Survey of Environmental Markets in APEC

Asia-Pacific Economic Cooperation
Committee on Trade and Investment
June 2001

Asia-Pacific Economic Cooperation
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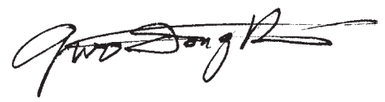
Foreword

The APEC CTI project Survey of Environmental Markets in APEC, is undertaken for the purpose of assessing the current market profiles and future prospects of environmental goods and services in the APEC region. This project will identify the primary needs of environmental goods and services. In pursuit of sustainable growth, APEC is committed to the important task of environmental protection through reducing the trade barriers of environmental goods and promoting innovative technology and cooperation among member economies. The goal of this project is to provide comprehensive and update information on various environmental markets. We hope businesses can utilize this information as a guide to explore potential environmental business opportunities.

We are extremely grateful to APEC member economies and their senior environmental officials who have responded to the survey and provided valuable suggestions to the report. The support of APEC CTI in sponsoring this project is greatly appreciated. We would also like to thank the APEC Secretariat for continuously providing assistance to the project.



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Executive Summary

■ The Significance of this Study

Based on the first part of the 1996 OECD definition and categorization, this study surveyed APEC Senior Environmental Officials (SEOs) to obtain the in governments' perspective of the environmental industry. This is a new approach that differentiates this study from previous studies conducted by other institutions.

■ Participating Economies

Ten APEC members participated in this study: Australia; Canada; China; Hong Kong, China; Japan; Korea; Peru; Singapore; Chinese Taipei and Thailand.

■ Definition and Categorization

There is no consensus in APEC on the definition and categorization of the environmental industry. The current definitions and categorizations employed by member economies differ greatly and make meaningful comparison and consolidation of market information extremely difficult. It is, therefore, important for APEC member economies to develop a definition and categorization system that is acceptable and used by all.

■ Market Profile

- Australia: 1997 market size of the environmental equipment and materials market was US$ 2.8 billion.
- Canada: 1998 overall market size was about US$ 10 billion with equally large sectors of equipment and services.
- China: market size reached around US$ 5 billion in 1998 with the equipment and materials sectors accounting for almost 50%.
- Hong Kong, China: Hong Kong's environmental industry fluctuated around US$ 0.6 billion between 1997 and 1999.
- Japan: Japan has the largest environmental industry in Asia. In terms of market structure, Japan's has a very large environmental service sector, which accounts for 60% of the industry, followed by construction and installation at 30%. Japan's estimate of market scale in this study is significantly larger than those of existing studies. This is because Japan's MITI has a very different estimate of the Japanese environmental industry.
- Chinese Taipei: market size is reported to be around US$3.1 billion. Construction and installation make up about 50% of the market followed by services at 40%.

■ **Potential High Growth Areas**

Economy	Potential High Growth Area
Australia	● Wastewater Management ● Water Protection ● Waste Management
Canada	● Water and Wastewater Treatment Technologies ● Liquid and Solid Waste Management; ● Environmental Instrumentation, Geomatics and Analysis; ● Energy Efficiency and Renewable Energy; ● Engineering and Consulting Services.
China	● Urban Sewage Treatment Equipment ● Air Pollution and Control Equipment ● Environmental Monitoring Equipment and Corresponding New High Technology Development and Product Production
Hong Kong, China	● Pollution Prevention Process and Supply ● Heat/Energy Saving and Management ● Infrastructure (Sewage, Landfills, Clinical Waste, Radioactive Waste) ● Low emission supplies (e.g. emission control equipment for vehicles)
Japan	● Environmental R&D ● Environmental Equipment ● Government's Green Purchasing
Korea	● Clean Production
Peru	● Pollution Management
Chinese Taipei	● Waste Management ● Air Pollution Control Equipment
Thailand	● Pollution Control and Management ● Improvement of Production Process (Pollution Prevention, Clean Production, Energy Saving, Waste Minimization) ● Recycling

Chapter One
Introduction

The focus of this chapter is an overview of the inclusion of environmental goods and services in APEC's EVSL initiative. In addition, this chapter introduces the research methodology of the project. The definition of the environmental industry and a summary of the questionnaire are also provided.

1.1 Background

Trade and Investment Liberalization, Trade and Investment Facilitation, and Economic and Technical Cooperation (ECOTECH) are the three pillars of the Asia Pacific Economic Cooperation (APEC). Since its establishment in 1989, APEC has been actively engaged in achieving these goals. A series of milestones have been met through the years. The first momentum was reached in the Leaders' Declaration of 1993, which provided a clear vision of APEC's future. The Bogor Declaration of 1994 set the 2010/2020 goals and the Osaka Agenda created a roadmap for APEC member economies to reach liberalization. The Manila Action Plan for APEC (MAPA) further showed determination of the member economies towards liberalization. This series of important achievements moves APEC member economies swiftly along the way to liberalization.

The Early Voluntary Sectoral Liberalization (EVSL) initiative was raised in 1996. In the 1997 Joint Statement of the Ministerial Meeting, ministers

"...recalled the Instructions of the Leaders in Subic to identify sectors for early voluntary sectoral liberalization...";

"...agreed to pursue initiatives for early voluntary sectoral liberalization...";

"...welcomed the fact that many of the proposals include measures that will promote facilitation as well as economic and technical cooperation...".

Fifteen sectors were identified during the process (see Table 1.1) and were divided into an A+ list and an A list. Progress was made during 1997 and 1998 while different opinions about certain sectors emerged along the procedure.

Table 1.1 EVSL Sectors

A+ List	A List
Chemicals	Oilseeds and Oilseed Products
Forest Products	Food Sector
Environmental Goods and Services	Natural and Synthetic Rubber
Medical Equipment and Instruments	Automotive
Energy Sector	Civil Aircraft
Gems and Jewelry	Fertilizers
Fish and Fish Products	
Toys	
Telecommunication Mutual Recognition Arrangement (MRA)	

Source: APEC, 1997, Attachment to the Joint Statement of Ninth Ministerial Meeting

After two years of discussion, the tariff portion of the EVSL initiative progressed to be renamed "Accelerated Tariff Liberalization" and moved to the WTO, while APEC concentrates on non-tariff measures and ECOTECH.

As one of the nine A+ sectors, environmental goods and services underwent intensive discussion. However, as of the end of 1998 when the last comprehensive discussion was held, consensus among members was not reached.

In order to maintain the momentum of progress, basic information must be readily available. Therefore, having a better understanding of the environmental goods and services markets of APEC economies is important to facilitate progress of the sector.

1.2 Research Objectives

As specified in the project design, this project has the following objectives:

- To Conduct a survey of APEC member economies to assess the current market profiles and future prospects of environmental goods and services as identified by the EVSL agreement on Environmental Goods and Services
- To facilitate the implementation of the EVSL agreement and help identify areas for future ECOTECH activities.
- To provide targeted beneficiaries with comprehensive and updated information on the environmental markets in APEC member economies, especially in the aftermath of the 1999 financial crisis in the region.
- To help identify the prioritized needs of environmental goods and services in APEC member economies, and increase access to cost-effective solutions to address environmental concerns.
- To assist the business/private sector in exploring potential business opportunities in APEC member economies, foster partnership with the private sector, and acquire industry support for the implementation of the EVSL agreement.
- To help identify future ECOTECH areas to facilitate the implementation of the EVSL agreement on Environmental Goods and Services.

The major purpose of this study is to update the current market profiles and future prospects of environmental goods and services of APEC economies. In order to avoid duplication of existing studies on environmental goods and services markets, areas not investigated before must be identified. A survey of the literature reveals, that most current studies were conducted by consulting companies and focussed on private sector information sources. Few studies adopted a government perspective. Since APEC is an inter-governmental organization, presenting, for the first time, government positions is valuable double checking estimates from different sources will also be helpful. Therefore, three major questions will be answered by this study: 1). Market size, 2). Environmental policies, 3). Institutional arrangement.

1.3 Research Scope

The first major task is to make a clear definition of the research scope. In this case, this is the definition of "environmental goods and services". There are several definitions of this term used by APEC member economies and various international organizations. Items proposed in EVSL include an even wider range. Therefore, establishing a definition that applies to most APEC economies yet still highlights characteristics of individual economies is important. Full adoption of the EVSL list encounters another technical problem: the classification is too detailed. Results of a pre-test indicated that respondents found retrieving information of such detail extremely difficult. The approach had to be modified.

Grouping EVSL items was considered. However, this was difficult because a quick survey of current statistics of most economies indicated that most current systems would not be able to provide the information based on the groupings. To respond to the grouping of EVSL items would require a new survey. Given the constraints in time and resources, a simplified OECD definition (1999) was chosen. The original OECD definition of the environmental market is divided into two tiers: core industries and non-core industries. This study adopts the core industries as the survey scope and thus provides an opportunity for respondents to include non-core industries. The choice was made for several reasons. First, a standard definition facilitates cross-economy comparison and creates more value-added results. Second, most EVSL items are included in the definition, and, therefore, the original goal of estimating the significance of EVSL items is maintained. Third, using the OECD definition provides an excellent platform for APEC to communicate upon to the second largest environmental goods and services market: Europe. Our definition of environmental goods and services market is shown in Table 1.2 and a detailed explanation of the categories can be found in Appendix 1.

Table 1.2 Definition of Environmental Industry*

1. Environmental Equipment and Materials
● Air pollution control
● Wastewater treatment (excluding water treatment)
● Waste management
● Solid waste collection, treatment, and disposal;
● Hazardous waste collection, treatment, and disposal;
● Waste recycling and recovery
● Remediation and clean up of soil and groundwater
● Noise and vibration abatement
● Environmental monitoring, analysis, and assessment
2. Environmental Services (including operation)
● Air pollution control
● Wastewater treatment (excluding water treatment)
● Waste management
● Solid waste collection, treatment, and disposal;
● Hazardous waste collection, treatment, and disposal;
● Waste recycling and recovery
● Remediation and clean up of soil and groundwater
● Noise and vibration abatement
● Environmental monitoring, analysis, and assessment
● Environmental research and development
● Education, training, and information
3. Construction and Installation
● Air pollution control
● Wastewater treatment (excluding water treatment)
● Waste management
● Solid waste collection, treatment, and disposal;
● Hazardous waste collection, treatment, and disposal;
● Waste recycling and recovery
● Remediation and clean up of soil and groundwater
● Noise and vibration abatement
● Environmental monitoring, analysis, and assessment

*** Modified from OECD, "The Environmental Goods and Services Industry: Manual for Data Collection and Analysis" (Paris: OECD, 1999), pp. 33-35.**

1.4 Methodology

In accordance with the project design, this study used a questionnaire survey, collected data from secondary sources, and conducted interviews.

The questionnaires were sent to 39 Senior Environmental Officials (SEOs) of all the APEC economies (see Appendix 2). SEOs were asked to act as coordinators in seeking proper resources to complete the questionnaire. A draft questionnaire was sent in January 2000. Comments from APEC member economies were received and the draft revised accordingly. The revised questionnaire was distributed in early March 2000. Approximately 90 days was allowed for participating economies to reply. Responses were analyzed in accordance with the APEC principles of voluntary participation and flexibility.

Personal interviews of selected economies were conducted during the study period in China; Hong Kong, China; Singapore; Thailand; and Vietnam. Information collected was incorporated into the report.

Given the constraints in time and resources, data from secondary sources play an important complementary role in this study. However, several issues must be raised when using secondary data. First, the definition of environmental goods and services constituted a major difficulty. That previous studies used different definitions was not a surprise. The

challenge lay in careful reference, so that appropriate and meaningful comparisons could be made. Second, while using secondary data, simply stitching several studies together without examining the actual time frames of each study can discrupt the continuity of trends. That estimates for environmental markets lags behind for several years is common. Rough estimates, or expert opinions, are usually employed when data is not available. Therefore, to construct a useful trend analysis of the environmental goods and services market, double-checking the representation of data is vita 1. This brings up the third issue: data quality. It is hard to ensure that data quality is reliable. This is especially difficult when data comes from various sources in a fairly new industry, such as environmental goods and services, in which the content is constantly evolving and the scope of the industry is expanding very fast.

1.5 The Questionnaire

The questionnaire is divided into four parts (see Appendix 3). The first part asks respondents to provide profile information about the environmental goods and services market. The second part assesses each member economy's comparative advantages in the environmental industry. The third part describes the environmental policies, implementation strategies, and future plans of member economies. The fourth part concerns institutional arrangement and asks respondents to list all government agencies responsible for environment-related affairs.

Part one consists of four questions. The first question categorizes environmental industry. Respondents are asked to report the market value of goods and services and the market values of imports and exports between 1997 and 1999. The purpose of this question is to obtain the basic description of the environmental goods and services markets for individual APEC member economies. The second question asks respondents to report categories not included in the previous question. This question is tailored to accommodate the problem caused by truncating the original OECD definition. The third question concerns environmental industry structure. This question specifically asks about the number and size of firms, employment, foreign direct investment and R&D expenses. The fourth question asks about environmental expenditures. Respondents are asked to divide environmental expenditures into three groups: the public sector, the private sector, and the household.

Part II of the questionnaire consists of 11 questions. The 11 questions are sub-divided into the supply side and demand side. Questions five through 11 ask supply side questions. Question five asks for a history review of the environmental goods and services market. Question six concerns the government policies that assist the growth and development of the market. Question seven touches upon potential high growth areas of individual economies. Question eight is about the comparative advantages and disadvantages of each market. Question nine asks about the future plans of the environmental industry of the government. Question ten seeks to identity the driving forces of the development of the market. Question 11 asks about member economies' assessments of the international market of environmental goods and services.

Questions 12 through 15 are the demand side questions. Question 12 inquires about government strategies and steps to increase the demand of environmental goods and services. Question 13 is about major marketing strategies. Question 14 touches upon the information dissemination mechanism of the industry. Question 15 asks about major events that have had significant impact on the industry. Through these two groups of questions, basic descriptions of the environmental goods and services markets can be made.

Part III of the questionnaire concerns the institutional arrangements, because development of the environmental goods and services industry is closely related to government policy. Therefore, the implementation mechanism is worthy of study. Question 16 utilizes the same table as question 1 and asks respondents to fill in government agencies in charge of the related affairs. Question 17 complements question 16 and asks for other agencies not covered in the previous question. Question 18 shifts the focus to non-governmental organizations (NGOs) and asks respondents to describe the NGOs in their economies. Question 19 is a follow-up to question 18 and asks for a more detailed description of NGOs.

Chapter Two
Environmental Policy

This chapter concentrates on the environmental policy of various economies. The first part of this chapter states the historical development of the environmental industry in some of the APEC economies. This is followed by a discussion of the important characteristics that are attributed to the individual economies' environmental industry and policies. In addition, the steps that have been taken to increase the growth of the environmental protection market are shown. Finally, the chapter discusses potential high growth areas.

2.1 Overview of the Environmental Industry: Market Supply

After a careful examination of the completed surveys, it can be inferred that all APEC economies that completed their surveys believe in the importance of having sound environmental policies. Thus, these economies have formulated and implemented policies in promoting the growth of the environmental industry. On the other hand, the environmental industries in these economies have experience different stages of growth. As is expected, developed economies have started earlier than developing economies in establishing environmental policies. Furthermore, developed economies also have more mature environmental industries. Let us now examine some of the main points that APEC economies have stated in the survey with regard to their environmental policies and industries.

■ Australia

Rising environmental awareness drives the development of the environmental market

According to Australia, the main factor influencing the development of the environmental industry has been the understanding of environmental issues by the private sector. In the 1980's and early 1990's, there existed strong opposition to the use of high temperature incinerators for disposing wastes. The effect has been the development of alternative methods for waste disposal. Thus, Austratia's waste management industry is now a world leader in the disposal of wastes such as polychlorinated biphenyls (PCBs).

During the 1980's, the greenhouse debate raised the concerns in the public of environmental issues that resulted in government legislation, regulation, and incentives for innovation. The growth of the environmental industry is in line with government policy on ecologically sustainable development. In order to strengthen the links between industry, academia, research organizations and government agencies, the Australian government funded the creation of the Cooperative Research Centre for Waste Management and Pollution Control (CRC) in 1991. Additionally, the Environment Management Industry Association (EMIAA) was also established in 1991. The association represents and helps organizations that provide environmental management goods, services, and systems. In 1994, to assist the development of the environmental industry, the Australian government gave 4.5 million Australian dollars for a coordinated environmental management industry development strategy. The Environment Industry Development Network (EIDN) was established to allow firms to collaborate in winning project contracts. The EIDN is a joint initiative between the Australian government, CRC, and EMIAA for waste management and pollution control.

In recent years, the Australian government has worked on several programs. The development of an action agenda for the environment management industry was announced in May 2000. The purpose is to create a partnership between businesses and government for helping the environment management industry to identify high growth opportunities. In addition, Australia has created EnviroNET, which is a network of databases on the Internet. The network lists over 1,000 suppliers of Australian environmental products, services, equipment, and over 600 environment courses offered at educational institutions in Australia. The Environment Industry Development Database has also been formed to highlight technologies, companies, environmental research institutions, and organizations that are involved in environment management. Furthermore, Australia has played a major role in establishing the APEC Virtual Centre on Environment Technologies Exchange.

Australia believes that the environmental industry has emerged because businesses have become more knowledgeable of environmental issues. There is now increasing emphasis on economic, social, and environmental performance in international markets. Companies will continue to enlarge international business in the environmental industry. This industry will grow because of rising global emphasis on sustainable development. Technological development and innovation will be important for the growth of the industry.

■ Canada

From pollution control to pollution prevention to eco-efficiency

The environmental industry in Canada began with municipal management of water systems, sanitary engineering, and waste collection in the 19th century. During the 1970s, governments in Canada mainly adopted a "command and control" (end-of-pipe) approach to address environmental problems. Detailed regulations enforced compliance among

industrial polluters. In the 1980s, there was continued emphasis on pollution control. By the 1990s, environmental policy shifted its focus towards pollution prevention. There has been an increased recognition of the merits of eco-efficient environmental solutions. The Canadian environmental industry is currently in transition and those segments of the industry that are maturing are undergoing a process of rationalization and consolidation. This is exemplified by the fact that governments are shifting their focus from pollution management to pollution prevention.

There is increasing interest by municipalities in transferring environmental activities to the private sector. Public-private partnerships have already been used in the development and operation of some local environmental infrastructure.

■ China

Government takes the lead in environmental protection

China has stated that it has enacted several important environmental policies. First, charge policies in accordance with the principle of "the polluter pays," creating an input and output relationships for pollution treatment. Second, China has improved its pollution discharge fee policy and raised the charge standard, so that the discharge fee is higher than the treatment costs. Third, there are taxation policies that promote environmental protection. Fourth, the establishment of financial and loan policies that also benefit environmental protection.

Furthermore, setting targets for environmental protection has resulted in higher requirements for the environmental industry. The government believes in the importance of investing in environmental infrastructure construction. Environmental goods and services are part of the industrial sectors that will be opened to free trade and investment. China would like to see that domestic environmental enterprises with strong competitiveness develop further, while those that lack competence would diminish in importance. Once environmental standards are improved, a limitation of enterprises' pollution discharge and an increase in the installation of pollution treatment equipment will result. The creation of environmental legislation and the promotion of environmental protection should greatly enlarge the environmental market in China.

China's view on the international outlook of the global environmental industry is that the industry will enjoy high growth, particularly in developing economies. There will be more international cooperation, such as in technical cooperation. Developed economies, however, will not readily provide core technology to developing economies. Economies and companies will certainly need to increase their investment in research and development.

■ Hong Kong, China

Close cooperation between government and private sector under a market mechanism

Hong Kong, China government's environmental policies have greatly impacted the development of the environmental industry. Since the 1970s, the government has served as the guardian of the environment. The implementation of environmental policies has led to large governmental investment in infrastructure and services. The government and the private sector have jointly developed the environmental industry in Hong Kong.

The government has done considerable work in environmental protection. Hong Kong, China believes that government environmental protection capital projects should be opened to competition from local and overseas businesses. The Innovation and Conservation Fund was established to provide funding to educational, research, and other projects and activities related to environmental and conservation matters. Since 1980, the Environmental Management Division of the Hong Kong Productivity Council has provided consulting services to waste/energy management and cleaner production technology development. The Industry Department has created "A Guide to Pollution Control Legislation Affecting Manufacturing industries" and is in the process of analyzing the environmental industry in Hong Kong, China. The Innovation and Technology Fund had given funding to 14 environment-related projects from 1997 to 1999. These projects seek to develop affordable waste treatment systems and green production technologies for local industries, increase the awareness of environmental requirements by industries, promote ISO 14000 environmental management standards to small- and medium-sized enterprises, and create an environmentally sustainable development strategy for the travel and tourism industry.

According to Hong Kong, China, the environmental industry will be one of the fastest growing industries, with an increasing expectation of a better environment and sustainable development. There will be business opportunities in services in the APEC region. Additionally, the transfer of technologies will increase among APEC economies. China will be a major environmental market because environmental protection is one of its major concerns.

■ Japan

Government creates incentives to protect the environment

Japan has indicated that its major governmental policy for promoting the environmental industry is through economic assistance. Subsidies for the development of advanced technologies are provided to companies. A low-interest loan program is applicable for the purchase of environmentally sound equipment. Special depreciation measures exist for

environmental devices. Additionally, strict environmental regulatory measures have served as incentives for the development of environmental technologies and for promoting the environmental industry. For example, after the implementation of the strict exhaust gas regulation for automobiles in the 1970s, car manufacturers began to make progress in the development of low emission technology for automobiles.

In recent years, Japan has given subsidies to the research and development of advanced technologies. It has provided low interest loans for the purchase of environmental equipment. The government has disseminated information about environmental goods and services. The promotion of environmental reporting and environmental accounting is also part of its government's efforts. The government has also promoted its green purchasing policy.

■ Korea

An emerging player in the international environmental goods and services market

Korea's environmental industry started to develop in the latter half of the 1970's, when environmental problems became severe. Development in the 1980s reflected overall industrial growth. Today, the environmental industry is advanced enough to seek foreign markets. In recent years, Korea has begun active promotion, formulating measures to encourage the creation of environmental technology and services. In particular, the government seeks advancement of environmental infrastructure, energy saving processes, and pollution reduction technology.

An inter-governmental committee was established to design comprehensive measures to help in the development of the environmental industry. Experts from industry, academia, and government are members of this committee. In addition, the committee helps implement plans for the environmental industry. These measures include the enhancement of management systems, the development and distribution of environmental technology, and the exploration of business opportunities for the environmental industry in other economies. Korea expects the international environmental market to enlarge in the future. The causal factors are the increase in environmental awareness worldwide and the rise in spending for environmental protection.

■ Peru

Legislation in place to facilitate environmental protection

Peru has stated that since the implementation of the 1997 Environmental Protection Regulations Governing Development of Manufacturing Industry Activities, companies have become more attentive to the need to protect the environment. Recently, the government has prepared several documents: 1) The guide for preparation of Environmental Protection Study; 2) The guide for preparation of Environmental Adjustments and Management Programs; 3) The protocol for monitoring atmospherics emission; and 4) the protocol for monitoring liquid effluents.

■ Chinese Taipei

Encouraging companies to develop technologies beneficial to the environment

Economic progress in Chinese Taipei has led to greater public awareness of environmental protection affairs. Although the government has proactively pursued environmental work and has achieved many concrete results, more mutual cooperation between the people and the government is required to achieve more progress. Thus, environmental consciousness must be accompanied by pragmatic action, for only then can potential uses be fully developed.

The environmental industry has a tremendous amount of room for growth. An example is the waste handling industry, which is still in its infancy. To solve the industrial waste problem, the government is aware that its first step is to provide appropriate guidance on waste reduction to industry, and on industrial waste exchange and reuse to private treatment firms. The government has simplified the application and approval procedure, raised financial incentives and tax breaks, and increased assistance in land purchases to make companies more willing to invest in waste cleanup and treatment.

The Environmental Protection Administration (EPA) actively encourages companies to come up with technologies and products beneficial to the environment. The EPA is working with companies to develop biodegradable plastics. Another noteworthy plan to reduce air pollution is the "Action Plan for the Development of the Electric Motorcycle." To promote the use of electric motorcycles, the EPA stipulates that two out of one hundred motorcycles sold be electric powered starting in 2000. The EPA also provides subsidies ranging from NT$12,000 to NT$25,000 to encourage consumers to purchase electric motorcycles. The EPA also encourages taxis to convert to an LPG fuel system and provides subsidies ranging from NT$20,000 to NT$50,000 for each LPG vehicle. In addition, subsidies ranging from NT$3 million to NT$4.5 million are given for each LPG station. The EPA will coordinate with related departments to revise the current regulations for the promotion of CNG buses.

The government is also aware of the importance of training which is why the National Institute of Environmental Training (NIET) was established to offer training programs for environmental

protection professionals from the public and private sectors. Its purpose is to expand its trainees' environmental knowledge and technical skills, so there will be qualified environmental professionals in the government and industry.

■ Thailand

Focusing on environmental technology on the way to recovery

Thailand's environmental good and services market was greatly hindered by the Asian Financial Crisis. According to Thailand, pollution control has been important since the enactment of the 1975 Environment Act. One of its major pollution control strategies is the formulation up of environmental quality standards, which has led to the building and installation of pollution control system used in factories and communities. The 1992 Environment Act has greatly affected the Thai environmental industry, providing incentives as well as penalties. The incentives include funds to help polluters clean up and conserve. Rising environmental awareness has greatly increased the growth of the environmental industry.

Recently, Thailand has implemented its "Thailand Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality 1997-2016." In its "Policy on Environmental Technology," the government seeks to: 1) promote and develop domestic technology for effective management and utilization of natural resources; 2) promote and develop technology for the conservation of environmental quality and apply technology for prevention and for providing solutions to environmental problems. Thailand has established an Environmental Fund to promote and conserve environmental quality and to give low interest loans to projects that seek to eradicate air pollution, waste water, and solid waste. Thailand has also implemented a "polluter pays" principle.

Table 2.1 Summary of Factors Causing the Development of the Environmental Industry: Market Supply

Country	Factors
Australia	1. Businesses capitalize on opportunities 2. Government's regulations 3. Government's policies 4. Government-sponsored organizations 5. Government's programs 6. Website on business opportunities
Canada	1. Business capitalize on opportunities 2. Government's regulations 3. Government's policies 4. Public-private partnerships
China	1. Government's regulations 2. Government's policies 3. Government's infrastructure projects
Hong Kong, China	1. Government's regulations 2. Government's policies 3. Government's programs
Japan	1. Businesses capitalize on opportunities 2. Government's regulations 3. Government's policies 4. Government's programs
Korea	1. Businesses capitalize on opportunities 2. Government's regulations 3. Government's policies 4. Government-sponsored organization
Peru	1. Government's regulations 2. Government's policies
Chinese Taipei	1. Businesses capitalize on opportunities 2. Government's regulations 3. Government's policies 4. Government's programs
Thailand	1. Government's regulations 2. Government's policies 3. Government's programs

2.2 Major Characteristics of the Environmental Industry and Policies

Australia has stated that most of the national expenditure on environmental protection is spent on wastewater management, water protection, and waste management. Corporate expenditure is centered on the services sector (forestry, construction, and transport services) and the manufacturing industries. The government's 2000-2001 budget indicates that during 2000, it has allocated greater than $880 million to the Environment and Heritage Portfolio, which includes providing funds to the Australian Greenhouse Office, the National Oceans Office, the Great Barrier Reef Marine Park Authority and the Australian Heritage Commission. The government has also provided significant amount of funds to the Natural Heritage Trust. Australia is also committed to promote sustainable recycling and reuse of waste oil through the development of a Product Stewardship System for Waste Oil.

Furthermore, Australia has related that its strengths in the environmental industry include a strong research base, and extensive experience in designing, building and operating advanced environment management systems. Strengths in research and development of new environmental solutions and technologies have been developed. Australian universities and research centers, such as the Commonwealth Scientific and Industrial Research Organization (CSIRO) have reached world-class standing. The environmental industry has been successful in developing leading edge technologies in air and noise pollution control, environmental monitoring, solid waste management and recycling, water and wastewater management, renewable energy, contaminated site remediation, hazardous waste management, and mining and mineral processing. On the other hand, the industry's weakness is its fragmentation. There are different stages of commercial development among the large number of small and medium-sized enterprises and the small number of large companies.

Australia has recognized the need to focus on exporting goods and services to the global market. The environmental industry is highlighted in the government's "Trade Outcomes and Objectives Statement 2000" that relates the trade policy goals and strategies for the year. The government announced in May 2000 the development of an Action Agenda for the Environment Management Industry. The objective is to identify high growth opportunities and strategies for the environment management industry. The Renewable Energy Action Agenda was also created in June 2000 for the purpose of helping industry achieve annual sales of $4 billion by 2010.

In 1994, the Canadian federal government established the Canadian Environment Industry Strategy (CEIS) to promote Canada's environment industry at home and abroad. The Strategy, comprises 17 initiatives, designed to meet the needs of Canadian industry, as identified in broad consultations with industry, government, and other stakeholders. The consultations identified three central themes:

- delivering services and providing infrastructure to industry;
- supporting the development and commercialization of innovative environmental technologies; improving access to domestic and global environmental markets.

The development and commercialization of environmental technology focuses on the adoption of appropriate eco-efficient technology and environmental management systems by small and medium enterprises (SMEs).

In terms of infrastructure, the Canadian government focuses on providing information services, namely its Environmental Industry Virtual Office web site, a statistical database, and various multimedia database products monitoring Canadian environmental capabilities.

China has indicated that high growth areas of the environmental industry are in urban sewage treatment equipment, air pollution prevention and control equipment, solid waste disposal equipment, and environmental monitoring equipment. There is great potential for development of the environmental industry. The outlook for the treatment of environmental pollution looks promising because the government has increased investment in environmental protection and increase of awareness, in the economy's environmental protection. The major weakness is that environmental companies are small. Also, the industry is not evenly spread throughout China. Environmental enterprises are mainly located in the coastal provinces. In the southwest and northwest areas, environmental industry development lags behind. China seeks to create sound environmental management systems and environmental law system. It will try to decrease environmental pollution and ecological degradation. In Addition, China will try to improve its environmental quality.

Hong Kong, China, has related that its high growth areas of the environmental industry are: 1) pollution prevention processes and supplies; 2) heat/energy saving and management; 3) supplies and construction of infrastructure projects (e.g. sewage collection and treatment, refuse transfer stations, land fills, clinical waste treatment, radioactive waste storage); and 4) low emission supplies (e.g. LPG taxis and buses, conversion kits/services for existing diesel taxis under the recently launched LPG Taxis Scheme, and catalytic converters for diesel buses).

The factors that have fueled the growth of the environmental industry in Hong Kong, China are: 1) implementation of environmental legislation; 2) government policies and initiatives to promote environmental protection and sustainable development; 3) infrastructure projects to

protect the environment; 4) public expectations for a better environment and sustainable development; and 5) the private sector's environment initiatives. Hong Kong, China, will strive to eliminate hurdles in the institutional and legal frameworks, to make it a showcase for a quality environment. In Addition, Hong Kong, China, will try to provide services, financial, technical and consulting to support environmental improvement in the Asia-Pacific region.

Japan has stated that its environmental industry is experiencing growth in general. The industry is highly competitive because of technological superiority and good performance. However, the lack of information about the environmental industry and funds for investment has led to low performance in some areas. Some of the factors that have fueled the growth of the industry are: 1) increasing environmental consciousness; 2) building close connection between clients and suppliers of environmental goods and services; 3) evaluating the environmental performance of companies in a correct manner; and 4) keeping fair competition in the market. Japan understands that the environmental industry is important to the realization of sustainable development. Thus, the government will formulate further measures to promote the growth of its environmental industry.

According to Korea, the high growth areas of its environmental industry are in clean production technologies. The government emphasizes the development of clean energy and technology. The purpose is to substitute high energy fuels with clean energy sources, in order to shift to an industrial structure that is environmentally friendly. The industry's strengths are in dust collection technologies, tertiary treatments of waste water, and purification systems. Its the weakness is the small size of environmental companies. The factors that have increased the growth of the environmental industry are 1) resource exhaustion and environmental destruction because of rapid growth and industrialization in the 1970s; 2) the implementation of environmental regulatory measures in the 1980s; and 3) the accelerated development of advanced technology in the 1990s. Korea's wants to increase the competitiveness of the environmental industry, so that there will be more exports in the future. It also seeks to make the domestic environmental market important to national development. Finally, Korea strives to develop and distribute new environmental technologies.

Peru has indicated that industrial firms are aware that environment regulations are not obstacles to development. The implementation of adjustment policies for protecting natural resources is beneficial to the improvement of productivity and competitiveness. The National Environment Council and other entities have agreed to create the Environmental Technique Study Group for air, water, and noise, in order to set national standards. Furthermore, industrial enterprises are studying the use of high technology to meet permissible emission standards.

Chinese Taipei has stated that the nature of its economy has changed from agricultural to industrial. As a result, waste production has also changed toward more industrial waste. According to the provisions of the Waste Handling Law, producers of industrial waste must either handle the cleanup on their own, or hire a contractor to do so. Since the majority of enterprises are small-or medium-sized enterprises, they lack the skills, manpower, economic scale, and technology and equipment to handle such tasks. To improve industrial waste management, the EPA has established a service center for disseminating information on industrial waste exchange. The government is also providing guidance to firms seeking to obtain ISO 14000 certification, adopt clean production methods, and reduce volume of industrial waste. In addition, the government encourages the establishment of joint or unified treatment systems and providing guidance on appropriate treatment and final disposition sites within industrial and science parks.

To allow the more integrated and more effective management of industrial waste, the EPA has established the industrial waste control centers and implemented plans for survey and analysis of the amount and characteristics of industrial waste. An Internet-based application and control system has been created to monitor industrial waste cleanup in real time. The EPA is requiring 13,000 industrial organizations to report via the Internet, which will allow the control of about 16.1 tons of industrial waste per year.

The government is actively pursuing ways to decrease pollution from mobile sources. The EPA has instituted an inspection and maintenance (I/M) program for motorcycles. Every motorcycle is required to have an exhaust emission inspection once a year at an I/M station. Since 1999, the I/M program has inspected about 5 million motorcycles each year. The EPA seeks to phase out 2-stroke motorcycles in favor of 4-stroke motorcycles, which have less exhaust emission. The stage IV motorcycle emission standards will go into effect on December 31, 2003, which will accelerate the phasing out of 2-stroke motorcycles.

The EPA utilizes the remote sensing measurement technology to screen out high pollution vehicles. The device is placed at the roadside to inspect and record the exhaust emission of vehicles. High pollution vehicles must be re-inspected at assigned garages. To reduce pollution from old buses and trucks, the EPA provides subsidies ranging from NT$23,000 to NT$1,000,000 to install pollution control devices. Subsidies are also given to phase out old buses and replace them with new ones. The EPA has promoted the use of low sulfur diesel and unleaded gasoline for years. Leaded gasoline has been prohibited for motor vehicles since January 1, 2000.

Thailand has related that high growth areas of the environmental industry are in pollution

control and monitoring. In addition, firms have begun to apply pollution prevention and energy saving technologies in production process. The waste recycling rate is increasing. According to Thailand, the strengths of its industry are: 1) more stringent regulations; 2) international standard (ISO 14001); 3) tax incentives; 4) cost savings; 5) public awareness; 6) environmental friendly products; and 7) greening supplier chains. Its weaknesses are: 1) economic crises; 2) the lack of soft loan; 3) the high cost of investment; 4) the lack of human resources; and 5) the lack of environmental awareness.

The factors that have caused the growth of the environmental industry are 1) environmental degradation due to increased industrial activities; 2) government's environmental regulations; and 3) increased environmental awareness of industries through seminars, training, and demonstration projects on industrial environmental management systems. Thailand seeks to eradicate water pollution through the establishment of central wastewater collection and treatment systems, and reduce taxes on imported machinery, equipment, facilities, supplies and materials. To reduce air and noise pollution, the government is encouraging investment in the production of equipment that reduces noise and vibration pollution. Thailand is pursuing the handling of solid waste through the creation of central solid waste and night soil disposal facilities. In hazardous materials, the government is establishing modern facilities to handle them. Thailand is investing in basic infrastructure for collection, transportation, treatment, and the destruction of hazardous waste.

Table 2.2 Summary of Major Characteristics of the Environmental Industry and Policies

Country	Major Characteristics
Australia	1. The majority of national spending is for wastewater management, water protection, and waste management. 2. Corporate expenditure is focused in the services sector and manufacturing industries. 3. The development of a Product Stewardship System for Waste Oil. 4. The government has recognized the importance of exporting environmental goods and services to the global market.
Canada	1. The government has established the Canadian Environment Industry Strategy (CEIS) to promote the environment industry at home and abroad. 2. Small and medium enterprises (SMEs) are the target for adopting appropriate eco-efficient technology and environmental management systems. 3. The government has focused on providing information services on environmental industry, statistics, and issues.
China	1. The high growth areas of the environmental industry are in urban sewage treatment equipment, air pollution prevention and control equipment, solid waste disposal equipment, and environmental monitoring equipment. 2. The government has increased investment and awareness of environmental protection. 3. Environmental enterprises are mainly located in the coastal provinces. 4. The government is seeking to create sound environmental management system and environmental law system.
Hong Kong, China	1. The high growth areas are in pollution prevention processes and supplies, heat/energy saving and management, supplies and construction of infrastructure projects, and low emission supplies. 2. The environmental industry has grown because of the implementation of environmental legislation, government policies and initiatives, infrastructure projects, the support for sustainable development, and private sector's environment initiatives. 3. The government will strive to eliminate hurdles in the institutional and legal frameworks. 4. The economy will try to provide services, such as financial, technical and consulting, to support environmental improvements in the Asia-Pacific region.
Japan	1. The environmental industry is experiencing growth and the industry is highly competitive because of technological superiority and good performance. 2. Factors that have fueled growth are increasing environmental consciousness, building close connection between clients and suppliers, evaluating correctly the environmental performance of companies, and keeping fair competition in the market. 3. The economy understands that the environmental industry is important to the realization of sustainable development.
Korea	1. The high growth areas of the environmental industry are in clean production technologies. 2. The government is emphasizing the development of clean energy and technology. 3. The industry's strengths are in dust collection technologies, tertiary treatment of wastewater, and purification system. 4. Factors causing the growth of the industry are resource exhaustion and environmental destruction, implementation of environmental regulatory measures, accelerated development of advanced technology. 5. The economy is seeking to increase the competitiveness of the environmental industry, so that there will be more exports in the future.

Country	Major Characteristics
Peru	1. Industrial firms are aware that environment regulations are not obstacles of development. 2. The National Environment Council and other entities have agreed to create the Environmental Technique Study Group for air, water, and noise, in order to set national standards. 3. Industrial enterprises are studying the use of high technology to meet the permissible emission standards.
Chinese Taipei	1. The EPA has established a service center for disseminating information industrial waste exchange. 2. The government is providing guidance to firms seeking ISO 14000 certification. 3. Industrial and science parks have been receiving guidance from the EPA on the operation of treatment and final waste disposition sites. 4. An Internet-based application and control system has been created to monitor industrial waste cleanup in real time. 5. The government is actively seeking to reduce air pollution through requiring motorcycles to have exhaust emission inspection, phasing out 2-stroke motorcycles in favor of 4-stroke motorcycles, and prohibiting the use of leaded gasoline.
Thailand	1. The high growth areas of the environmental industry are in pollution control and monitoring. 2. Firms have begun to apply pollution prevention and energy saving technologies in the production process. 3. The economy is seeking to eradicate water pollution through the establishment of central wastewater collection and treatment system. 4. The strengths of the industry are more stringent regulations, international standard, tax incentive, cost saving, public awareness, environmental friendly product, and greening supplier chain. 5. The government is encouraging investments in the production of equipment that reduces noise and vibration pollution.

2.3 The Environmental Protection Market (Market Demand)

Australia has related that an important step taken to promote the growth of the environmental market was the establishment of The National Environment Protection Council (NEPC). The Council's purpose is to set national environmental goals and standards through National Environment Protection Measures (NEPMs). The NEPC's objectives are to make sure that: 1) the people of Australia enjoy the benefit of equivalent protection from air, water, soil and noise pollution, no matter where they live; and 2) decisions of the business community are not distorted, and markets not fragmented, by variations between member governments in relation to the adoption or implementation of major environment protection measures. The NEPMs can be related to 1) ambient air quality; 2) ambient marine, estuarine and fresh water quality; 3) the protection of amenities in relation to noise (but only if differences in environmental requirements relating to noise have an adverse effect on national markets for goods and service; 4) general guidelines for the assessment of site contamination; 5) environmental impact associated with hazardous wastes; and 6) the re-use and recycling of used materials.

Australia has implemented several marketing strategies to increase its competitiveness in overseas markets. These strategies are: 1) the environment management industry export development strategy; 2) Austrade Export Market Assessment Survey; 3) APEC Virtual Centre for Environmental Technologies Exchange; 4) its capability database (e.g. Enviro-Net database, www.environet.ea.gov.au); 5) attendance at international conferences and trade shows; 6) trade missions; 7) the Olympics Showcase project; 8) itscapability directories (e.g. www.environmentdirectory.com.au); 9) Australia's Environment Industries: The Green Book; and 10) Australian Environment Management Export Corporation, Ltd. In the domestic market, there are conferences, trade shows, traditional advertising media, and awards.

To disseminate information on environmental products and technology, Australia has established several entities. "Environment Australia" maintains the EnviroNET (www.environet.ea.gov.au), a network of databases on the Internet. This network provides listings of over 1,000 Australian suppliers of environmental products, services, equipment, case studies, demonstration projects, and education courses. The Australian Greenhouse Office provides information through workshops, discussion papers, public consultation forums, reports, and through its websites (http://www.greenhouse.gov.au and http://renewable. greenhouse. gov.au).

In Canada, government policies and especially environmental regulations have played a key role in the growth of the environment industry. More recently, governments have attempted to respond to the high costs of enforcing regulations by shifting more responsibility for environmental control to the private sector. The development of a pollution prevention strategy in 1995 signaled a shift in emphasis by the federal government from attempting to manage pollution to pollution prevention. The new focus promotes efficient conservation strategies through which private firms will contribute to the broader objective of sustainable development.

The influence of governments on the Canadian industry extends beyond their role as regulator; the public sector is an important market for environmental goods and services. For instance, municipalities account for over 50 percent of the total domestic market. In the future, Canadian governments will continue to build on the successes of CEIS in working with industry to determine how best to reduce greenhouse gas emissions and to demonstrate commitment to sustainable development. This is exemplified in Industry Canada's Sustainable Development Strategy, which has identified four strategic objectives:

- To foster a marketplace climate in Canada that promotes sustainable development;
- To enhance the ability of Canadian firms to develop and use innovative technologies and tools that contribute to sustainable development ;
- To encourage trade and investment flows that contribute to sustainable development in Canada and abroad;
- To continue to improve the capacity of Industry Canada to manage and deliver departmental policies, programs and operations that contribute to sustainable development.

China has indicated that sustainable development is a national development strategy. Enterprises have been ordered to meet the national standards for emissions by the end of 2000. The government will close small companies if they do not meet these standards. To disseminate information on environmental products and technology, China has implemented an environmental label, green label, and ISO 14000 policy. A special space is made in some supermarkets for environmental food. Public awareness has been improved through the media. Household products that can save energy and water are widely available. The State Environmental Protection Administration has ranked cities by indicators of Sustainable Model City.

Hong Kong, China, has related that its government is constantly promoting environmental awareness. Information is given on available environmental technologies and best practices. Hong Kong is also encouraging waste reduction through reuse and recycling. The dissemination of information on environmental products is similar to other commercial products, such the media, product brochures, and exhibitions.

According to Japan, major corporations have been developing environment-friendly products. Firms have promoted these products through the application of environmental labeling schemes. Information is disseminated through clear instruction books and advertisement in newspapers and television. The government has been encouraging consumers to use environment-friendly products. Japan supports the eco-mark program that examines and authorizes environment-friendly products. Japan's government awards corporations that promote "green purchasing." The number of corporations that have started "green purchasing" is increasing. Some corporations have even established their own guideline for "green purchasing."

Korea has been promoting the growth of its environmental market through the establishment of environment-friendly production and consumption patterns. Preventive and self-governing environmental management has been introduced. The expansion of privatization in environmental infrastructure is also encouraged. The marketing strategies adopted to expand the domestic and overseas markets include: strengthening public relations for the environment industry, collecting and disseminating information on environmental markets, and creating cooperative networks. Notable was the second meeting between environmental ministers of China, Japan, and Korea in Beijing on February 2000 called the "Tripartite Environmental Ministers Meeting (TEMM)". The ministers agreed to undertake cooperation projects, such as holding a roundtable on environmental industry cooperation.

In Peru, the government has prioritized environmental standards for the the beer, pulp and paper, tanning, and cement sectors to improve productivity and competitiveness. These sectors will be pilot projects in environmental management. The results will be used by other sectors. Aid consultants provide information on technologies, legal matters, and other assistance.

Chinese Taipei has indicated the importance of the promotion of environmental education and public awareness, as it seeks to achieve sustainable development. The media is relied up on to disseminate information on the various environmental projects and activities. Books, publicity materials, videotapes, advertisements, television broadcasts, and radio programs have been used to further the public awareness campaign. Educational materials for students have been published to strengthen environmental education. An increase in public awareness would certainly lead to greater demand for environmental goods and services.

In August 1992, the Green Mark program was launched to spread the concept of recycling, pollution reduction, and resource conservation. The objectives in awarding the Green Mark are to guide consumers in purchasing and to encourage manufacturers to design and supply environmentally benign products. When the Government Procurement Act was ratified in 1998, a clause was included for green procurement. The clause stipulates that during government procurement bids, products bearing the Green Mark or with comparable characteristics, should be given priority in bids and enjoy a price advantage of within 10%. The EPA has arranged green purchasing training courses for procurement staff in government agencies. In addition, the EPA has provided publications, telephone hotlines, and a web

page as references for implementing the green procurement program. The Green Mark program has awarded its logo to about 906 products made by around 225 companies.

The EPA established its Annual Green Business Award in 1992. Companies are honored for environmental excellence. The award seeks to encourage businesses to continue their good work in improving environmental performance. The EPA is certain that activities that exhibit practices from award winning organizations will encourage other companies to follow. Since 1992, 90 companies have demonstrated excellence in environmental protection. The EPA believes that the promotion of the Green Business Award has led to an increase in the number of companies receiving ISO 14000 certification. There are over 560 organizations that have received ISO 14000, making Chinese Taipei number 5 in the world and number 2 in Asia, second only to Japan.

Another noteworthy program is the implementation of the Energy Star certifications in Chinese Taipei that began in July 2000. The program is based on a cooperative agreement between the United States and Chinese Taipei. After initial consultations, Chinese Taipei's EPA selected office supplies to be the first wave of the program. The goal of the program is to promote energy conservation and reduction of greenhouse gases.

Thailand has implemented several strategies to expand its environmental market through the creation of its Environmental Fund, introduction of tax reductions, and the establishment of targets to improve environmental quality. Thailand has disseminated information on environmental products through advertisement, exhibitions, demonstrations, campaigns, and projects. In recent years, the Federation of Thai Industries' Industrial Environment Institute has enhanced environmental awareness among member companies through training, seminars, demonstration projects, and the formation of sector-specific working groups. The government has formulated the Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality. Environmental awareness is also enhanced through the educational system. Eco-labeling has been encouraged extensively.

Table 2.3 Summary of Steps Taken to Increase the Growth of the Environmental Protection Market: Market Demand

Country	Steps Taken
Australia	1. The establishment of The National Environment Protection Council (NEPC) for setting national environmental goals and standards. 2. The implementation of marketing strategies to increase industries' competitiveness in overseas markets. 3. The dissemination of information on environmental products and technology, such as through Environment Australia's EnviroNet and The Australian Greenhouse Office.
Canada	1. Government policies and environmental regulations. 2. The development of pollution prevention strategy. 3. The implementation of Industry Canada's Sustainable Development Strategy. 4. The promotion of efficient conservation strategies through which private firms will contribute to the broader objective of sustainable development.
China	1. The recognition that sustainable development is the national development strategy. 2. The dissemination of information on environmental products and technology. 3. The implementation of the environmental label, green label, and ISO 14000. 4. The ranking of cities by indicators of Sustainable Model City.
Hong Kong, China	1. The promotion of environmental awareness. 2. The dissemination of information on available environmental technologies and best practices. 3. The encouragement of waste reduction through reuse and recycling. 4. The dissemination of information on environmental products through the media, product brochures, and exhibitions, etc.
Japan	1. The application of environmental labeling schemes for environment-friendly products. 2. The dissemination of information through clear instruction books and advertisement in newspapers and television. 3. The encouragement of consumers to use environment-friendly products. 4. The support for the ecomark program. 5. The encouragement of corporations to start "green purchasing."
Korea	1. The establishment of environment-friendly production and consumption patterns. 2. The introduction of preventive and self-governing environmental management. 3. The expansion of privatization of the environmental infrastructure. 4. The adoption of marketing strategies to expand the domestic and overseas markets.

Country	Steps Taken
Peru	1. The establishment of environmental standards for industries in order to improve productivity and competitiveness. 2. The implementation of pilot projects in environmental management. 3. The dissemination of information on technologies, legal matters, and others.
Chinese Taipei	1. The promotion of environmental education and public awareness. 2. The implementation of the Green Mark program to spread the concept of recycling, pollution reduction, and resources conservation. 3. The establishment of the Annual Green Business Award by the EPA to honor companies for environmental excellence. 4. The adoption of the Energy Star program to promote energy conservation and reduction of green house gases, beginning with office supplies.
Thailand	1. The implementation of strategies to expand environmental market through the creation of Environmental Fund, introduction of tax reductions, and the establishment of targets to improve environmental quality. 2. The dissemination of information on environmental products through advertisement, exhibition, demonstration, campaign, and projects. 3. The enhancement of environmental awareness by the Federation of Thai Industries' Industrial Environment Institute through training, seminars, demonstration projects, and formation of sector-specific working group. 4. The formulation of the Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality. 5. The raising of environmental awareness through the educational system and encouragement of eco-labeling.

2.4 Potential High Growth Areas

APEC economies differ greatly in their economic development stages. As summarized from the responses of member economies, potential high growth areas of environmental goods and services industries are described in Table 2.4. Note that despite the different stages of economic development among APEC members, water and wastewater issues appear to be a common concern of many economies. This survey did not explore the reason behind this circumstance, but perhaps maybe because water is gradually becoming a global problem.

Table 2.4 Potential High Growth Areas of Selected Economies

Economy	Potential High Growth Area
Australia	● Wastewater Management ● Water Protection ● Waste Management
Canada	● Water and Wastewater Treatment Technologies ● Liquid and Solid Waste Management; ● Environmental Instrumentation, Geomatics and Analysis; ● Energy Efficiency and Renewable Energy; ● Engineering and Consulting Services.
China	● Urban Sewage Treatment Equipment ● Air Pollution and Control Equipment ● Environmental Monitoring Equipment and Corresponding New High Technology Development and Product Production
Hong Kong, China	● Pollution Prevention Process and Supply ● Heat/Energy Saving and Management ● Infrastructure (Sewage, Landfills, Clinical Waste, Radioactive Waste)
Japan	● Environmental R&D ● Environmental Equipment ● Government's Green Purchasing
Korea	● Clean Production
Peru	● Pollution Management
Chinese Taipei	● Waste Management ● Air Pollution Control Equipment
Thailand	● Pollution Control and Management ● Improvement of Production Process (Pollution Prevention, Clean Production, Energy Saving, Waste Minimization) ● Recycling

Source: Compiled by this study

Chapter Three
Institutional Arrangement

Part III of the survey inquires about institutional arrangements concerning environmental protection in each member economy. Specifically, APEC economies were asked to list government offices responsible for the planning, monitoring, and policy development of each specific category of function related to environmental protection. APEC members were also asked to list major non-governmental organizations (NGOs) actively involved in environmental protection through education, research, and advocacy to the business community and the general public. This section summarizes major findings and presents discussions on the design of survey instruments.

3.1 Government Institutions

3.1.1 Summary

Principle governmental offices in charge of environmental protection related affairs are summarized in Table 3.1.1 through 3.1.9. Listed in alphabetical order are the economies that respond to this survey. Economies differ on two organizational features: the degree of institutional integration of substantive areas and the degree of centralization. A high degree of institutional integration refers to the existence of a specialized agency that takes charge of all environmental protection affairs. A high degree of centralization refers to the situation where the central government is the primary level of government responsibility.

Overall, most participating economies established an integrated agency that specializes in all substantive areas of environmental protection. Exceptions are noted in the case of Thailand where a higher division of labor is observed according to groups of substantive areas of environmental protection. Although Japan has an integrated Environmental Agency, waste management falls under the jurisdiction of the Ministry of Health and Welfare. Most participating economies delegate the planning of environmental protection to the central government level. Australia stands out as a notable exception- state and local governments have independent jurisdiction over environmental protection affairs confined to their locality. The central government plays a coordinating role in cases where issues involve more than one state or are of national scale and interest. Between the two extremes, provincial and municipal governments in Canada and Thailand are actively engaged in waste management.

3.1.2 Individual Economies

Australia adopts a high degree of institutional integration and a low degree of centralization in environmental protection affairs. "Environmental Australia" at the federal level, environmental protection agencies/authorities at the state/territory level, and local authorities are the major responsible agencies. State environmental protection agencies/authorities play an active role in planning, monitoring, and in policy development. Local authorities appear to share greater responsibilities in environmental construction and installation, as well as environmental services, than in environmental equipment and materials. The Environment Protection and Biodiversity Conservation Act of 1999 for the first time clearly defined separate responsibilities of federal versus local governments and sought to avoid redundancies.

Canada adopts a high degree of institutional integration and a medium degree of centralization in environmental protection affairs. "Environment Canada" at the federal level takes charge of environmental protection in most substantive areas. Provincial and municipal governments are responsible for waste management as well as environmental services relating to education, training, and information.

The Chinese government adopts a high degree of institutional integration and a high degree of centralization in environmental protection affairs. The State Environmental Protection Administration at the central government is the agency in charge.

Hong Kong, China adopts a low degree of institutional integration and a high degree of centralization in environmental protection affairs.

Japan adopts a high degree of centralization in environmental protection affairs and a medium degree of institutional integration. "The Environmental Agency" assumes major planning responsibilities in most substantive areas except for waste management, which is under the jurisdiction of the Ministry of Health and Welfare.

Korea adopts a high degree of institutional integration (through the establishment of its Ministry of the Environment) and a high degree of centralization in environmental protection affairs.

The Singaporean government adopts a high degree of institutional integration (through its

Ministry of Environment) and a high degree of centralization in environmental protection affairs.

The Thai government adopts a low degree of institutional integration and a medium degree of centralization. Major environmental protection planning fall under a number of central agencies and local authorities.

Figure 3.1 describes the relative positions of institutional arrangements amongst selected economies.

Figure 3.1 Institutional Arrangement of Selected Economies

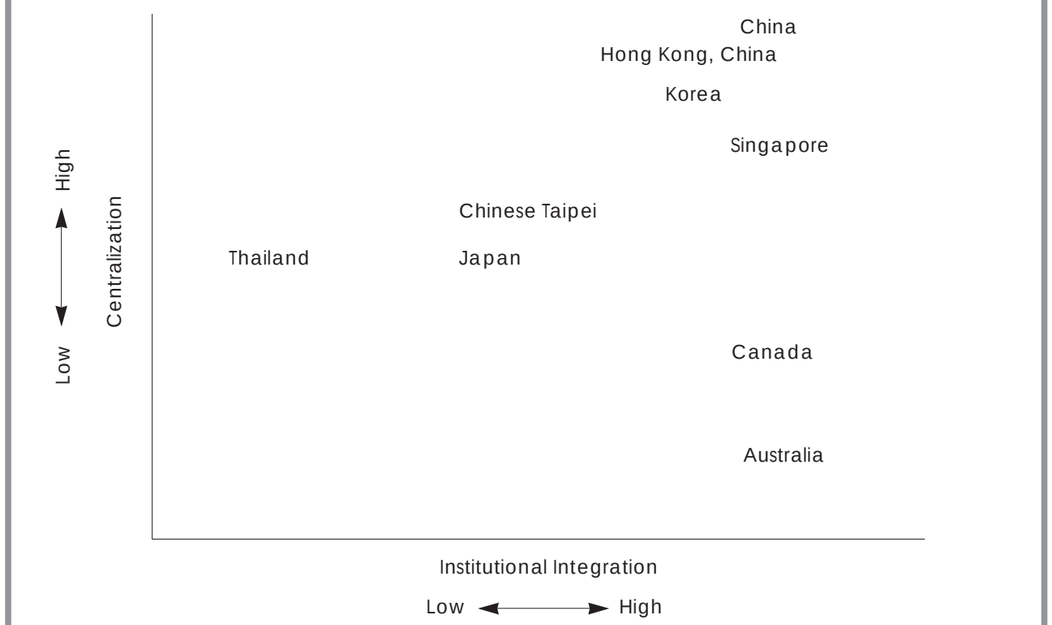


Table 3.1.1 Australian Government Offices in Charge of Environmental Protection Affairs

Group		Office	E-mail and/or Website
Air pollution control		State and Territory EPAs (EEM, ES, CI); local authorities (CI)	● Environment Australia http://www.environment.gov.au
Wastewater treatment (excluding water treatment)		State and Territory EPAs (EEM, ES, CI); water authorities (ES); local councils (ES)	● Australian Capital Territory http://www.act.gov.au/environ/ ● New South Wales
Waste management	Solid waste collection, treatment and disposal	State and Territory EPAs (EEM, CI); local authorities (EEM, ES, CI)	http://www.epa.nsw.gov.au/ ● Northern Territory http://www.lpe.nt.gov.au
	Hazardous waste collection, treatment and disposal	Environmental Australia (EEM); State and Territory EPAs (EEM, ES, CI); local authorities (ES, CI)	● Queensland http://www.env.qld.gov.au ● South Australia http://www.denr.sa.gov.au/epa/epa.html
	Waste Recycling and recovery	State and Territory EPAs (EEM, ES, CI); local authorities (EEM, ES, CI)	● Tasmania http://www.dpiwe.tas.gov.au
Remediation and clean up of soil and groundwater Noise and vibration abatement		State and Territory EPAs (EEM, ES, CI); local authorities (CI) State and Territory EPAs (EEM, ES, CI); local authorities (ES, CI)	● Victoria http://www.epa.vic.gov.au ● Western Australia http://www.environ.wa.gov.au/EPA
Environmental monitoring, analysis and assessment		State and Territory EPAs (EEM, ES, CI); local authorities (ES, CI)	http://www.environ.wa.gov.au/DEP ● The Australian Local Government Association http://www.alga.com.au ● For a list of State Association websites http://www.alga.com.au/sta.htm ● For a list of Local Government Authorities/Councils websites http://www.algin.net.au/cnclist.htm
Environmental R&D (Environmental services only)		Environmental Australia; AFFA (R&D Corporations, Bureau of Rural Sciences, and Australian Bureau of Agricultural and Resource Economics); State and Territory EPAs; local authorities	
Education, training, and information (Environmental services only)		Environmental Australia; State and Territory EPAs; local authorities	

Group	Office	E-mail and/or Website
Other governmental offices responsible for environmental protection related policies whose functions not accounted for by survey definition of environmental industry	● Australian Greenhouse Office ● Agriculture, Fisheries and Forestry-Australia (AFFA), includes the Australian Quarantine and Inspection Service (AQIS), Bureau of Rural Sciences (BRS) and Australian Bureau of Agricultural and Resource Economics (ABARE). ● AUSTRADE ● Australian Maritime Safety Authority ● Northern Territory Department of Mines and Energy ● Northern Territory Parks and Wildlife Commission ● New South Wales National Parks and Wildlife Service ● New South Wales Department of Land and Water Conservation ● Victorian Department of Natural Resources and Environment ● Queensland Department of Natural Resources ● Western Australian Department of Conservation and Land Management ● Tasmanian Department of Infrastructure, Energy and Resources ● Tasmanian Parks and Wildlife Service	● http://www.greenhouse.gov.au/ ● http://www.affa.gov.au ● http://www.austrade.gov.au ● http://www.amsa.gov.au ● http://www.dme.nt.gov.au/ ● http://www.nt.gov.au/paw ● http://www.npws.nsw.gov.au/ ● http://www.dlwc.nsw.gov.au/ ● http://www.nre.vic.gov.au/dnre.htm ● http://www.dnr.qld.gov.au/ ● http://www.calm.wa.gov.au/ ● http://www.dier.tas.gov.au/ ● http://www.parks.tas.gov.au/tpws.html

Note: **1. EPA stands for Environmental Protection Agency/Authority**
2. EEM represents Environmental Equipment and Materials, ES stands for Environmental Services, CI stands for Construction and Installation.

Table 3.1.2 Canadian Government Offices in Charge of Environmental Protection Affairs

Group		Office	E-mail and/or Website
Air pollution control		Air Pollution Directorate, Environment Canada (EEM, ES, CI)	David.egar@ec.gc.ca
Wastewater treatment (excluding water treatment)		Wastewater Technology Center (EEM, ES, CI)	Kathy.faulkner@ec.gc.ca
Waste management	Solid waste collection, treatment and disposal	Provincial and Municipal (EEM, ES, CI)	http://www.ene.gov.on.ca/waste.htm
	Hazardous waste collection, treatment and disposal	Provincial and Municipal (EEM, ES, CI)	http://www.ene.gov.on.ca/waste.htm
	Waste Recycling and recovery	Provincial and Municipal (EEM, ES, CI)	http://www.ene.gov.on.ca/waste.htm
Remediation and clean up of soil and groundwater Noise and vibration abatement		Environmental Emergencies Branch (EEM, ES, CI)	http://www.etcentre.org/divisions/esd/english/esd.html
Environmental monitoring, analysis and assessment		Emergencies Science Division (EEM, ES, CI)	merv.fingas@etc.ec.gc.ca http://www.etcentre.org/main/e/org/org.html
Environmental R&D (Environmental services only)		Environmental Technology Centre (EEM, ES, CI)	david.thorton@etc.ec.gc.ca http://www.etcentre.org/main/e/org/org.html
Education, training, and information (Environmental services only)		Municipal or Provincial jurisdiction (EEM, ES, CI)	

Note: 1. For inquiry, please contact Environment Canada, Inquiry Centre, 351 St. Joseph Blvd, Hull, QC, K1A OH3, fax number 819-953-2225.
2. EEM represents Environmental Equipment and Materials, ES stands for Environmental Services, CI stands for Construction and Installation.

Table 3.1.4 Chinese Government Offices in Charge of Environmental Protection Affairs

Group		Office	E-mail and/or Website
Air pollution control		State Environmental Protection Administration, Division of Air and Noise Pollution control (EEM, ES, CI)	http://www.nepa.unep.net
Wastewater treatment (excluding water treatment)		State Environmental Protection Administration, Division of Water Pollution Control (EEM, ES, CI)	http://www.nepa.unep.net
Waste management	Solid waste collection, treatment and disposal	State Environmental Protection Administration, Division of Solid Wastes and Toxic Chemicals (EEM, ES, CI)	http://www.nepa.unep.net
	Hazardous waste collection, treatment and disposal	State Environmental Protection Administration, Division of Solid Wastes and Toxic Chemicals (EEM, ES, CI)	http://www.nepa.unep.net
	Waste Recycling and recovery	State Environmental Protection Administration, Division of Solid Wastes and Toxic Chemicals (EEM, ES, CI)	http://www.nepa.unep.net
Remediation and clean up of soil and groundwater		State Environmental Protection Administration, Division of General Affairs (EEM, ES, CI)	http://www.nepa.unep.net
Noise and vibration abatement		State Environmental Protection Administration, Division of Air and Noise Pollution control (EEM, ES, CI)	http://www.nepa.unep.net
Environmental monitoring, analysis and assessment		State Environmental Protection Administration, Division of Development Management and Monitoring (EEM, ES, CI)	http://www.nepa.unep.net
Environmental R&D (Environmental services only)		State Environmental Protection Administration, Division of Environmental Impact Assessment (ES)	http://www.nepa.unep.net
Education, training, and information (Environmental services only)		State Environmental Protection Administration, Office of Communication and Education	http://www.nepa.unep.net
Other governmental offices responsible for environmental protection related policies whose functions not accounted for by survey definition of environmental industry		● Association of Environmental Industry ● China-Japan Friendship Center for Environmental Protection ● China National Environmental Monitoring Center ● Chinese Research Academy of Environmental Sciences ● China Environment News ● Chinese Environmental Science Press	

Note: EEM represents Environmental Equipment and Materials, ES stands for Environmental Services, CI stands for Construction and Installation.

Table 3.1.5 Hong Kong Government Offices in Charge of Environmental Protection Affairs

Group		Office	E-mail and/or Website
Air pollution control		Environmental Protection Department, Air Management Group (EEM, ES, CI)	http://www.info.gov.hk/epd
Wastewater treatment (excluding water treatment)		Drainage Services Department (EEM, ES, CI); Environmental Protection Department, Sewage Infrastructure Planning Group (EEM, ES, CI)	http://www.info.gov.hk/dsd http://www.info.gov.hk/epd
Waste management	Solid waste collection, treatment and disposal	Environmental Protection Department, Facilities Management Group (EEM, ES, CI); Food and Environmental Hygiene Department (EEM, ES, CI); Civil Engineering Department (ES, CI)	http://www.info.gov.hk/epd http://www.info.gov.hk/fehd http://www.info.gov.hk/ced
	Hazardous waste collection, treatment and disposal	Environmental Protection Department, Special Waste Facilities Group (EEM, ES for treatment facilities, CI); Environmental Protection Department, Waste and Water Management Group (ES for general purpose)	http://www.info.gov.hk/epd
	Waste Recycling and recovery	Environmental Protection Department, Facilities Planning Group (EEM, ES, CI); Food and Environmental Hygiene Department (ES); Civil Engineering Department (CI)	http://www.info.gov.hk/epd http://www.info.gov.hk/fehd
Remediation and clean up of soil and groundwater		Environmental Protection Department, Water Policy and Services Group (EEM, ES, CI), Territory Development Department (EEM, ES, CI)	http://www.info.gov.hk/epd http://www.info.gov.hk/tdd

Group	Office	E-mail and/or Website
Noise and vibration abatement	Environmental Protection Department, Noise Management and Policy Group (EEM, ES, CI), Territory Development Department (CI), Highways Department (CI)	http://www.info.gov.hk/epd http://www.hyd.gov.hk http://www.info.gov.hk/tdd
Environmental monitoring, analysis and assessment	Environmental Protection Department, Water Policy and Planning Group (EEM); Environmental Protection Department, Water Policy and Services Group (EEM); Environmental Protection Department, Air Services Group (EEM); Environmental Protection Department, Urban Assessment Group (ES for general purpose); Environmental Protection Department, Water Policy and Services Group (ES for Beach); Environmental Protection Department, Water Policy and Planning Group (ES for Marine and River Waters); Environmental Protection Department, Air Services Group (ES for Air)	http://www.info.gov.hk/epd
Education, training, and information (Environmental services only)	Environmental Protection Department, Community Relations Unit	http://www.info.gov.hk/epd
Other governmental offices responsible for environmental protection related policies whose functions not accounted for by survey definition of environmental industry	● Agriculture, Fisheries and Conservation Department ● Architectural Services Department ● Buildings Department ● Education Department ● Electrical and Mechanical Services Department ● Hong Kong Police Force ● Hong Kong Observatory ● Labor Department ● Lands Department ● Marine Department ● Planning Department ● Transport Department ● Government Laboratory	

Note: EEM represents Environmental Equipment and Materials, ES stands for Environmental Services, CI stands for Construction and Installation.

Table 3.1.6 Japanese Government Offices in Charge of Environmental Protection Affairs

Group		Office	E-mail and/ or Website
Air pollution control		Planning Division, Air Quality Bureau, Environment Agency (EEM, ES, CI).	Web@eanet.go.jp
Wastewater treatment (excluding water treatment)		Water Pollution Control Bureau, Water Quality Bureau, Environment Agency (EEM, ES, CI)	Web@eanet.go.jp
Waste management	Solid waste collection, treatment and disposal	Ministry of Health and Welfare (EEM, ES, CI)	www-admin@mhw.go.jp
	Hazardous waste collection, treatment and disposal	Ministry of Health and Welfare (EEM, ES, CI)	www-admin@mhw.go.jp
	Waste Recycling and recovery	Ministry of Health and Welfare (EEM, ES, CI).	www-admin@mhw.go.jp
Remediation and clean up of soil and groundwater		Soil and Agricultural Chemicals Division and Office of Ground Water and Land Environment, Water and Land Environment, Water Quality Bureau, Environment Agency (EEM, ES, CI)	Web@eanet.go.jp
Noise and vibration abatement		Office of Sensory Pollution and Air Quality, Air quality Bureau, Environment Agency (EEM, ES, CI)	Web@eanet.go.jp
Environmental monitoring, analysis and assessment		Environmental Impact Assessment Division, Planning and Coordination Bureau, Environment Agency (EEM, ES, CI)	Web@eanet.go.jp
Environmental R&D (Environmental services only)		Environmental Research and Technology Division, Planning and Coordination Bureau, Environment Agency	Web@eanet.go.jp
Education, training, and information (Environmental services only)		Office of Environmental Activities, Planning and Coordination Bureau, Environment Agency	Web@eanet.go.jp
Other governmental offices responsible for environmental protection related policies whose functions not accounted for by survey definition of environmental industry		● Ministry of International Trade and Industry ● Ministry of Agriculture, Forestry and Fishery ● Ministry of Transport ● Ministry of Construction ● Science and Technology Agency ● Japan Environment Corporation ● Development Bank of Japan ● Japan Small and Medium Enterprise Corporation	● NA ● NA ● NA ● NA ● NA ● http://www.jec.go.jp/eg/index.html ● http://www.dbj.go.jp/top/index_e.html ● http://jasmec.go.jp/english/index/html

Note: EEM represents Environmental Equipment and Materials, ES stands for Environmental Services, CI stands for Construction and Installation.

Table 3.1.7 Korean Government Offices in Charge of Environmental Protection Affairs

Group		Office	E-mail and/or Website
Air pollution control		Ministry of Environment, Air pollution control Division (EEM, ES, CI)	http://www.me.go.kr
Wastewater treatment (excluding water treatment)		Ministry of Environment, Industrial Wastewater Control Division; Ministry of Environment, Domestic Wastewater Control Division; Ministry of Environment, Sewage Treatment Division (EEM, ES, CI)	http://www.me.go.kr
Waste management	Solid waste collection, treatment and disposal	Ministry of Environment, Industrial Wastewater Control Division; Ministry of Environment, Domestic Wastewater Control Division; Ministry of Environment, Sewage Treatment Division (EEM, ES, CI)	http://www.me.go.kr
	Hazardous waste collection, treatment and disposal	Ministry of Environment, Industrial Wastewater Control Division; Ministry of Environment, Domestic Wastewater Control Division; Ministry of Environment, Sewage Treatment Division (EEM, ES, CI)	http://www.me.go.kr
	Waste Recycling and recovery	Ministry of Environment, Industrial Wastewater Control Division; Ministry of Environment, Domestic Wastewater Control Division; Ministry of Environment, Sewage Treatment Division (EEM, ES, CI)	http://www.me.go.kr
Remediation and clean up of soil and groundwater		Ministry of Environment, Soil Conservation Division (soil); Ministry of Environment, Water Quality Policy Division (groundwater)(EEM, ES, CI)	http://www.me.go.kr
Noise and vibration abatement		Ministry of Environment, Noise, Vibration and Dust Control Division (EEM, ES, CI)	http://www.me.go.kr
Environmental monitoring, analysis and assessment		National Institute of Environmental Research, Korea Environment Institute (EEM, ES, CI)	http://www.nier.go.kr http://www.kei.go.kr
Other governmental offices responsible for environmental protection related policies whose functions not accounted for by survey definition of environmental industry		● Korea Forest Service - Erosion Control - Forest Management - Forest Protection - Forest Recreation - Wildlife Management and Hunting ● Marine Policy Bureau, Ministry of Maritime Affairs and Fisheries	

Note: 1. Contact Point is the Environment and Economy Division at Ministry of Environment,.
2. EEM represents Environmental Equipment and Materials, ES stands for Environmental Services, CI stands for Construction and Installation.

Table 3.1.8 Singaporean Government Offices in Charge of Environmental Protection Affairs

Group		Office	E-mail and/or Website
Air pollution control		Ministry of the Environment, Pollution Control Department (EEM, ES, CI)	http://www.env.gov.sg
Wastewater treatment (excluding water treatment)		Ministry of the Environment, Sewerage Department (EEM, ES, CI)	http://www.env.gov.sg
Waste management	Solid waste collection, treatment and disposal	Ministry of the Environment, Engineering Services Department (EEM, ES, CI)	http://www.env.gov.sg
	Hazardous waste collection, treatment and disposal	Ministry of the Environment, Pollution Control Department (EEM, ES, CI)	http://www.env.gov.sg
	Waste minimization	Ministry of the Environment, Environmental Health Department (EEM, ES, CI)	http://www.env.gov.sg
Environmental monitoring		Ministry of the Environment, Strategic Planning and Research Department (EEM, ES, CI).	http://www.env.gov.sg

Note: EEM represents Environmental Equipment and Materials, ES stands for Environmental Services, CI stands for Construction and Installation.

Table 3.1.9 Thai Government Offices in Charge of Environmental Protection Affairs

Group		Office	E-mail and/or Website
Air pollution control		Pollution Control Department (EEM); The Department of Land Transport (CI);	http://www.pcd.go.th
Wastewater treatment (excluding water treatment)		The Department of Industrial Works (CI) Department of Industrial Works (EEM, ES); Pollution Control Department (EEM); Public Works Department (CI)	http://www.diw.go.th http://www.pwd.go.th
Waste management	Solid waste collection, treatment and disposal	Bangkok Metropolitan Administration (EEM, ES); Municipalities (EEM, ES); Department of Land Development (EEM, ES); Public Works Department (CI)	http://www.bma.go.th pitaya@asiaaccess.net.th
	Hazardous waste collection, treatment and disposal	Department of Industrial Works (EEM, ES); Pollution Control Department (EEM, ES); Department of Industrial Works (CI)	
	Waste Recycling and recovery	Pollution Control Department (EEM); Department of Land Development (EEM, ES)	
Remediation and clean up of soil and groundwater		Department of Mineral Resources (EEM)	http://www.dmr.go.th
Noise and vibration abatement		Pollution control Department (EEM); The Department of Land Transport (EEM).	http://www.dlt.motc.go.th
Environmental monitoring, analysis and assessment		Pollution Control Department (EEM, ES, CI)	
Environmental R&D (Environmental services only)		Department of Environmental Quality Promotion; Pollution Control Department	http://www.deqp.go.th
Education, training, and information (Environmental services only)		Department of Environmental Quality Promotion	
Other governmental offices responsible for environmental protection related policies whose functions not accounted for by survey definition of environmental industry		● Office of the Commission for the Management of Road Traffic ● National Energy Policy Office ● Royal Thai Navy ● Land Development Department ● The Habour Department ● The National Research Council of Thailand ● Office of Atomic Energy for Peace ● Department of Cirriculum and Instruction Development ● Department of Health	

Note: EEM represents Environmental Equipment and Materials, ES stands for Environmental Services, CI stands for Construction and Installation.

3.2 NGOs

Economies report that NGOs perform an important function in information dissemination, advocacy, education, training, and research development to businesses and the general public. Table 3.2 lists major NGOs as documented in the survey responses. The large number of NGOs listed by Australia; Hong Kong, China and Thailand may indicate more active roles for NGOs in these three economies versus other APEC members.

Notice the great diversity found among NGOs of member economies. NGOs in member economies differed in organization, objectives, functionality as well as size. Several members indicate that some NGOs at the national level are rather powerful and maintain close cooperation with the government. Some NGOs are in the position to facilitate or set regulations and standards in certain industries. In addition to large national NGOs, member economies report a large amount of smaller, grassroot organizations. Results of interviews show that some small NGOs are radical environmental activists and are not necessarily directly related to the objectives of this study.

Table 4.2 Industrial Associations and Other Non-Governmental Organizations (NGOs)

ECONOMY	Organizations	Website
AUSTRALIA	(1) Key Industry Associations & Groups	
	● Association of Consulting Engineers Australia	● http://www.acea.aust.com
	● Australian Business Ltd	● http://www.australianbusiness.com.au/
	● Australian Chamber of Commerce and Industry	● http://www.acci.asn.au/
	● Australian Food and Grocery Council	● http://www.afgc.org.au/
	● Australian Industry Group	● http://www.aigroup.asn.au/
	● Australian Water Association	● http://www.awa.asn.au/
	● Community Participation and Review Committee	● NA
	● Environment Institute of Australia	● http://www.vicnet.net.au/~eia
	● Environmental Management Industry Association of Australia	● http://www.emiaa.org.au/welcome.htm
	● Housing Industry Association	● http://www.buildingonline.com.au/
	● Institute of Engineers, Australia	● http://www.ieaust.org.au/
	● Waste Management Association of Australia	● http://www.wmaa.asn.au/
	● Renewable Energy Generators of Australia	● NA
	● Australia Cogeneration Association	● http://www.cogen.com.au/
	● Australian Wind Energy Association	● http://www.auswea.com.au
	● Australian Building Energy Council	● http://www.abec.com.au/
	● Australian and New Zealand Solar Energy Society	● http://www.arch.unsw.edu.au/faculty/arch/solarch/anzses/
	● Sustainable Energy Industry Association	● http://www.seia.com.au/
	(2) NGOs Targeting Consumers	
	● Alternative Technology Association	● http://www.netspace.net.au/~altec/
	● Australian Association of Environmental Education	● http://ee.environment.gov.au/
	● Australian Marine Conservation Society	● http://www.ozemail.com.au/~amcs
	● Marine Education Society of Australia	● http://www.mesa.edu.au/
	● Society for Responsible Design	● http://www.green.net.au/srd/
CANADA	(1) Industry Associations and Consulting Organizations	
	● The Canadian Council for Human Resources in the Environmental Industry	
	● Canadian Environment Industry Association	
	● Three Canadian Environmental Technology Advancement Centres:	
	1. Ontario Center for Environmental Technology Advancement	
	2. Canadian Environmental Technology Advancement Corporation	
	4. Enviro-Access	
	(2) NGOs/Network Targeting Consumers	
	● The Globe Foundation of Canada	
	● The Canadian Labor Congress	
	● The Canadian Environmental Network	
CHINA	(1) Industry Associations and Consulting Organizations	
	● China Association of Environmental Protection Industry	
	● Chinese Association for Chemical Pollution Prevention and Control	
	(2) NGOs Targeting Consumers	
	● China Association of Environmental Protection Industry	
	● Global Village of Beijing	
	● China Energy Research Society	
HONG KONG, CHINA	(1) Key Industrial Support Bodies	
	● Business Environment Council Limited	● http://www.bec.org.hk
	● The Hong Kong Productivity Council	● http://www.hkpc.org
	(2) Mixed of Official and Unofficial Members	
	● Environmental Campaign Committee	● http://www.ecc.org.hk
	(3) Environmental Professional Organizations	
	● Charted Institution of Water and Environmental Management	
	● Hong Kong Environmental Law Association	
	● Hong Kong Institute of Acoustics	
	● Hong Kong Institution of Engineers, Environmental Division	
	● Hong Kong Institute of Environmental Impact Assessment	
	● Hong Kong Waste Management Association	
	● The Marine Biological Association of Hong Kong	

ECONOMY	Organizations	Website
	(4) Major Green Groups in Hong Kong	
	● The Conservancy Association	● http://home.netvigator.com/~cahk
	● Friends of the Earth	● http://www.foe.org.hk
	● Green Lantau Association	● NA
	● Green Power	● http://www.greenpower.org.hk
	● The Hong Kong Marine Conservation Society	● http://www.geocities.com/Tokyo/Bridge/3338
	● World Wide Fund for Nature Hong Kong	● http://www.wwf.org.hk
	● Greenpeace	● http://www.greenpeace-china.org.hk
JAPAN	● Japan Environment Association	● http://www.jeas.or.jp/ecomark/english/index.html
	● Green Purchasing Network	● http://www.wnn.or.jp/wnn-eco/gpne/index.html
KOREA	(1) Key Industry Associations	
	● Environmental Management Corporation	● http://www.emc.or.kr
	● Korea Environmental Industry Association	● http://www.keia.or.kr
	(2) Other NGOs Targeting Consumers	
	● Korea Environmental Preservation Association	● http://www.epa.or.kr
	● Korean Federation for Environmental Movement	● http://www.kfem.or.kr
	● Green Korea United	● http://wwwgreenkorea.org
PERU	● Peruvian Environmental Right Association	
	● Bureau Veritas Group	
	● Social Economy Promotion Institute	
	● Network of Alternative Action upon Use of Agri-chemical Products	
THAILAND	(1) Industrial Associations	
	● The Industrial Environment Institute, The Federation of Thai Industries (IEI/FTI)	
	● Thailand Environmental Institute	
	(2) Other NGOs	
	● Foundation for Anti Pollution and Environmental Protection	
	● Thailand Environment Foundation	
	● Think Earth Association	
	● Thai Environmental and Community Development Association	

3.3 Discussion

Overall, the survey collects valuable information from each participating economy regarding relevant government agencies responsible for environmental protection and major NGOs that actively advance the cause of environmental protection. Such information constitutes an integrated database where interested individuals and businesses from any economy could easily locate or search for related information in APEC economies.

Differences in the pattern of institutional organization appear significant and may indicate varying degrees of institutional efficacy and perceived priorities of environmental protection in each economy, which relates closely to potential growth of environmental market and market access costs. Nonetheless, further information on specific responsibilities of each involved agency in each substantive area of environmental protection is needed before any pattern of association can be ascertained.

The report on NGOs indicates variations in the number and significance of NGO functions in APEC economies. The development of NGOs in Australia appears most advanced. East Asian countries, except for Hong Kong, report fewer NGOs with less diverse mandates. Such imbalance suggests that the potential role of foreign NGOs in promoting environmental protection and hence creating environmental protection market is worth noting.

Chapter Four
Market Profile

In this chapter, information on the value of the environmental goods and services markets is provided. First, the value of the global market is described to indicate the general outlook. Next, this chapter shows the market value of environmental goods and services of APEC economies that wrer returned in the questionnaire.

4.1 Previous Estimates of Environmental Goods and Services Markets

There are several studies on the market profile of environmental goods and services markets. Using the OECD definition of the environmental market, a report by the European Union (1999) indicates that among the three categories of environmental goods and services, services accounts for 52% of market share, followed by equipment at 24% and resource management at 24%. In order to provide a base for comparison, the size of the equipment market of 1998 can be estimated to be between 79 billion and 99 billion Euros. (the Services market, on the other hand, is estimated to be between 172 billion and 208 billion Euros. The size of resource management market is estimated to be between 79 billion Euro and 105 billion Euro (see Table 4.1).

Table 4.1 EU Estimates of Global Market

in billion Euro

	Estimate 1	Estimate 2	% of Total
Equipment	79	99	24%
Services	172	208	52%
Resource Management	79	105	24%
Total	330	412	100%

Source: modified from European Union, 1999, The EU Eco-Industry's Export Potential: Final Report to DGXI of the European Commission

For regional information, the same report provides a forecast 2010. The highest growth for the environmental goods and services market between 1998 and 2010 is expected to be in Southeast Asia at 14%, followed by 12% for China and 10% for the Central European Economies (CEE). North America, Japan and the Australia/New Zealand markets are all estimated to experience low growth around 1%. This, once again, illustrates the great diversity of APEC economies. It should be noted that the low growth markets happen to be the major sources of environmental technologies. Thus, inter-regional trade of environmental goods and services will likely increase between 1998 and 2010 (See Table 4.2).

Table 4.2 Forecast of Global Environmental Markets to 2010

	1998 Market Size in billion Euro	2010 Market Size in billion Euro	Estimated Annual % Growth Rate
North America	132	149	1%
EU 15	104	118	1%
Japan	62	69	1%
China	4	17	12%
SE Asia	9	43	14%
CEE	4	12	10%
Australia/NZ	4	5	1%
Global	330	439	2%

Source: modified from European Union, 1999, The EU Eco-Industry's Export Potential: Final Report to DGXI of the European Commission

The International Trade Center of the UNCTAD/WTO (1997) has published a report of the environmental goods and services market. Using data from EBI (1996), the global market between 1994 and 1996 was estimated. The world's largest environmental market during this period was the United State, followed by Western Europe and Japan. These results suggest a very similar pattern in the EU report. This is an indication of the rigid market share of regional markets. Using these two reports, it is therefore possible to argue that the global environmental goods and services market has been rather stable, and will continue to be stable for the next ten years (see Table 4.3).

Table 4.3 Global Environmental Market, 1994 - 1996

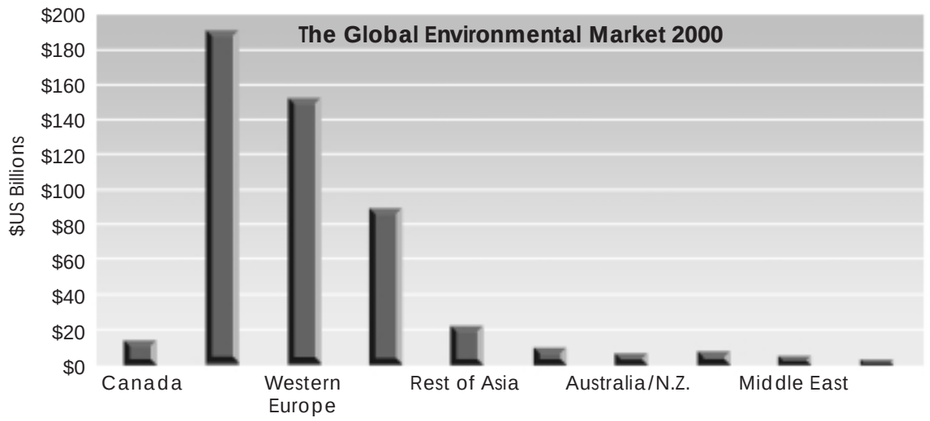
In billion US$	1994	1995	1996 Estimate
United States	166.4	171.7	179.0
Western Europe	127.4	129.9	137.8
Japan	66.5	66.4	70.4
Rest of Asia	14.2	16.3	19.4
Canada	10.8	11.1	11.9
CEE	6.4	6.7	7.5
Australia/NZ	6.2	6.5	6.8
Global	409.1	421.7	447.6

Source: EBI, 1996 quoted in ITC, 1997, Environmental Engineering and Support Services

From the two studies, APEC economies can be said to comprise the majority of the global environmental goods and services market. Progress within APEC will shape the future development of the global market. therefore one must not underestimate the significance of APEC as an important player in the global market.

Information contained in the response of Canada is worth sharing. Canada cited studies by EBI (1999) and concluded that in 1999, Canada accounted for an estimated 2.7 percent of global spending on environmental goods and services (Figure 2.1). Member countries of the OECD represented more than 85 percent of the world market. Developing countries, however, are becoming an increasingly important source of demand as their industrial sectors come under growing pressure to develop in a more sustainable fashion.

Figure 4.1 Global Market 2000



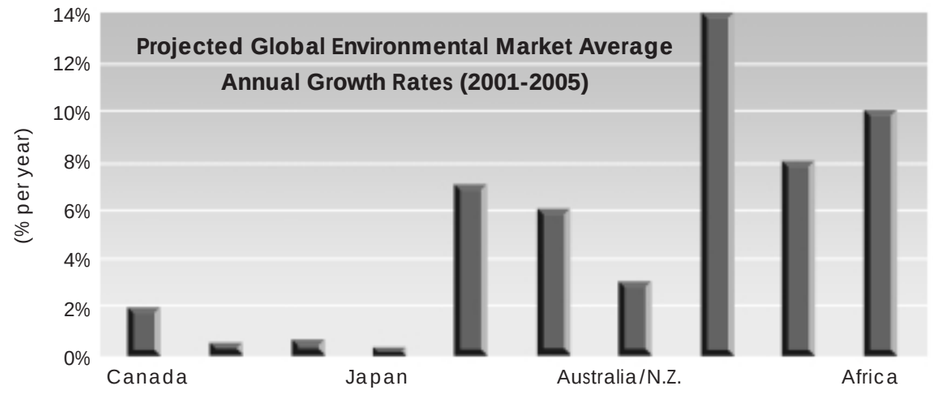
Source: Environmental Business International, Inc., 1999, cited by Canada in response to the questionnaire

The world market is forecast to grow at an average annual rate of 1.5 percent to the year 2005 by Environmental Business International. The Delphi Group (An Analysis of Markets for Canadian Environmental Technologies, a report prepared for the Environmental Affairs Branch of Industry Canada and Technology Partnerships Canada, Ottawa, March 1998) forecasts Canadian annual growth in environmental markets at approximately 3 percent over the same period.

Figure 2.2 shows that while markets in developed countries such as the United States, Western Europe and Japan are projected to grow at less than 1 percent per year, developing countries should see their markets expand at average rates ranging from 6 percent in Latin America to 14 percent in Eastern Europe over the same period.

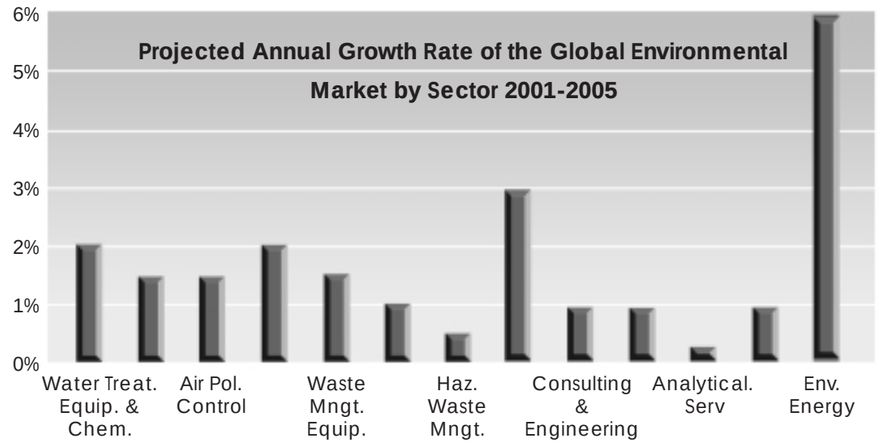
In terms of future growth and innovation, the environmental energy sector is expected to see much

Figure 4.2 Projected Growth of Global Market



Source: Environmental Business International, Inc., 1999, cited by Canada in response to the questionnaire

Figure 4.3 Projected Growth by Sector



Source: Environmental Business International, Inc., 1999, cited by Canada in response to the questionnaire

technological progress and to become one of the fastest growing environmental sectors worldwide.

Competition is on the rise in global environmental markets, with firms aggressively positioning themselves to export their products and services to developing nations. At the same time, however, developing countries are acquiring increasing domestic expertise in the provision of environmental goods and services. To succeed in many of these markets, foreign firms may need to take advantage of this expertise through joint ventures and partner ships with local firms.

The Canadian environmental industry is some ways away from achieving its goal of becoming a major

exporter. Exports accounted for only 7.8 percent of the industry's shipments in 1997. The relatively small size of Canada's domestic market means that increased penetration of global markets is important to sustain the strong growth of the industry. This in turn requires Canadian firms to build upon their competitive advantages and aggressively pursue export opportunities in niche markets.

The North American Free Trade Agreement (NAFTA) and the supplemental North American Agreement on Environmental Cooperation (NAAEC), which came into force in 1994, have nudged the Canadian industry to focus more on trade, investment and technology development opportunities south of their border. The purpose of the NAAEC, which created the Commission of Environmental Cooperation (Summary of Environmental Law in Canada), is to "enhance continental environmental cooperation in order to meet the challenges and take advantage of the opportunities created by the growing economic links between Canada, the United States and Mexico and by their shared reliance on a single ecosystem."

The United States is the largest and most accessible market for Canadian firms and is currently the destination for about 60 percent of the industry's exports. Canadian firms have mainly directed their attention to U.S. markets. Although it is highly competitive, the U.S. market is likely to remain important simply because of its sheer size. It appears that the best opportunities for Canadian firms will remain in niche segments and markets for specialized technologies. Partnering with U.S. firms would give Canadian firms access to state and local government contracts, which are not covered by the World Trade Organization procurement code or NAFTA.

At the same time, U.S. firms have become important competitors in Canada's domestic market. Imports represented 13 percent of the domestic environmental market in 1997, with 80 percent of this coming from the United States.

It is anticipated that Mexico will become an important export market as a result of NAFTA. The vast majority of environmental goods in Mexico are imported, with 70 percent of current imports coming from the United States. New regulatory requirements may lead to major infrastructure projects, such as the construction of wastewater treatment facilities and municipal solid waste disposal systems. The Mexican environmental market is expected to reach US$2.5 billion by 2000 ("Latin American Markets," Environmental Business Journal 11, October/November 1996, p. 3).

NAFTA eliminated tariffs on a number of types of environmental equipment, such as drying machinery, distillation equipment, centrifuges and instrumentation. By January 1998, Mexico and the United States were to have eliminated tariffs on various other equipment of specific interest to Canadian firms, most notably incinerators and filtering and purifying machinery for water, other liquids and gases. The Canadian environment industry should also benefit from provisions in NAFTA that encourage the three countries to effectively enforce their domestic environmental regulations.

4.2 Estimates of Individual Markets

In this section, market portfolios of responding economies will be presented. In addition to original figures reported by member economies, information collected from secondary sources, if available, will also be included. The goal is to deliver as much information as possible. As stated in the previous chapter, there has been no previous figure from APEC economies to provide a cross-economy comparison. This section will serve as the cross-reference. As has been clarified earlier, the difference among figures from different sources does not imply any assessment of accuracy. Estimates are conducted within different time frames for various purposes and may have different scopes.

■ Australia

The Australian response is described in Table 4.4. The latest statistics available for Australia is 1997 but an update is underway and may be completed in the near future using OECD definitions of environmental goods and services.

Figures in Table 4.4 indicate that wastewater treatment and waste management constitute the majority of Australia's Environmental market.

Table 4.4 Australian Response

			(A) Market value of goods and services produced by business (millions in AUD)
			1997
Environmental Equipment and Materials			5,255
	Air pollution control		11
	Wastewater treatment (excluding water treatment)		2,969
	Waste management	Solid waste collection, treatment and disposal	Total Waste Management 2,222
		Hazardous waste collection, treatment and disposal	
		Waste Recycling and recovery	
	Remediation and clean up of soil and groundwater		24
	Noise and vibration abatement		29
Biodiversity and Landscape			143

■ Canada

Canada provided the most detailed report among the responding APEC members. The Canadian system is rather comprehensive.

Table 4.5 Canadian Responses
Box 2 Profile of the Environmental Industry

	(A) Market value of goods and services produced by business (millions in U.S. dollar)				(B) Market value of imports (millions in U.S. dollar)			(C) Market value of exports[1] (millions in U.S. dollar)		
Overall Environmental Industry	**1996**	**1997**	**1998**		**1996**	**1997**	**1998**	**1996**	**1997**	**1998**
Environmental Equipment and Materials	8039.4	8263.2	9763.0		1563.7	2094.5	n/a	560.9	646.8	848.4
Air pollution control	378.9	375.3	n/a		383.3	472.5	n/a	149.1	149.3	n/a
Wastewater treatment (excluding water treatment)[2]	494.6	533.2	n/a		368.1	569.2	n/a	113.2	132.6	n/a
Waste management	191.8	187.1	n/a		498.5	380.0	n/a	63.1	64.4	n/a
Solid waste collection, treatment and disposal	included in waste mgmt	included in waste mgmt	n/a		included in waste mgmt	included in waste mgmt	n/a	included in waste mgmt	included in waste mgmt	n/a
Hazardous waste collection, treatment and disposal	included in waste mgmt	included in waste mgmt	n/a		included in waste mgmt	included in waste mgmt	n/a	included in waste mgmt	included in waste mgmt	n/a
Waste Recycling and recovery	included in waste mgmt	included in waste mgmt	n/a		included in waste mgmt	included in waste mgmt	n/a	included in waste mgmt	included in waste mgmt	n/a
Remediation and clean up of soil and groundwater	included in waste mgmt	included in waste mgmt	n/a		included in waste mgmt	included in waste mgmt	n/a	included in waste mgmt	included in waste mgmt	n/a
Noise and vibration abatement included in other env goods	included in other env goods	included in other env goods	n/a		included in other env goods	included in other env goods	n/a	included in other env goods	included in other env goods	n/a
Environmental monitoring, analysis and assessment	114.3	122.1	n/a		118.0	180.0	n/a	30.1	30.7	n/a
Renewable energy and alternative fuel systems	99.3	100.2	n/a		n/a	n/a	n/a	19.5	23.0	n/a
Other environmental goods	2395.3	2479.8	n/a		n/a	n/a	n/a			n/a
SUB-TOTAL	3674.2	3797.6	3916.0		1367.9	1601.8	n/a	374.9	400.0	n/a
Environmental Services (including operation)										
Air pollution control	42.8	47.5	n/a		n/a	n/a	n/a	...	...	n/a
Wastewater treatment (excluding water treatment)[2]	148.3	120.2	n/a		42.0	63.2	n/a	30.2	18.8	n/a
Waste management	2082.0	2103.5	n/a		52.9	106.3	n/a	10.1	19.4	n/a
Solid waste collection, treatment and disposal	included in waste mgmt	included in waste mgmt	n/a		included in waste mgmt	included in waste mgmt	n/a	included in waste mgmt	included in waste mgmt	n/a
Hazardous waste collection, treatment and disposal	included in waste mgmt	included in waste mgmt	n/a		included in waste mgmt	included in waste mgmt	n/a	included in waste mgmt	included in waste mgmt	n/a

(Table 4.5 continued)

Waste Recycling and recovery	included in waste mgmt	included in waste mgmt	n/a		included in waste mgmt	included in waste mgmt	n/a	included in waste mgmt	included in waste mgmt	n/a
Remediation and clean up of soil and groundwater	included in waste mgmt	included in waste mgmt	n/a		included in waste mgmt	included in waste mgmt	n/a	included in waste mgmt	included in waste mgmt	n/a
Noise and vibration abatement	included in air pollution ctrl serv	included in air pollution ctrl serv	n/a		included in air pollution ctrl serv	included in air pollution ctrl serv	n/a	included in air pollution ctrl serv	included in air pollution ctrl serv	n/a
Environmental monitoring, analysis and assessment	110.5	110.4	n/a		3.0	4.5	n/a	24.9	25.3	n/a
Environmental R&D	included in other env services	included in other env services	n/a		n/a	n/a	n/a	...	...	n/a
Education, training, and information	included in other env services	included in other env services	n/a		n/a	n/a	n/a	...	...	n/a
Environmental consulting & engineering	592.0	709.7	n/a		97.8	318.7	n/a	28.1	52.1	n/a
Other environmental services	242.2	279.1	n/a		n/a	n/a	n/a	92.7	131.0	n/a
SUB-TOTAL	3217.8	3370.5	4314.8		195.7	492.8	n/a	186.0	246.7	n/a
Construction and Installation										
Air pollution control	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Wastewater treatment (excluding water treatment)[2]	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Waste management	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Solid waste collection, treatment and disposal	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Hazardous waste collection, treatment and disposal	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Waste recycling and recovery	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Remediation and clean up of soil and groundwater	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Noise and vibration abatement	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Environmental monitoring, analysis and assessment	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Other environment-related construction services	1147.6	1095.1	n/a		n/a	n/a	n/a	n/a	n/a	n/a
SUB-TOTAL	1147.6	1095.1	1532.2		n/a	n/a	n/a	n/a	n/a	n/a

Notes: **Figures may not add up to total due to rounding**
n/a = data are not available
Detailed data for 1998 will be available in Fall 2000.
1. Market value of exports for "other environmental services" include both environmental goods and environmental services.
2. Estimates for wastewater treatment INCLUDE water treatment.

Box 4 Expenditure by Sector (millions in U.S. dollar)

Sector		1996	1997	1998
Public sector	All levels	3959.3	n/a	n/a
	Federal	687.7	819.4	792.3
	Provincial/Territorial	674.7	n/a	n/a
	Local	2765.2	2860.4	2669.7
Private sector	Total	3576.6	3418.8	n/a
	Operating	2178.2	2159.0	n/a
	Capital	1398.5	1259.8	n/a
Household sector		n/a	n/a	n/a

Total and environmental revenues, by industry, 1996 (millions in Canadian dollars)

Establishment size	Establishments	Employment	Total Revenues	Environmental goods	Environmental services	Environment related Construction	Total Environmental revenues	Exchange rate
0 - 4	2983	4473	1014.1	546.6	x	x	805.2	0.73
5 - 9	814	5423	662.5	282.0	267.7	5.4	555.1	
10 - 24	992	15411	2633.4	1226.6	601.7	65.1	1893.4	
25 - 49	442	15731	2256.9	942.8	562.2	112.9	1618.0	
50 - 99	289	20398	2905.9	787.8	794.8	173.9	1756.6	
100 - 499	190	41581	6445.1	893.5	1422.2	982.6	3298.2	
500 - 999	22	16039	1741.1	x	207.5	x	432.1	
> 999	10	19612	3532.8	x	x	-	654.3	
Canada	5742	138668	21191.7	5033.1	4407.8	1572.0	11012.9	

Total and environmental revenues, by industry, 1997 (millions in Canadian dollars)

Establishment size	Establishments	Employment	Total Revenues	Environmental goods	Environmental services	Environment related Construction	Total Environmental revenues	Exchange rate
0 - 4	3065	4593	1038.2	568.6	x	x	830.2	0.72
5 - 9	848	5671	781.0	309.6	277.7	12.0	599.3	
10 - 24	1029	15955	2608.8	1213.1	613.8	54.6	1881.5	
25 - 49	458	16201	2460.3	1028.0	524.1	125.1	1677.2	
50 - 99	305	21851	2986.5	895.5	837.5	198.2	1931.3	
100 - 499	203	46313	6517.0	908.4	1509.7	908.8	3327.0	
500 - 999	25	18336	1737.3	x	275.3	x	492.2	
> 999	17	31012	4255.2	x	x	-	738.0	
Canada	5950	159932	22384.2	5274.5	4681.1	1521.0	11476.6	

Total and environmental revenues, by industry, 1998 (millions in Canadian dollars)

Establishment size	Establishments	Employment	Total Revenues	Environmental goods	Environmental services	Environment related Construction	Total Environmental revenues	Exchange rate
0-4	3270	4726	883.5	x	229.1	x	810.2	0.68
5-9	897	5996	821.4	324.7	329.8	10.5	664.9	
10-24	1055	16256	2496.7	1019.1	772.8	59.7	1851.7	
25-49	494	17091	2718.8	888.6	709.8	83.6	1682.0	
50-99	322	23151	3068.0	845.1	816.5	169.7	1831.3	
100-499	219	49044	8066.6	1700.2	1981.1	801.9	4483.2	
500-999	26	25050	3773.4	431.6	424.1	1019.5	1875.2	
>999	11	23027	2861.1	x	1053.9	x	1079.8	
Canada	6294	164341	24689.4	5708.2	6317.0	2253.1	14278.3	

Total and environmental revenues, by industry, 1996 (millions in U.S. dollars)

Establishment size	Establishments	Employment	Total Revenues	Environmental goods	Environmental services	Environment related Construction	Total Environmental revenues
0 - 4	2983	4473	740.3	399.0	x	x	587.8
5 - 9	814	5423	483.6	205.8	195.4	3.9	405.2
10 - 24	992	15411	1922.4	895.4	439.2	47.5	1382.2
25 - 49	442	15731	1647.5	688.3	410.4	82.4	1181.1
50 - 99	289	20398	2121.3	575.1	580.2	127.0	1282.3
100 - 499	190	41581	4704.9	652.3	1038.2	717.3	2407.7
500 - 999	22	16039	1271.0	x	151.4	x	315.5
> 999	10	19612	2578.9	x	x	-	477.6
Canada	5742	138668	15469.9	3674.2	3217.7	1147.6	8039.4

Total and environmental revenues, by industry, 1997 (millions in U.S. dollars)

Establish-ment size	Establish-ments	Employ-ment	Total Revenues	Environ-mental goods	Environ-mental services	Environment related Construction	Total Environmental revenues
0 - 4	3065	4593	747.5	409.4	x	x	597.7
5 - 9	848	5671	562.3	222.9	199.9	8.7	431.5
10 - 24	1029	15955	1878.3	873.5	441.9	39.3	1354.7
25 - 49	458	16201	1771.4	740.2	377.3	90.1	1207.5
50 - 99	305	21851	2150.3	644.8	603.0	142.7	1390.5
100 - 499	203	46313	4692.3	654.1	1087.0	654.3	2395.4
500 - 999	25	18336	1250.9	x	198.2	x	354.4
> 999	17	31012	3063.7	x	x	-	531.4
Canada	5950	159932	16116.6	3797.6	3370.4	1095.1	8263.2

Total and environmental revenues, by industry, 1998 (millions in U.S. dollars)

Establish-ment size	Establish-ments	Employ-ment	Total Revenues	Environ-mental goods	Environ-mental services	Environment related Construction	Total Environmental revenues
0-4	3270	4726	600.7	x	155.8	x	551.0
5-9	897	5996	558.6	220.8	224.2	7.1	452.2
10-24	1055	16256	1697.8	693.0	525.5	40.6	1259.1
25-49	494	17091	1848.8	604.3	482.7	56.8	1143.8
50-99	322	23151	2086.2	574.7	555.2	115.4	1245.3
100-499	219	49044	5485.3	1156.2	1347.2	545.3	3048.6
500-999	26	25050	2565.9	293.5	288.4	693.2	1275.1
>999	11	23027	1945.5	x	716.6	x	734.2
Canada	6294	164341	16788.8	3881.6	4295.6	1532.1	9709.2

■ China

Table 4.6 Responses from China-I

Table 4.6 Shows that environmental equipment and materials is the largest portion of china's enviromental market followed by air pollution control.

		(A) Market value of goods and services produced by business	
Overall Environmental Industry		**1997**	**1998**
		23.5billion RMB	39.56billion RMB
Environmental Equipment and Materials		18.21 billion RMB	n/a
Air pollution control		7.61 billion RMB	n/a
Wastewater treatment (excluding water treatment)		7.94 billion RMB	n/a
Waste management	Solid waste collection, treatment and disposal	0.97 billion RMB	n/a
	Hazardous waste collection, treatment and disposal	n/a	n/a
	Waste Recycling and recovery	n/a	n/a
Remediation and clean up of soil and groundwater		1.23 billion RMB	n/a
Noise and vibration abatement		0.46 billion RMB	n/a
Environmental monitoring, analysis and assessment		n/a	n/a

It is to be noticed that China has a different statistical system and they provided their results as in table 2.7.

Table 2.7 Responses from China - II

According to China's classification, environmental goods and management of "three wastes" are the largest two sectors of the market.

	(A) Market value of goods and services produced by business
Additional groups (Please fill in below)	**1997**
The whole environmental industry	45.92 billion RMB
Environmental goods	18.21 billion RMB
Environmental technical services	5.78 billion RMB
Comprehensive utilization of "three wastes"	18.14 billion RMB
Natural ecological protection	1.63 billion RMB
Products with lower environmental pollution	2.16 billion RMB

■ Hong Kong, China

The figures provided in the study by Hong Kong, China, are based on government expenditures only, and donot includ expenditures by quasi-government organzations and institutions, non the private sector. It is clear from Table 2.8 that two major sectors of Hong Kong, China's environmental markets are waste water treatment and air pollution control.

Table 4.8 Hong Kong, China Responses

			(A) Market value of goods and services produced by business (millions in U.S. dollar)			(B) Market value of imports (millions in U.S. dollars)		
			1997	1998	1999	1997	1998	1999
Overall Environmental Industry			772.35	633.55	647.85	6.35	10.17	1.92
Environmental Equipment and Materials			n/a	n/a	n/a	n/a	n/a	n/a
	Air pollution control		0.04	0.04	0.05	n/a	n/a	n/a
	Wastewater treatment (excluding water treatment)		0.04	0.04	0.05	n/a	n/a	n/a
	Wastemanagement	Solid waste collection, treatment and disposal	0.42	0.99	1.13	1.95	8.37	0.62
		Hazardous waste collection, treatment and disposal	0.02	0.02	0.003	0.003	0.003	0.006
		Waste Recycling and recovery	n/a	n/a	n/a	n/a	n/a	n/a
	Remediation and clean up of soil and groundwater		n/a	n/a	1.93	n/a	n/a	n/a
	Noise and vibration abatement		0.04	0.04	0.05	n/a	n/a	n/a
	Environmental monitoring, analysis and assessment		0.52	0.56	0.50	1.39	1.78	1.26
Environmental Services (including operation)								
	Air pollution control		113.03	118.03	136.03	n/a	n/a	n/a
	Wastewater treatment (excluding water treatment)		15.65	9.09	31.60	n/a	n/a	n/a
	Waste management	Solid waste collection, treatment and disposal	83.43	98.63	103.23	n/a	n/a	n/a
		Hazardous waste collection, treatment and disposal	65.92	67.92	58.01	n/a	n/a	n/a
		Waste Recycling and recovery	n/a	n/a	1.77	n/a	n/a	n/a
	Remediation and clean up of soil and groundwater		0.03	0.03	0.03	n/a	n/a	n/a
	Noise and vibration abatement		3.41	8.38	8.24	n/a	n/a	n/a
	Environmental monitoring, analysis and assessment		1.68	3.69	2.38	n/a	n/a	n/a
	Environmental R&D		0.2	0.2	0.44	n/a	n/a	n/a
	Education, training, and information		n/a	n/a	n/a	n/a	n/a	n/a
Construction and Installation								
	Air pollution control							
	Wastewater treatment (excluding water treatment)		453.9	316.9	292.1	n/a	n/a	n/a
	Waste management	Solid waste collection, treatment and disposal	32.94	4.58	3.33	n/a	n/a	n/a
		Hazardous waste collection, treatment and disposal	n/a	n/a	n/a	n/a	n/a	n/a
		Waste recycling and recovery	n/a	n/a	n/a	n/a	n/a	n/a
	Remediation and clean up of soil and groundwater		n/a	n/a	0.64	n/a	n/a	n/a
	Noise and vibration abatement		n/a	n/a	n/a	n/a	n/a	n/a
	Environmental monitoring, analysis and assessment		0.10	0.39	0.11	n/a	n/a	n/a
Sewage Projects			n/a	1.77	4.98	n/a	n/a	n/a
Enforcement database system			0.02	0.005	0.105	n/a	n/a	n/a
Environmental Consulting - solid waste management			0.2	1.7	0.4	n/a	n/a	n/a
Waste management planning			0.7	0.1	0.4	n/a	n/a	n/a

■ Japan

Japan's over all Enviromental industry amounts to US$ 132.793 billion in 1997. Among the three sectors of the questionnaire, environmental services make the largest part. Another big sector of the Japanese market is resource management, which is not included in the definition of environmental industry used in this survey.

Table 4.9 Japanese Responses

			(A) Market value of goods and services produced by business (millions in U.S. dollar)		
			1997	1998	1999
Overall Environmental Industry			132,793	n/a	n/a
Environmental Equipment and Materials			12,594	n/a	n/a
	Air pollution control		2,852	n/a	n/a
	Wastewater treatment (excluding water treatment)		9,183	n/a	n/a
	Waste management	Solid waste collection, treatment and disposal	32	n/a	n/a
		Hazardous waste collection, treatment and disposal	51	n/a	n/a
		Waste Recycling and recovery	0	n/a	n/a
	Remediation and clean up of soil and groundwater		14	n/a	n/a
	Noise and vibration abatement		133	n/a	n/a
	Environmental monitoring, analysis and assessment		329	n/a	n/a
Environmental Services (including operation)			80,417	n/a	n/a
	Air pollution control		-	n/a	n/a
	Wastewater treatment (excluding water treatment)		8,943	n/a	n/a
	Waste management	Solid waste collection, treatment and disposal	39,478	n/a	n/a
		Hazardous waste collection, treatment and disposal	2,743	n/a	n/a
		Waste Recycling and recovery	26,849	n/a	n/a
	Remediation and clean up of soil and groundwater		333	n/a	n/a
	Noise and vibration abatement		-	n/a	n/a
	Environmental monitoring, analysis and assessment		2,053	n/a	n/a
	Environmental R&D		-	n/a	n/a
	Education, training, and information		18	n/a	n/a
Construction and Installation			39,782	n/a	n/a
	Air pollution control		-	n/a	n/a
	Wastewater treatment (excluding water treatment)		31,721	n/a	n/a
	Waste management	Solid waste collection, treatment and disposal	-	n/a	n/a
		Hazardous waste collection, treatment and disposal	6,725	n/a	n/a
		Waste recycling and recovery	-	n/a	n/a
	Remediation and clean up of soil and groundwater		-	n/a	n/a
	Noise and vibration abatement		1,336	n/a	n/a
	Environmental monitoring, analysis and assessment		-	n/a	n/a
Additional groups (Please fill in below)			n/a	n/a	n/a
Cleaner Technologies and Products			2,108	n/a	n/a
Cleaner/Resource-efficient Technologies and Processes			0	n/a	n/a
Cleaner/Resource-efficient Products			2,108	n/a	n/a
Resource Management			96,291	n/a	n/a
Indoor air Pollution Control			0	n/a	n/a
Water Supply			269	n/a	n/a
Recycled Materials			35,001	n/a	n/a
Renewable Energy Plant			1,579	n/a	n/a
Heat/Energy Saving and Management			7,065	n/a	n/a
Sustainable Agriculture and Fisheries			-	n/a	n/a
Sustainable Forestry			-	n/a	n/a
Natural Risk			n/a	n/a	n/a
Management			-	n/a	n/a
Eco-tourism			-	n/a	n/a
Others			52,375	n/a	n/a

■ Chinese Taipei

Chinese Taipei provided results of a year 2000 survey. The findings can be summarized as in table 4.10: Table 4.10 indicates that chinese Taipei's overall environmental industry is dominated by equipment and marterials market.

Table 4.10 Chinese Taipei Response

		(A) Market value of goods and services produced by business (thousands in N.T. dollar)
		1999
Overall Environmental Industry		100,757,549
Environmental Equipment and Materials		9,576,377
Air pollution control		3,747,887
Wastewater treatment (excluding water treatment)		4,183,609
Waste manage-ment	Solid waste collection, treatment and disposal	0
	Hazardous waste collection, treatment and disposal	0
	Waste Recycling and recovery	0
Remediation and clean up of soil and groundwater		0
Noise and vibration abatement		211,765
Environmental monitoring, analysis and assessment		0
Other		776,645
Environmental Services (including operation)		40,821,552
Air pollution control		3,310,062
Wastewater treatment (excluding water treatment)		3,507,807
Waste manage-ment	Solid waste collection, treatment and disposal	8,405,277
	Hazardous waste collection, treatment and disposal	1,300,412
	Waste Recycling and recovery	3,033,253
Remediation and clean up of soil and groundwater		1,123,590
Noise and vibration abatement		1,688,867
Environmental monitoring, analysis and assessment		3,061,084
Environmental R&D		2,112,285
Education, training, and information		2,945,262
Other		7,658,264
Construction and Installation		50,359,621
Air pollution control		4,229,584
Wastewater treatment (excluding water treatment)		13,460,840
Waste manage-ment	Solid waste collection, treatment and disposal	1,106,101
	Hazardous waste collection, treatment and disposal	0
	Waste recycling and recovery	421,010
Remediation and clean up of soil and groundwater		0
Noise and vibration abatement		1,479,735
Environmental monitoring, analysis and assessment		521,301

Chapter Five
Conclusion

This chapter summarizes the results of the project. Information from the completed questionnaires and secondary sources are shown to provide a more complete picture of the environmental goods and services' markets. Finally, recommendations are given for increasing each APEC economies' understanding of their environmental protection markets.

5.1 Summary of Findings

This study employed a questionnaire survey to APEC senior environmental officials (SEOs). Each economy was required to responsd with one questionnaire. By approaching the issue from a governmental perspective, our study distinguished itself from other existing research that estimated the environmental industry scales all prion estimates of environmental industry sizes were done by survey lng the private sector. Ten economies responded to our questionnaire, providing information on market size, goverment policy and institutional arrangements. The economies that responded were: Australia; Canada; China; Hong Kong, China; Japan; Korea; Peru; Singapore; Chinese Taipei and Thailand.

In terms of environmental market size, a great variation was found to exist among APEC member economies. Information provided by economies that responded and from secondary sources is summarized in Table 5.1.

Table 5.1 Environmental Market Scales of Selected APEC Economies

Economy	Market Size (Million USD)	Note
Australia	2,840	estimate of 1997, from this survey
Canada	9,763	estimate of 1998, from this survey
China	5,000	estimate of 1998, from this survey
Hong Kong, China	647.85	estimate of 1999, from this survey
Indonesia	860	secondary data, EBI (1998)
Japan	132,793	estimate of 1997, from this survey
Korea	4,840	secondary data, EBI (1998)
Malaysia	580	secondary data, EBI (1998)
Mexico	75	secondary data, EBI (1998)
New Zealand	900	secondary data, EBI (1998)
Philippines	350	secondary data, EBI (1998)
Singapore	870	secondary data, EBI (1998)
Chinese Taipei	3,125	estimate of 1999, from this survey
Thailand	1,120	Secondary data, EBI (1998)
U.S.A.	171,800	Secondary data, EBI (1998)
Vietnam	3.4	Secondary data, EBI (1998)

Source: Compiled by this study

Users of information from Table 5.1 should be cautious when comparing markets size information from the two different sources. Such comparisons may not be valid the definition of environmental industry employed by this survey differs from that used by the secondary source. Therefore, any comparison of numbers from the two sources may be misleading.

In terms of market profile, Australia's US$ 2.8 billion environmental services sector is very concentrated on wastewater management and waste management. The two sectors' share of the market is, 56.5% and 42.3% respectively.

Canada has two equally large sectors: equipment and services. However, the services sector outgrew the equipment sector in 1998. Overall market size of the Canadian environmental industry reache almost US$ 10 billion.

China is an emerging market for the environmental industry. Its market size reached around US$ 5 billion in 1998, and its equipment and material sector accounts for almost 50%. Noticed that China uses a different system for categorizing its environmental industry. Without further information, this study is unable to draw any conclusion on the details of China's system.

Hong Kong, China provided estimates of market sizes between 1997 and 1999. The information shows that Hong Kong's environmental industry fluctuated during the period, possibly reflecting variations in government capital expenditure programs.

According to Japan's responses, Japan has the largest environmental industry in Asia. In terms of market structure, Japan's has a very large environmental service sector accounting for 60% of the industry, followed by construction and installation at 30%. Some may notice that Japan's estimate of market scale in this study is significantly larger than those of other studies. This is because Japan's MITI uses a very different estimate for the Japanese environmental industry.

Chinese Taipei provided its 1999 estimate of the environmental industry. The market size is reported to be around US$3.1 billion. Construction and installation makes up about 50% of the market, followed by services at 40%. This is a very similar market structure to Japan. Chinese Taipei also provided additional information on its forecast for market potential for the next six years. Chinese Taipei's environmental industry is expected to remain stable for the next six year with its equipment and material sector growing faster than the two other sectors.

As mentioned earlier, differences in definition make comparing information from different sources very difficult. This is perhaps one of the major challenges faced by all researchers of this subject. Therefore, it is important for APEC member economies to reach a consensus on the definition and categorization of the environmental industry. Without consistent definitions and categorizations, further studies will not be able to produce useful results for all member economies. This is, of course, a task that requires cooperation, and APEC must take this responsibility.

Another important finding of this study is there is a 3-5 year lag in the overall environmental industry among APEC member economies. However, the environmental industry is evolving very fast. The need for a more timely response to the market situation is clear.

This study also found that government policies have a strong influence on the environmental industry. To be more specific, except for a few export-oriented economies, government policies actually shape the development of the environmental industry of individual economies. New environmental standards and regulations are clearly the driving forces of growth in the environmental industry.

5.2 Recommendations

First of all, this study suggests that a consistent definition and categorization of the environmental industry is of vital importance for a better understanding of the markets of the Asia Pacific region. Without a consistent definition and categorization, consolidating information for future use by member economies is impossible.

Therefore, APEC can assume this responsibility and organize activities to achieve a consensus among all member economies. Taking into account the great diversity of APEC member economies, this study recommends that a "module" approach be taken in defining the environmental industry. A more practical way to begin is to define a "core" that is agreed upon by all APEC members and to use this "core" as the common denominator for all APEC economies. Other extended modules can be added, as economies feel necessary. These extended modules can be developed through proper fora and recognized by member economies through various APEC mechanisms. As more modules are added, a more comprehensive system of definition and categorization of the environmental industry can be established.

Another recommendation by this study is the importance of continuous and regular investigation of the APEC environmental industry. As stated earlier, the environmental industry market is evolving very fast. Without continuous monitoring, it will be difficult for member economies to coordinate with each other in term of industrial and trade policies. EVSL is an initial attempt but does not complete the task. APEC must continue to work on establishing a mechanism that can provide timely and accurate information to member economies.

References

1. ACF/ACTU. 1994. Green Jobs in Industry - Research Report, Australian Conservation Foundation, Australian Council of Trade Unions and the Commonwealth Department of Employment, Education and Training, Melbourne.

2. APEC CTI Chair. 1997. APEC Committee Trade and Investment (CTI): Chair's Report to SOM II.

3. APEC, Economic Committee. 1997. "The Impact of Trade Liberalization in APEC". Published by the APEC Secretariat.

4. APEC Energy Ministerial Meeting. 1997. "Second Meeting of APEC Energy Ministers: Infrastructure for Sustainable Development." Edmonton, Canada, August 26-27 (http://www.nautilus.org/aprenet/library/apec/energy_1997.html).

5. APEC SOM Chair Office. 1997a. "Implementation of APEC's Economic and Technical Cooperation Agenda: A Discussion Paper." Paper prepared for the SOM III, St. John's, August 20-31.

6. APEC SOM Chair Office. 1997b. "SOM Chair's Report to Ministers on EVSL." Paper prepared for the Informal SOM, Vancouver, November 19-20.

7. APEC SOM Chair Office. 1999. APEC SOM Meeting Conclusions, Wellington, Feburary 15.

8. APEC SOM Chair Office. 1999. "APEC Accelerated Tariff Liberalisation" (ATL) Initiative, An Informaiton Paper Prepared by the Delegation of New Zealand as APEC Chair, Wellington, Feburary 15.

9. Australian Industry Commission.1993. "Environmental Waste Management Equipment, System and Service," Draft Report.

10. Blackhurst, Richard, Nicolas Marian, and Jan Tumlir. 1977. "Trade Liberalization, Protectionism and Interdependence". Geneva: GATT Studies in International Trade, No. 5.

11. Brown, Drusilla K., Alan V. Deardorff, Alan K. Fox and Robert M. Stern. 1995a.

"Computational Analysis of Goods and Services Liberalization in the Uruguay Round. "Paper for the Conference on The Uruguay Round and Developing Countries, The World Bank, Washington, D.C., January 26-27. Appeared in Will Martin and Alan Winters, eds., The Uruguay Round and Developing Economies (Cambridge U. P., 1996).

12. Brown, Drusilla K., Alan V. Deardorff and Robert M. Stern. 1995b. "Modelling Multilateral Trade Liberalization in Services." Paper prepared for the Third International Conference on the Asia-Pacific Economy, "International Trade in Services," Brisbane, Australia, July 12-13.

13. Bryman, A. 1992. "Quality and Quantity in Social Research." London and New York: Routledge.

14. Canada. Department of Foreign Affairs and International Trade. Tariffs and Market Access Division (EAT). APEC EVSL Interdepartmental Task Force (1998). "Invitation to Submit Views on Possible Reductions or Elimination of Tariffs under the Asia Pacific Economic Cooperation Early Voluntary Sectoral Liberalization Initiative." http://www.dfait-maeci.gc.ca/.

15. Chinese Taipei APEC Study Center. 1998. "Strengthening the SOM ECOTECH Subcommittee: A Draft Discussion Paper (2)," April (http://www.tier.org.tw/apecc/hotnews/Discussion_Papers/ctasc005.pdf)

16. Environmental Business International, Inc. 1998. Asia Country Briefings

17. European Commission. 1994. "Eco-industries in the EC," in Panorama of EU Industry 94, Brussels.

18. ECOTEC. 1994. The U.K Environmental Industry: Succeeding in the Changing Global Market, Department of Trade and Industry, and Department of the Environment, HMSO, London.

19. Flamm, Kenneth and Edward Lincoln. 1997. "Time to Reinvent APEC." Brookings Policy Brief No. 26, November 1997 (http://www.brook.edu/ES/POLICY/Polbrf26.htm).

20. Garnaut, Ross, ed. 1997. "Open Regionalism and Trade Liberalization: An Asia-Pacific Contribution to the World Trade System." St. Leonards, NSW: Allen & Unwin.

21. Gilpin, Robert. 1987. "The Political Economy of International Relations." Princeton, New Jersey: Princeton University Press.

22. Hoekman, Bernard M. 1994. "Conceptual and Political Economy Issues in Liberalizing International Transactions in Services." In Alan V. Deardorff and Robert M. Stern, eds., Analytical and Negotiating Issues in the Global Trading System (Ann Arbor, MI: University of Michigan Press), 501-38. With comment by James R. Melvin.

23. Hoekman, Bernard M.and Pierre Sauve. 1994. "Liberalizing Trade in Services." World Bank Discussion Papers No. 243 (The Office of the Publisher).

24. International Trade Center UNCTAD/WTO. 1997. Environmental Engineering and Support Services: a hand book for exports from developing countries.

25. Jacquemin, Alexis and Andre Sapir. 1991. "Europe Post-1992: Internal and External Liberalization." American Economic Review, 81(2), May, 166-70.

26. James, William E. 1997. "APEC and Preferential Rules of Origin: Stumbling Blocks for Liberalization of Trade?" Journal of World Trade, 31(3), June, 113-34.

27. Kerlinger, Fred N., "Foundations of Behavioral Research," Holt, Rinehart and Winston, Inc., United States of America, 1986

28. McKibbin, Warwick J. 1996. "Quantifying APEC Trade Liberalization: A Dynamic Analysis." http://coombs.anu.edu.au/~ecopac/wpaper/ wp1996/961.prn.

29. MITI. 1994. "Environment Industry Policy in Japan," mimeo, Tokyo, September.

30. Morrow, James D. 1994. "Game Theory for Political Scientists." Princeton, New Jersey: Princeton University Press.

31. OECD. 1996., The Global Environmental Goods and Services Industry, Paris.

32. OECD. 1996. Interim Definition and Classification of the Environment Industry, Paris.

33. OECD. 1992. The OECD Environment Industry: Situation, Prospects and Government Policy, Paris.

34. Olson, Mancur. 1971. "The Logic of Collective Action: Public Goods and the Theory of Groups." Cambridge: Harvard University Press.

35. Oye, Kenneth A. ed. 1986. "Cooperation Under Anarchy". Princeton, New Jersey: Princeton University Press.

36. PECC. 1998. "Information Resource Study on APEC Early Sector Liberalization: PECC Progress Report." Paper presented to the Meeting of the APEC Committee of Trade and Investment Market access Group, June 15-18, Kuching, Malaysia.

37. Phillip, Evans and James Walsh. 1995. "The EIU Guide to World Trade under the WTO." The Economist Intelligence Unit Research Report.

38. U.S. Industry Spokepersons. 1998. "Discussion Paper prepared by the U.S. industry spokepersons from each of the fifteen sectors earmarked for EVSL." Mimeo.

39. Wonnacott, Paul. 1995. "Merchandise Trade in the APEC Region: Is There Scope for Liberalization on an MFN Basis?" The World Economy, Global Trade Policy, 33-51.

40. WTO. Various Trade Policy Reviews.