regulation should be formulated in terms of case studies to see what the inflow is to Australia from the application of different technologies”.

Contaminated Soil

An engineering consultant who works with land developers described contaminated soil as being “a cost headache”. And, “the interpretation of what constitutes contaminated soil is very narrow with even very low levels of contamination requiring remediation”.

Businesses quoted that it currently costs \$30/metre to dispose of soil in landfills. The businesses saw this as “cheaper and faster than biological methods of remediation but landfills are expected to stop receiving contaminated soil in the foreseeable future”.

Profile

This topic was discussed in detail at workshops in metropolitan Melbourne. The general consensus was that “there is a lack of representation amongst environmental consultants, none have a profile high enough to fully represent the industry”.

Smaller consultants expressed a willingness to “utilise networks to attach themselves to larger companies when their expertise was required”. Networking and networking opportunities were considered of “high importance” amongst consultants in both rural and urban areas.

Competitive Environment

Some consulting businesses regard the “lack of open and transparent implementation of the National Competition Policy by Government agencies and statutory authorities” as an impediment to growth in Victoria.

“State institutions competing with business that has traditionally been the domain of the private sector has increased competition, but it disadvantages the smaller operators who may be totally reliant on consulting income to maintain and grow their business”.

“An associated impediment is that the statutory authorities trend towards developing in-house skills and thereby reducing the levels of service they require from consultants”.

Solar & Renewable Energy Issues

Definition

The definition of Renewable Energy as defined by the audit team was “not considered to be broad enough”, especially by those developing cleaner energy production technologies.

Several submissions expressed the view that “it would make more sense to deal with sustainable energy industries that reduce greenhouse gas emissions rather than just renewable energy”.

There was also a call by educators and industry organisations to include training institutions within the definition of renewable energy industry.

Energy Efficiency

A submission from an energy auditor stated that “Energy audits using taxpayer funds are not an effective path towards energy efficiency. Despite the fact that there is potential to save energy, many organisations have no incentives to save energy and they are not penalised for excessive energy consumption”. A solution was “to establish workable standards to reduce environmental impact and improve company profits”.

At the workshops energy efficiency was a popular ‘no regrets’ approach to tackling greenhouse issues. Incorporating energy efficient principles in building design and planning considerations was seen as an opportunity to stimulate the renewable energy industry.

Grid Interactive

Grid-interactive systems (two-way grid interconnection systems) use sophisticated control equipment so that when a renewable energy system produces more power than needed, the excess power is fed back into the grid. When the system doesn't produce enough power, then power is supplied from the grid.

Grid interactive systems and the differences in electricity and connection pricing structures between retail power companies has been “an area of concern for many in the photovoltaics industry”.

“A rebate equal to the cost of the power that goes into your house would be an ideal outcome, but currently retailers will only give a rebate equal to the wholesale cost of the electricity going into homes. A larger rebate would be seen to make photovoltaics a more attractive cost option to consumers over the long term”.

Larger scale grid connections are reporting having “difficulty with regards to the rules and regulations regarding connecting imbedded generation to distribution networks”. Some organisations have made submissions to the Office of the Regulator General regarding this matter.

Photovoltaics Rebate Scheme

Submissions from businesses selling other forms of renewable energy such as wind and micro-hydro wrote, “the rebate should be applied more broadly to include other alternative forms of energy”. Apparently the decision not to include other forms of alternative energy was made at a Federal level and hence is outside the control of Sustainable Energy Authority Victoria.

At one of the audit team interviews with a photovoltaic installer there was a suggestion that “more of the rebate schemes cash should have been spent on a saturation advertising campaign”. This was to “create greater awareness of the benefits of renewable energy amongst the general public”.

Education

Many retailers of photovoltaic equipment interviewed expressed the concern that “builders and plumbers in general lack the knowledge required to be able to give potential renewable energy consumers an informed choice”. Many whom the audit team interviewed believe that “misinformation regarding the effectiveness of renewable energy is spread by the builders and plumbers and that they will try to convince customers to take traditional approaches to energy requirements”. It was suggested that builders and plumbers as a part of their apprenticeships should take courses on solar installations.

There is also concern amongst alternative energy retailers that the general public is “lacking knowledge as to the advantages and disadvantages of renewable energy”. Solar power system retailers noted that “the cost and payback period of a renewable energy system for a home is important to communicate as most customers make their final decision based on price”.

Green Power

The Green Power scheme enables consumers to purchase their electricity from renewable sources. A small premium is added on to their electricity bill. When consumers sign on to the Green Power scheme, electricity retailers are bound to purchase pledged portion of their supply from renewable sources.

The scheme was criticised by some renewable energy producers and retailers in workshops and submissions for “effectively subsidising users of fossil fuel generated electricity”. The reasoning behind this is that “Green Power scheme customers pay a higher price for their electricity than fossil fuel users”.

In reality SEAV reports that the revenue from Green power producers is required to be ring fenced from other revenue sources. The premium goes directly to funding the purchase by the retailers of approved renewable energy for their customers. This scheme is rigorously monitored to ensure customer confidence and provides another opportunity for consumers, who want to purchase green power.

A suggested significant potential driver for the renewable energy industry was that “a levy should be placed on fossil fuel generated electricity in order to help fund renewable energy projects”.

Energy Market Reform

Submissions from renewable energy generators and workshops thought electricity market reforms should also include the development of legislation and incentives for the industry to deliver positive social, economic and environmental outcomes. “As new owners of energy infrastructure restructure their business to maximise their investments and protect market share, almost no attention is being paid to longer term issues which have an impact on the environment and the community”.

Another concern brought up in workshops is that “the introduction of competition will reduce market share for renewable projects, which will not be able to compete with traditional fuels when market price is the determining factor of sales”. Renewable power generators say “unless externalities such as pollution are priced into fossil fuel generated electricity, renewable power generators will find it almost impossible to enter into profitability”.

Energy from Waste

Recovery of energy from waste through smelting or incineration to fire cement kilns is seen as a viable opportunity to “deal with waste streams while creating inert slag that is sold to concrete producers”. According to submissions “Victoria already has considerable expertise in this area” and there is “significant potential in exporting this technology to South East Asian economies”.

Also, “with the possibility of landfills closing or costs of waste disposal increasing the opportunity exists to apply this technology commercially at home”.

Carbon Trading & Kyoto

If the Kyoto protocol is ratified, some businesses mentioned that they were “unclear as to what form carbon emissions trading will take”. Statements from submissions report that “Kyoto will have a significant effect on the market for renewable energy goods and services”. At workshops there were calls for certainty in this area by asking Victoria to take the lead in carbon trading arrangements.




One submission from a company involved in supplying energy production equipment said “it is only a matter of time before carbon trading will become a part of business life and that early development of expertise in this area could open international and interstate markets for Victorian organisations”.

While recognising that “sorting out the issues involved in carbon trading is a monumental task”, it was stated that “businesses would like the Australian government on a state and federal level to take leadership in this area to develop procedures, rules and guidelines”.

Consultation Participants

The audit team would like to thank all those who participated in the consultations.








Key

-  Written Submission
-  Interview
-  Workshop Participant

Government Organisations






-  Australian Alpine Valleys Agribusiness Forum
-  Australian Bureau of Statistics
-  CSIRO – Energy Technology
-  Environmental Protection Authority
-   Department of State & Regional Development – Office of Manufacturing
-  Department of State & Regional Development – Regional Development Victoria
-  Department of State & Regional Development – Science Technology & Innovation
-  Department of State & Regional Development – Small Business Victoria
-  East Gippsland Catchment Management Authority
-    EcoRecycle
-  Strategic Industry Research Foundation
-    Sustainable Energy Authority Victoria

Universities





















-  Monash University
-  RMIT – Department of Mechanical & Manufacturing Engineering
-  RMIT – Office of the Pro-Vice Chancellor (Research & Development)
-  RMIT – School of Management
-  South West TAFE
-  The University of Melbourne
-  Victorian University of Technology

Industry Associations

-  Australian Industry Greenhouse Network
-  Australia and New Zealand Solar Energy Society – Victorian Branch
-  Alternative Technologies Association Inc
-  Banksia Environmental Foundation Inc
-  Electricity Supply Association of Australia Limited
-   Environment Management Industry Association of Australia

-  National Association of Testing Authorities Australia
-  Sustainable Energy Foundation
-  Sustainable Energy Industry Association
-  Sustainable Energy Industry Association – Victorian Branch
-  Victorian Water Industry Association

Businesses

-  Adtech Windpower
-  AGL Pty Ltd
-  Aquascope Pty Ltd
-  Asia Pacific Consultants
-  Ausmelt Ltd
-  Australian Environmental Laboratories
-  Australian Productivity Council
-  Australian Recycling Technologies Pty Ltd
-  Australian Ultra Violet Services (Operations) Pty Ltd
-  A.W.N Consultants
-  Bartlett Associates Pty Ltd
-  Biotech Pacific
-  Brickwood Holdings Pty Ltd
-  Catt Bros Pty Ltd
-  Ceramic Fuel Cells Ltd
-  City West Water
-  Citipower Ltd
-  Cleaners World Gippsland
-  CleanTeq Pty Ltd
-  Clough Engineering Ltd
-  Composite Flooring Pty Ltd
-  CSR Humes Ltd
-  The Daniels Corporation
-  Davy Industries Ltd
-  Deanrange International Pty Ltd
-  Deni Greene Consulting Services
-  Desmond Fitzgerald Pty Ltd
-  Diomedes & Associates
-  EEA Group Pty Ltd
-  EEP Management Pty Ltd
-  Encore Rubber Technologies
-  Enviro-Mulch Pty Ltd
-  Environment Equipment Pty Ltd

- * EnviroQ Pty Ltd
- ☐ EnviroRisk Management Pty Ltd
- * ☐ Finwaste Pty Ltd
- ☐ Fisher Stewart Pty Ltd
- * ☐ Gas Technology Services
- * ☐ The Geo-Eng Group
- ☐ GCD International Pty Ltd
- * GHD International Ltd
- * Global Renewables Ltd
- * Going Solar
- * Gould League
- * ☐ Graham B Jackson Pty Ltd
- * Halstead Environmental Management Pty Ltd
- * Handex Australia Pty Ltd
- ☐ Hodson & Associates Pty Ltd
- * HRL Technologies Pty Ltd
- * ☐ IDS Consulting Services
- ☐ International Chemicals & Engineering
- * Jimco Australia Pty Ltd
- ☐ John B Tingate – Vestas
- * Keppel Prince Engineering Pty Ltd
- * Lateral Technology
- * Levings & Associates
- 👤 Lincoln Waste Pty Ltd
- * ☐ MacDonald Johnson Engineering Company Pty Ltd
- * Magnetiser Pty Ltd
- * Maunsell McIntyre
- 👤 The Meinhardt Group
- 👤 Melbourne Enterprises International
- 👤 Melbourne Water
- 👤 Microgarden Pty Ltd
- 👤 Midland Worm Castings
- 👤 Moconna Pty Ltd
- 👤 Motorway Tyres Pty Ltd
- * MRI
- * Mr Solar
- ☐ Oilclean Services Pty Ltd
- 👤 Outlook Alternatives Ltd
- * Pacific Hydro Ltd
- ☐ Paul Kelly & Associates

	Platypus Power Pty Ltd
	Powercor Australia Ltd
	Renewable Energy Corporation Ltd
	Rustic River Pty Ltd
	Sandhurst Enterprises Ltd
	Saurin Enterprises
	Seghers Applied Engineering Services Inc
	Septech Industries Australia Pty Ltd
	Shearwater Environmental Management Pty Ltd
	Solar Systems Pty Ltd
	Solar Systems Ballarat
	Solar Still Pty Ltd
	South East Water
	South West Solar
	Southern Hydro Ltd
	Stanwell Corporation Ltd
	Stawell Recyclers Pty Ltd
	Sturton-Gill Engineering Pty Ltd
	Sunbather Pty Ltd
	Sunlight Solar Systems Pty Ltd
	Sunraysia Environmental Ltd
	Sunsine Australia Pty Ltd
	Sustainable Solutions Pty Ltd
	Teris Pty Ltd
	Theiss Contractors Pty Ltd
	Treebank Carbon Services
	TXU Retail
	USTMAN Australasia Pty Ltd
	UTA Products
	Vac-Tec Group Pty Ltd
	VISY Recycling
	Virotec Global Solutions
	Waste Audit & Consultancy Services Pty Ltd
	Watqual Engineering and Environmental Services
	Western Liquid Waste
	Wharington International
	Wimmera Recycling Pty Ltd
	Yarra Valley Water

APPENDIX 2

DATA PROBLEMS

The constantly changing nature of the environment management and renewable energy industries as they adapt to new environmental requirements makes statistical classification of their products or services, a very difficult task.

The Australian Bureau of Statistics (ABS) generally gathers data for the purpose of the national accounts, following the Australia New Zealand Standard Industrial Classification (ANZSIC). Only few ANZSIC classes exist which unambiguously apply to the environment management industry.

Table A2.1 ANZSIC Class – Environment Management Descriptions

ANZSIC class	Description
3701	Water supply
3702	Sewage and drainage services
9634	Waste disposal services

The table below lists ANZSIC classes which include an environment management or renewable energy primary activity, but it has not been possible to separate the primary activities and no assumptions about their percentage of the total has been made.

ABS is currently developing alternative measures of environmental activity, but as yet these efforts have not resulted in ongoing statistics being available.

The Victorian Government, through the Department of State and Regional Development is currently negotiating with the ABS on a national survey of the environment industry.

Table A2.2 ANZSIC Classes with Environment Management or Renewable Energy Primary Activities

ANZSIC class	Description	Primary Activities
2839	Professional and Scientific Equipment Manufacturing n.e.c. <ul style="list-style-type: none"> This class consists of units mainly engaged in manufacturing measuring, drafting, meteorological, surveying or other professional or scientific instruments or equipment n.e.c., or watches, clocks or other timing instruments. 	Control equipment electrical, mfg., measuring instruments mfg, scientific ,instruments or equipment mfg n.e.c.
2851	Household appliance manufacturing <ul style="list-style-type: none"> This class consists of units mainly engaged in manufacturing refrigerators, industrial, commercial, or household water heating systems, bath heaters, sink heaters, urns, household appliances or room air conditioners. 	Solar water heating systems manufacture
4231	Plumbing services <ul style="list-style-type: none"> This class consists of units mainly engaged in plumbing or draining or septic tank installation. Plumbing work arising from the installation of appliances is included in this class. 	Solar hot water systems installation
7823	Consultant Engineering Services <ul style="list-style-type: none"> This class consists of units mainly engaged in providing consultant engineering services. Also included are units mainly engaged in providing quantity surveying services. 	Building consultancy service, construction project management service, materials handling engineering service, product design service
7829	Technical services <ul style="list-style-type: none"> This class consists of units mainly engaged in providing scientific and technical services n.e.c. Included are units mainly engaged in collecting, collating or analysing meteorological information, or in supplying meteorological forecasts or in providing scientific testing services. 	Pollution monitoring service
7855	Business management services <ul style="list-style-type: none"> This class consists of units mainly engaged in providing business management services, including business analysis, efficiency or organisation and methods studies, personnel management, public relations consultancy or statistical services. 	Environmental consulting services (ex lab services)
8113	Local Government administration <ul style="list-style-type: none"> This class consists of units mainly engaged in Local Government administration. 	Environmental standards control (Local Government)

Obviously, data is a big problem when analysing the environment management industry. As a result, most quantitative information in this report is based on estimates by government bodies, industry associations and industry experts. These estimates have been made to the best of their ability without guarantee for accuracy.

APPENDIX 3

INDUSTRY SECTORS

This appendix provides some mainly qualitative background information on the different industry sectors in Victoria of the environment management and renewable energy industries. In total, we would estimate that about 1,500 businesses could be loosely defined as belonging to either the environment management industry or the renewable energy industry. However, a great number of these would be companies undertaking bin hire. We have not included bin hire specifically in the strategic audit but have interviewed larger waste and recyclables management companies who provide this as an auxiliary service.

Air Quality Management

Companies in this sector mainly provide control equipment, monitoring equipment, software or simulation services and consulting services.

Companies in this sector are generally multi-disciplined in design and construction and are not confined to any one industry for customers. Applications provided by these companies can be anything from a small retro-fit item to a large turnkey operation. Some Victorian companies involved in air pollution control include APC Horizon (control equipment), Ecotech (monitoring equipment), Awn, EML and Egis for consulting services, Air Pollution Systems Ltd, Clean Teq Pty Ltd, United Air Specialists and Dustek Ltd.

Expected drivers of the sector are the Victorian air policies relating to ambient air quality and air quality management. The ambient air quality policy enacts the stringent national air quality standards established by the National Environment Protection Council (NEPC). The air quality management policy, currently being varied, establishes the framework for managing emissions to the air environment to ensure these standards are met and air quality in Victoria continuously improves, in line with the state's economic and social goals. Performance in relation to the standards will be assessed by measurements approved by NEPC.

Water and Wastewater Management

Until 1995, water supply and polluted water disposal in metropolitan Melbourne was run by Melbourne Water Corporation - the only urban authority in Victoria – which had a legislated monopoly for the provision of water, sewage and drainage services to metropolitan Melbourne and nearby areas.

In 1995, Melbourne Water Corporation was corporatised (but all entities are still fully owned by the Victorian government). It was divided into five businesses, namely Melbourne Parks and Waterways, City West Water Ltd, South East Water Ltd, Yarra Valley Water Ltd (three regional water, sewage and drainage businesses, who interface with customers), and, a water headwork's business. The water

headwork's business, continues to carry the Melbourne Water Corporation name and functions as a collector, storer and wholesaler of water to the three retailers, and also treats and disposes of sewage. It partially funds Melbourne Parks and Waterways.

The three regional water, sewage and drainage businesses are now limited liability companies with the state government as the main shareholder. Their profitability has increased, but this is mainly due to rationalisation, ie. reduction of staff.

There are 15 non-metropolitan urban water authorities (local councils or regional water boards) in Victoria's rural areas, supplying water, sewage and drainage services.

Water boards have extensive experience in catchment management, operating systems etc. Though they don't currently export, they may possibly export their services as consultants in the future, perhaps in conjunction with other engineering and/or consultancy firms that are involved in the supply of goods and services to developing areas of the world, in particular ASEAN countries⁶⁶.

The importance of water and polluted water management in terms of employment and turnover should be evident from the table below, which contains data for all the seven states combined in Australia. However, when this is compared with the figures provided in section 3 – Background on the total market, it is obvious that water and polluted water management accounts for a large share of the total market for environment management products and services.

Table A3.1 IBIS Statistics – All States Combined Statistics on Employment and Turnover

ANZSIC Code	Heading	1998-99 Industry Turnover (\$m)	1998-99 Gross Product (\$m)	1998-99 Employment	1998-99 Total Wages (\$m)
9634	Waste Disposal Services	1 571	746	10 325	344
3701	Water Supply	3 145	1 880	16 920	670
3702	Sewerage & Drainage Services	3 844	2 298	7 080	280
		8 560	4 924	34 325	1 294

⁶⁶ Brunei Darussalam, Burma, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand and Vietnam, Australia, ASEAN relations: A guide to the sources of information, Oliver Mann, 1998.

Stormwater, not being polluted from household or industrial usage, is not channelled through the sewage systems in the metropolitan Melbourne area. This has led to a sub-sector emerging in stormwater management, mainly consisting of companies providing consulting services and stormwater cleaning systems. CSR Humes Ltd provides both stormwater and sewage system pipes and management systems.

Solid Waste and Recyclables Management (including Industrial Waste and Recyclables Management)

Extensive privatisation and outsourcing has seen the transfer of government activity to the private sector, and has bolstered growth within this sector in the past 5–7 years. Public environmental pressures together with government/industry waste reduction agreements will see more businesses outsourcing their solid waste and recyclables management requirements in order to more adequately address their own refuse issues.

Municipalities tend to use large refuse collectors in order to more easily monitor compliance and trace liability, which has led to some concentration of the bulk of contracts in the hands of a few companies. Companies in Victoria specialising in waste and recyclables management include Collex, VISY Recycling, Cleanevent Ltd (special events), J.J. Richards and RMA Recycling.

The amount of refuse collected from households designated for recycling is quite high and has been growing steadily. Table A3.2 outlines trends in recycling in Victoria.

Table A3.2 Comparison of Annual Quantities of Materials Diverted

Category	Material ('000 tonnes)	1993	1994	1995	1996	97/98	98/99	99/00
Metal	Aluminium cans							17
	Aluminium (other) ¹		40	38	45	9	12	32
	Non-Ferrous Metals		60	57	120	20	21	35
	Steel	492	492	540	630	540	503	937
	Packaging Steel ²				10	10	3	
C&D	Asphalt			10	19	125	371	59
	Brick & Brick Rubble		45	130	102	126	271	228
	Other C&D Material							20
	Foundry Sand							2
	Concrete ³ Plasterboard	300	450	550	748	834	899	493
			6	10	20	27	5	
Paper/ Cardboard	Cardboard/Other Paper	227	245	397	469	382	271	490
	Newsprint	63	75	85	84	139	137	173
Organics	Timber		10	10	12	30	148	49
	Animal Waste							193
	Other Food Waste*		400	400	531	316	146	13
	Garden/Green	95	95	199	152	183	120	230
	Organics Sawdust						8	21
	Seaweed		16	18	11	23	33	4
Glass	Glass Containers		111	110	111	110	158	116
	Sheet Glass		12	12	15	14	10	15
Plastic/Rubber	Plastic	36	42	43	44	53	10	35
	Rubber	20	20	16	15	25	77	53
Textiles	Textiles & Clothing			13	30	19	10	153
TOTAL ('000 tonnes)		1 283	2 113	2 634	3 148	2 978	3 242	3 377

Source: EcoRecycle Victoria

Notes: ¹In 1999/2000 the aluminium category was split into "cans" and "other". For earlier years these are combined in the "other" category.²One major steel recycler that contributed data in past years did not respond.³One major concrete recycler that contributed data in past years did not respond.

*Food waste has been split from animal waste in this survey, accounting for the decrease.

Many large players identify themselves as belonging to the Industrial Waste Management industry/group, covering both liquid and solid industrial refuse. Strong growth is anticipated in industrial solid refuse and recyclables management, due to trends of rising landfill costs and the proposed Packaging Covenant⁶⁷.

⁶⁷ The Packaging covenant is a cooperative effort between government and industry. It focuses on reducing the amount of consumer packaging and household paper going to landfills. Companies that sign up to the Covenant will be expected to produce Action Plans for evaluating and improving environmental outcomes with respect to their packaging and adopt "product stewardship" policies and targets and contribute to the effective environmental management of packaging throughout its life cycle. Must design packaging so that the use of

Converting refuse to energy is a way of recovering some of the energy embodied in the refuse. The practice has been used for a long period of time, for instance in hospitals, where many small furnaces are fired with medical waste and contributes with heat and sometimes power for the hospital. The practice became less popular for a period of time due to some problems with emissions, but is now facing a resurgence in popularity as landfills are filling up and greenhouse gases are moving to the top of the agenda.

Most flammable liquid/sludge generated by industry and some solid refuse can be used as fuel for cement kilns. A large percentage of returned tyres are disposed of in this manner, but there is potential for additional recovery of energy from refuse deposited at landfills. Teris Australia provides the technology for energy recovery for cement kilns. Ausmelt is trialing waste to energy technology specifically targeted at hazardous waste.

Energy recovery from biomass refuse is becoming viable as it can be regarded as a renewable energy and may limit methane gas production from the breakdown of organic matter in landfills. Global Renewables Ltd is investing in the development of this technology, both locally and internationally.

Remediation / Clean Up of Soil and Water

As a result of industrial expansion with limited environmental regulation and supervision from the 1940s to the 1970s, much land became contaminated. Illegal dumping of poisonous chemicals contributed to the problem.

The solutions provided by this industry include the design and operation of systems or provision of other services to reduce the quantity of polluting materials in soil and water. This includes emergency response to spills and treatment of water and dredging residues.

In Victoria, entities that provide services for solutions in decontamination of sites are from both the private and public sector and include Australian Defence Industries (ADI), Thiess Environmental and Geo Eng.

Good export opportunities in South East Asia are perceived for this industry.

Noise and Vibration Monitoring, Modelling and Abatement

Most pollution complaints in urban areas throughout the world relate to noise, with traffic noise being the dominant source of noise followed aircraft and general

material is minimised. The Government in response is to provide financial support for kerb-side and other recycling systems in cooperation with all tiers of government, encourage more recognition that packaging is a resource to be reused where practical and feasible, or to be disposed of with the least detrimental impact on the environment. Seek wider recognition and implementation of the Environmental Code of Practice for Packaging.

industry. Conventional rail noise is generally not a significant problem⁶⁸. Another major concern is control of noise in the workplace, following regulations by Workcover Victoria in the Occupational Health & Safety regulations.

The acoustics, noise and vibration industry is one which has had a steady rather than spectacular growth in recent years. It is one which has enormous potential particularly with respect to export of know-how in the services sector. Services provided by Australian firms are seen as being of first rate quality and very good value for money especially given the relatively low value of the dollar.

This sector of the environmental services industry is small with perhaps six significant firms in Melbourne, with the largest employing about 12–15 specialists operating in the field of acoustics, noise, vibration, environmental impact and noise assessment. There is also a group of major contracting firms who provide noise and vibration control equipment for mechanical services in buildings, supply silencers and acoustic enclosures for industry and engineering, design and manufacture noise control barriers and in-vehicle noise insulation material for traffic noise control and conduct some research and development as well.

The sector also includes the design, management or other services for acoustic and soundproof screens and street coverings and the design and manufacture of noise monitoring equipment.

The *Environmental Protection Authority* (EPA) is responsible for monitoring and enforcing industry noise restrictions. The EPA is also instrumental in setting noise policy and levels of noise restriction. Liquor Licensing Victoria monitors entertainment venues noise levels.

Companies and organisations involved in computer modelling and sale and marketing of their own software are Lochard Ltd, Marshall Day Acoustics, Vipac engineers and scientists and Audiometric & Acoustic Services.

Leading suppliers of noise control equipment are NAP Silentflo, dB Metal Products Pty Ltd, DBL Engineering Pty Ltd, Ofinac, Lochard Ltd and others.

Cleaner Production Systems and Technology

“Cleaner Production is the continuous application of an integrated preventative environmental strategy applied to processes, products and services. It embodies the more efficient use of natural resources and thereby minimises waste and pollution

⁶⁸ Comments provided by Marshall Day Acoustics.

as well as risks to human health and safety. It tackles these problems at their source rather than at the end of the production process; in other words it avoids the 'end-of-pipe' approach."⁶⁹

Cleaner production technology is not measurable using conventional methods, as its activities are included in the normal production of the receiving industry. However slower growth of the classical end-of-pipe equipment industry, and environmental regulatory interest in a more integrated approach for environmental protection suggest the increasing importance of cleaner technologies.

Companies in this sector cover such areas as waste minimisation due to improvement in design, raw material production and selection of input materials, more efficient assembly, production and use of products and repairability and reusability of inputs in production. Energy efficiency is also included.

Renewable Energy

The traditional elements of the renewable energy industry include solar, wind, hydro and biomass. Renewable energy also includes "enabling" technology, linked to the use of renewable energy, such as, batteries and inverter technologies. The strategic audit has concentrated on technologies for producing electricity and heat/hot water, rather than on alternative transport fuels.

In Victoria the main source of renewable energy is Pacific Hydro's dams (Lake William Hovell, Lake Glenmaggie and Eildon Pondage Hydro Power project), which supplies 2.4% (1997, ESAA Figures) of Victoria's electricity demand⁷⁰. Southern Hydro, as operator of the former SECV (State Electricity Commission of Victoria) hydropower facilities, also provides renewable energy. Photovoltaic roof panels, stand-alone wind generators and biogas driven generators also provide some renewable energy.

Windfarm developments near Portland (Codrington under construction, Cape Bridgewater, Cape Nelson, Cape Sir William Grant and Yambuk in planning phase), will contribute further to the share of renewable energy within the next 2 to 4 years.

A number of households have installed solar hot water units, replacing demand for electricity or gas as a means of heating water.

⁶⁹ World Business Council for Sustainable Development (WBCSD) and the United Nations Environment Programme (UNEP), *Cleaner Production and Eco-efficiency. Complementary Approaches to Sustainable Development*, pg3.

⁷⁰ The Snowy Mountain Hydro Scheme is actually larger, delivering 1,400 MW annually to Victoria, but it is located in NSW.

Efforts are being made to shift from conventional energy to renewable energy in accordance with the Kyoto agreement on Greenhouse gases⁷¹. By year 2010, the Mandated Renewable Electricity Target, a new law passed in December 2000, aims to deliver an additional 9,500 GWh (from 1997) of renewable electricity by 2010⁷². The efforts to shift to renewable energy will be a strong driver for the renewable energy industry, with demand for consulting engineers, technology, manufacturing of units and construction all on the rise.

The projected capital cost for this shift to renewable energy sources is AUD\$ 1.8–3 billion over the period to 2010 for Australia⁷³. Because of the expected dominance of bagasse (sugar mill wastes) generated electricity in Queensland, Victoria's share of the investment is likely to be around 15% (which should translate to a capital cost for Victoria of \$270 million – \$450 million), not 25% which is roughly Victoria's GSP as a percentage of GDP. In Victoria, wind generation and generation from a range of refuse biomass are likely to be important Mandated Renewable Electricity Target sources.

Exports from the Victorian renewable energy industry in 1995/6 were worth around \$100 million, out of total Australian renewable energy industry sales of \$850 million⁷⁴. The majority of exports were solar electrical equipment (\$57 million). Import data is not readily available for the Renewable Energy industry.

⁷¹ Australia, an outspoken opponent of the agreement as it stands to suffer the most from the economic penalties, needs to ensure its emissions levels are no more than 8 percent above its 1990 emission levels by 2008–2012.

⁷² A wide range of energy sources has been included as being eligible for the 9,500 GWh. These include solar, wind, ocean, wave and tidal, hydro, geothermal, biofuels (largely bagasse), specified wastes, solar water heating, pump storage hydro (not eligible if it uses fossil fuel electricity for pumping), renewable stand-alone power systems, co-firing renewables with fossil fuels and fuel cells using a renewable fuel.

⁷³ Final Report to the Greenhouse Energy Group, Implementation Planning for Mandatory Targets For The Uptake Of Renewable Energy In Power Supplies, May 1999.

⁷⁴ Renewable Energy Industry Survey On Present and Future Contribution to the Australian Economy, Department of Primary Industries and Energy, May 1997.

Details of the Kyoto Protocol

Reductions: Subject to ratification of the Protocol, thirty-eight industrialised nations are required to reduce their greenhouse gas emissions from 1990 levels by the period 2008 to 2012. For example, the European Union would reduce them by 8 percent, the United States by 7 percent and Japan by 6 percent. As a group, developed nations would cut emissions by just over 5 percent.

Gases involved: Emissions of six gases would be affected: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

Flexibility mechanisms: Two measures are currently under consideration:

Joint Implementation – Annex I countries (those agreeing to commit to targets, though no Annex B countries have formally ratified their commitment) can gain credits through greenhouse gas abatement projects in other Annex I countries.

Clean Development Mechanism – Annex I countries can gain credits through greenhouse gas abatement projects in non-Annex I countries.

International emissions trading: International emissions trading between Annex I countries would provide for more comprehensive credit/permit trading for target attainment. This additional flexibility mechanism is under consideration, but implementation is very unlikely before 2006–08.

Enforcement: A later meeting of the treaty parties will decide on “appropriate and effective” ways to deal with non-compliance.

Third World: Countries not listed in Annex I, including such major developing countries as China and India, are not assigned specific reduction targets.

Next Step: The Protocol takes effect once it is ratified by 55 nations, representing 55 percent of 1990 emissions. It is binding on individual countries contingent upon ratification by their respective governments. To date 30 countries have ratified.

NRE, 14/02/2001