Development of Environmental management Sysytem for SMEs

2001.2
Contents

I. Introduction ............................................................................................................... 1

II. Korean Industrial Environmental Laws and Regulations ............................ 4
   1. Industrial Environmental Protection Policies .................................................... 4
      1.1 Command and Control .................................................................................. 4
      1.2 Economic Incentives ..................................................................................... 8
      1.3 Commentary ................................................................................................. 13
   2. Industrial Environment Management Incentives ............................................ 14
      2.1 Incentives Given for Investing in Environment Facilities .............................. 14
      2.2 Environmental Technology Support ............................................................ 16
      2.3 Limitations ................................................................................................. 18

III. Environmental Management Precedents in Korea ..................................... 19
   1. Voluntary Environmental Management ............................................................ 19
      1.1 Government Driven Environmental Programs ............................................. 19
      1.2 Regional Government Driven Environmental Programs ......................... 24
      1.3 Regional Environmental Agreement ............................................................. 24
      1.4 Industry Lead Private Sector Initiatives ....................................................... 25
      1.5 Regional Private Sector Initiatives ................................................................. 28
      1.6 Supply Chain Environmental Management ................................................ 28
      1.7 Voluntary Environmental Management Related to Energy ....................... 29
   2. The Limitations of Voluntary Environmental Management Systems .......... 31
      <Appendix> Supply Chain Management of Large Firms ................................. 32

IV. SMEs in Korea and Environmental Management ...................................... 35
   1. Definition and Status of the SMEs ................................................................. 35
      1.1 Definition .................................................................................................... 35
      1.2 Importance of SMEs .................................................................................... 36
      1.3 Status Change of SMEs .............................................................................. 37
2. Environmental Management System .............................................................. 109
   2.1 Definition of Environmental Management System .............................. 109
   2.2 The Reason to Implement an Environmental Management System .... 110
   2.3 Conceptual Framework for Small and Medium Sized Enterprises Voluntary Environmental Management System (SME-VEMS) .................. 112
   2.4 EMS Adoption of SMEs .................................................................. 115

VII. Environmental Management of Korean SMEs: Survey ....................... 121
   1. Environmental Management in General ............................................. 121
   2. Organizational Commitment to Environmental Management .......... 123
   3. Environmental Department ............................................................... 126
   4. Environmental Management ............................................................... 128
   5. Environmental Subsidies and Assistance Programs ......................... 135
   6. Quality Management and the Environment ......................................... 137

VIII. Best Practices: Case Studies ............................................................... 139
   1. Changwoon Co. (Taegu Factory) ......................................................... 139
      1.1 General ......................................................................................... 139
      1.1 Environmental Situation .............................................................. 142
      1.2 Environmental Management ....................................................... 144
      1.3 Implications and Key Conclusions .............................................. 148
   2. Daeduck Global Digital Solution Co ................................................... 149
      2.1 General ......................................................................................... 149
      2.2 Environmental Situation .............................................................. 156
      2.3 Environmental Management ....................................................... 160
      2.4 Implications and Key Conclusions .............................................. 165
   3. Korea Omyang Co. ................................................................. 166
      3.1 General ......................................................................................... 166
      3.2 Environmental Situation .............................................................. 169
      3.3 Environmental Management ....................................................... 174
      3.4 Implications and Key Conclusions .............................................. 185
IX. Environment Management Guidelines for SMEs ................................................. 232

1. Incentives for Implementing EM ........................................................................ 232
   1.1 Market ........................................................................................................... 235
   1.2 Regulation ..................................................................................................... 237
   1.3 Internal Factors .......................................................................................... 237

2. Overcoming Difficulties when Implementing EM(S) ........................................ 238
   2.1 Internal .......................................................................................................... 238
   2.2 External Barriers and Help .......................................................................... 241

3. Overcoming Difficulties during EM(S) Adoption and Entering a Routine ...... 244
   3.1 Goals and Targets ........................................................................................ 244
   3.2 Management Systems ................................................................................ 245
   3.3 Organization ................................................................................................. 247

4. Environmental Management Programs .......................................................... 250
   4.1 Pollution Prevention .................................................................................... 250
   4.2 Waste Minimization .................................................................................... 251
   4.3 Recycling ...................................................................................................... 251
   4.4 Pollution Control .......................................................................................... 251
   4.5 Waste Disposal Programs ........................................................................... 252
   4.6 Auditing ........................................................................................................ 252
   4.7 Performance Management .......................................................................... 253
   4.8 Suggestion Programs .................................................................................. 253
X. Policy Recommendations for Government ............................................... 261

1. Regulatory Policies .................................................................................. 261
   1.1 Regulatory Policies and Corporate Environmental Management ........ 261
   1.2 Implication and Direction of Regulatory Policies ................................ 263
   1.3 Policy Recommendations .................................................................. 269

   2.1 Promotional Policy ............................................................................. 270
   2.2 Current Issues and Improvement Directions ...................................... 271
   2.3 Recommendations ............................................................................ 273

3. Government’s Support to Facilitate SMEs’ Environmental Management .... 274
   3.1 Policies for Supply Chain Environmental Management ..................... 275
   3.2 Government Supporting System ....................................................... 281

XI. Summary and Conclusion ..................................................................... 286

Reference ........................................................................................................ 292

<Appendix> Survey Form
Tables

Table II-1. Various Environmental Standards......................................................... 5
Table II-2. Standard for Level of Work Place.......................................................... 7
Table II-3. Annual Number of Periodic Inspections Conducted ............................... 7
Table II-4. Pollutants Subject to Emission Charges ............................................... 10
Table II-5. Environmental Charge Status in Korea ............................................... 12
Table III-1. Yearly Status of ISO 14000s Certificates ............................................ 21
Table III-2. Status of ISO 14000 Certificates by Industrial Sector ......................... 21
Table III-3. Business Association ........................................................................ 26
Table IV-1. SME Classification............................................................................. 35
Table IV-2. Status of SMEs .................................................................................. 38
Table IV-3. Number of SMEs by Year in Manufacturing Industry ....................... 38
Table IV-4. SME Status by Industry...................................................................... 39
Table IV-5. SME Export Status by Year ............................................................... 40
Table IV-6. Status of Financial Assistance in SMEs ............................................. 42
Table IV-7. Weighted Average Interest on Loans .................................................... 44
Table IV-8. Corporate Bond Issuing ..................................................................... 44
Table IV-9. Stock Issue Status ............................................................................. 45
Table IV-10. Manpower Shortage Trends in SMEs .............................................. 45
Table IV-11. Employment of the Person Qualified for Environmental Management ... 46
Table IV-12. Number of Person who is in Charge of Environmental Management.... 47
Table IV-13. Number of SMEs Certified as Environmental Management............ 47
Table IV-14. SMEs' Facility Investment in Manufacturing Industry ..................... 48
Table IV-15. SMEs’ Facility Investment by Purpose............................................. 48
Table VII-1. Organizational Commitment and Environmental Management Performance .. 125
Table VII-2. Environmental Management Activities and Performance ............... 132
Table VIII-1-1. Major Corporate Customers ....................................................... 141
Table VIII-1-2. History of Environmental Programs ............................................. 145
Table VIII-2-1. Products of Daeduck GDS ............................................................ 153
Table VIII-2-2. Environmental Facilities .............................................................. 157
Table VIII-2-3. Characteristics of Wastewater ..................................................... 158
Table VIII-2-4. Discharge Limits and Control of Emissions ............................... 159
Table VIII-2-5. Costs for Adopting ISO 14001 Certification............................... 161
Figures

Figure II-1. Emission Facility and Emission Charge Management ....................... 6
Figure IV-1. Relative Importance of Environment ............................................. 46
Figure IV-2. SMEs Certified by ISO ................................................................. 47
Figure VI-1. Conceptual Framework of Environmental Change in Overall Context. 105
Figure VI-2. PDCA Circle of Improvement ..................................................... 112
Figure VI-3. Elements and Factors to Consider for the Introduction of EMS ....... 113
Figure VII-1. Companies by Business ............................................................ 121
Figure VII-2. Companies by Sales ................................................................. 122
Figure VII-3. Companies by Size ................................................................. 122
Figure VII-4. Companies by Market Channel ............................................... 123
Figure VII-5. Market Channel (by size) ......................................................... 123
Figure VII-6. Organization Commitment ....................................................... 123
Figure VII-7. Companies’ Information Sources on Environmental Management.. 124
Figure VII-8. The Recognition Sources of Environmental Management (by size)... 124
Figure VII-9. Environmental Policy ............................................................... 125
Figure VII-10. Environmental Policy (by size) ............................................... 125
Figure VII-11. Departments in Charge of Environmental Issues ...................... 126
Figure VII-12. Environmental Departments (by size) ..................................... 126
Figure VII-13. The Role of Departments in Charge of Environment ................. 127
Figure VII-14. The Role of Departments in Charge of Environment (by business) . 127
Figure VII-15. The Drivers of Environmental Management ............................ 128
Figure VII-16. The Drivers of Environmental Management (by industry) ........... 128
Figure VII-17. Environmental Certification Required by Customer Requirements . 129
Figure VII-18. Environmental Certification by Customers’ Requirements (by industry). 129
Figure VII-19. Environmental Management Efforts ....................................... 130
Figure VII-20. The Efforts of Environmental Management (by industry) ......... 130
Figure VII-21. The Performance of EM .......................................................... 130
Figure VII-22. Results from Environmental Management (by size) ................... 131
Figure VII-23. Results from Environmental Management (by industry) ............ 131
Figure VII-24. Resources for Environmental Management ............................ 132
Figure VII-25. Resources for Environmental Management (by industry) ........... 133
Figure VII-26. Cooperation with Customers on Environmental Management ..... 133
I. Introduction

Background

Today, many businesses seek to manage their organizations’ environmental impacts and performances by adopting Voluntary Environmental Management (VEM) tools and systems: VEM aims to systematize procedures, controls and responsibilities to make environmental issues a strategic part of an organization's overall management system. International EMS certification programs, such as ISO 14001 and the European Union's Eco-Management and Audit Scheme (EMAS), are part of this rapidly growing trend and are now commonly used worldwide. Both domestic and international trends towards environmental management have been supported by a number of factors: Montreal Protocol, increasing trade pressures imposed by international environmental agreements, increased attention to environmental liabilities, and clean development mechanisms (CDMs).

Governments around Asia have initiated technical extension programs to encourage corporate adoption of VEM tools and reduce regulatory burdens. Whereas conventional technical extension programs were very effective amongst large corporations, they had limited success with small and medium sized enterprises (SMEs). Though many reasons have been suggested why SMEs failed to adopt VEM tools, no clear consensus has been reached on the primary causes, and national agencies still lack systematic research on strategies to reshape their promotion programs. However, experts generally agree that the problem of SME environmental management performance must be addressed and that VEM promotion programs should present environmental performance as a strategic concern for SME management. To achieve such a goal, a thorough study of factors limiting VEM adoption by SMEs is needed.

Increased levels of scrutiny from regulators, end-users, and local communities have forced many major companies to begin viewing environmental efficiency as a strategic business interest. As testament, the number of corporations voluntarily reporting detailed environmental performance has increased from less than one hundred in 1991 to over 1,200 last year. One growing driver is the adoption of public right-to-know policies such as the Toxics Release Inventory in the United States. Businesses must take direct responsibility for their level of performance (and often for smaller suppliers and clients). Stakeholders have begun to systematically benchmark corporate performances and demand improvements in return for sustained patronage of corporate products,
services, and stocks. As a result, large companies have invested significant resources in developing internal systems and expertise to manage environmental performance.

Despite the progress among large companies, environmental management remains a challenge for many SMEs. There are a limited number of practical environmental management strategies or instruments available that are appropriate and suitable to the structural and financial conditions of SMEs. Given the large number of SMEs in many countries and their relatively low visibility, few government agencies have sufficient manpower to comprehensively inspect all SMEs in the market. Fear of regulatory penalties and low likelihood of public exposure of poor environmental performance, therefore, provides only a limited incentive for SMEs to improve their performance. In Korea in particular, SME participation in environmental management schemes diminished due to extensive downsizing and business restructuring which occurred after the Asian financial crisis. Nevertheless, SMEs in Korea continue to have a significant impact on the environment as illustrated below:

- More than 50% of total pollutants generated in the industrial sector in Korea originate from SMEs
- By number, 99% (96,241) of all enterprises in Korea (97,133) are SMEs
- For most SMEs, investment in environmental pollution abatement or prevention infrastructure accounts for less than 5% of total investment expenditures.

**Objectives and Approaches**

The study carried out for this project aimed to identify good examples of environmental management as practiced by Korean SMEs. A study of Korean SMEs is valuable because of the persistent and successful efforts at environmental management by leading companies in the face the Asian economic crisis in the late 1990s. In this sense, this study will be a valuable reference on environmental management to other countries - especially developing countries – that must balance their environmental needs with those of economic survival.

This paper is intended for two audiences, SMEs interested in better understanding VEM and government regulators looking for innovative ways to encourage SMEs to adopt VEM. It encapsulates the results of a project studying the relationships between SMEs and VEM, which began in April 2000 and concluded in February 2001 and commissioned by the Korea Ministry of Environment and the World Bank. The chapters are organized to reflect the stages in which project work was carried out. A framework
of environmental management was designed for this study to better understand environmental management as a process, and not as a tool, to help SMEs properly approach improving environmental performance. At the same time, the study also carried out an investigation on the general status of Korean SMEs, focused on putting their progress and competence in terms of environmental management in a broader context.

This investigation was initiated through a survey, in which one hundred leading SMEs were asked to participate. Following the survey, case studies were prepared on thirty of these companies to obtain a closer look at their practical experiences and insights on environmental management. Through this process, detailed case studies of five exemplary companies were chosen for inclusion in the final report.

Through the work performed in this study recommendations were generated for both SMEs and the government in Korea. SMEs should consider these recommendations as a guideline to use during the environmental management process, while government can view them as added input when weighing actions to encourage SMEs to improve environmental management.
II. Korean Industrial Environmental Laws and Regulations

This chapter will look at industrial environmental laws and regulations that promote corporate environmental management in Korea. At their most fundamental level, Korean environment regulations are intended to prevent the diseases or disaster that might arise as a result of environmental pollution, and to maintain a comfortable standard of living for local residents by placing controls on facilities (or actions) that discharge pollutants into the environment. All companies are subject to these regulations and incur a "compliance cost" by adopting pollution prevention activities.

This chapter first addresses the command and control regulatory system, followed by an analysis of different types of charge systems that create an economic incentive for companies to reduce discharge of pollutants. Next, supporting systems that encourage corporate environmental management (in terms of investment and operations of environmental facilities, and development and application of environmental technology) are reviewed.

1. Industrial Environmental Protection Policies

There are two types of environmental protection policies used in Korea: "Command and control" that directly regulates activities that discharge pollutants and "Economic incentive" that induces polluters to voluntarily reduce pollution by providing economic incentives such as tax benefits and subsidies.

1.1 Command and Control

Command and control policies entail government specification of environmental standards for activities causing pollution, and require polluters to satisfy these standards or face legal punishment. Command and control is widely used due to the ease in imposing penalties and the speed with which results are obtained.

- Precautionary Regulations: Licensing for Emission Facilities

Licensing for facilities that emit pollutants (stationary sources) is comprised of

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1 Ministry of Environment, Environmental Protection in Korea, 1997.
approval/permission and conduct/inspection. Licenses are permitted or granted to facilities that have installed equipment or altered emission facilities to limit pollution within the range specified by environmental standards. This policy is intended to prevent pollution damages caused by facilities and minimize overall emissions. As of the end of March 1999, 211 precautionary regulations were enacted covering permission, approval, designation, certification, standards, inspection and confirmation.

Ⅲ. Pollution Regulations

① Environmental Standards

Environmental standards, including those related to water and air quality, are provided in environmental law. Any firm violating these standards can be punished by issuance of an improvement command, business suspension, permit revocation, fine and/or imprisonment.

<table>
<thead>
<tr>
<th>Table II-1. Various Environmental Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Standard</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Water Quality</td>
</tr>
</tbody>
</table>

Figure II-1. Emission Facility and Emission Charge Management

② Inspection of Emission Facilities

Regulations regarding inspections are structured to achieve several purposes, including: to monitor emission facilities or verify proper management of pollution prevention equipment; to supervise execution of emissions self-measurement; to drive appointment of an environmental manager; as part of implementation of an administrative order; and to guarantee observance of permitted emission standards. Inspection regimes for of air or water pollutant are divided into two categories: (i) Periodic Inspection and (ii) Frequent Inspection. Periodic Inspection applies to companies that have violated environmental laws in the past. The number of inspection visits is determined based on past performance, graded into 3 levels - Blue, Green, and Red. Frequent Inspection is applied under any of the following three circumstances: (i) a complaint is filed by local residents; (ii) a problem occurs with the Telemetry System (TMS); and (iii) when pollution levels detected in a particular region show an
increase for unknown reasons after a survey conducted as defined under Article 3 of the Air Environment Preservation Act, or Article 3 of the Water Quality Preservation Act.

Table II-2. Standard for Level of Work Place

<table>
<thead>
<tr>
<th>Level</th>
<th>Air</th>
<th>Wastewater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>- No violations were reported</td>
<td>Blue</td>
</tr>
<tr>
<td>Green</td>
<td>- Though no violation was reported, a work place missed one or more inspections</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>- One emission exceeding relevant standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Not more than 2 violations related to air environment law</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>- More than 2 emissions exceeding relevant standard</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>- More than 3 violations of any regulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. A new work place is initially graded Green.
2. Level is adjusted yearly based on the previous 2 years performance.

Table II-3. Annual Number of Periodic Inspections Conducted

(Unit: Number/Year)

<table>
<thead>
<tr>
<th>Level</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV</th>
<th>Class V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Green</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Red</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
1.2 Economic Incentives

Economic incentives use market forces to reduce environmental pollution. The government induces polluters to reduce pollution voluntarily, by imposing specific charges or taxes on activities generating pollution, rather than by applying direct regulation to activities causing environmental pollution. Korea has a comprehensive system of charges that cover a range of pollutants.

○ Environmental Improvement Charges

The Environmental Improvement Charge System was established based on the Polluter-Pays Principle, which holds that those who discharge pollutants are responsible for any expenses necessary to compensate for environmental damages. The charges levied on polluters vary directly in proportion to the volume of pollutants discharged. The goal of this system is to help reduce pollution and raise financial resources for environmental investment. The Environmental Improvement Charge System Act was enacted in December 1991, creating a legal basis for government's efforts in this area.

Environmental improvement charges are imposed on owners of large buildings and/or diesel-powered vehicles, as they discharge relatively large quantities of pollutants. The structures subject to these charges include buildings with a floor space exceeding 160 m², except those located in agricultural areas in accordance with the Land Use and Management Act. Owners of diesel-powered vehicles (which are registered nationwide in accordance with the Automobile Management Act) are required to pay these charges as well.

Production and manufacturing facilities and diesel-powered motor vehicles equipped with three-way catalytic converters are exempt from these charges, as are residential and foreign government housing units (e.g. apartment complexes).

Charges are assessed to the actual facility or motor vehicle owner. If the owners cannot be identified at the time of levying the charges, those using the facilities at the time are then responsible for paying the environmental improvement charges.

Under Article 22 of the Environmental Improvement Charge System and Article 28 of its Enforcement Decree, the mayor or governor is empowered to impose and collect these charges in his/her jurisdiction.

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2 Ministry of Environment, Environmental Protection in Korea, 1997.
II. Korean Industrial Environmental Laws and Regulations

- Emission Charge System

  1. Purpose

  The emissions charge system took effect on 1 September 1983 to prevent environmental damage from pollutant discharges in excess of established permissible limits, and to help ensure that companies observe such limits. Any firm found in violation of such limits is required to pay an emissions charge equivalent to the treatment expenses for the excess volume of pollutant. In 1992, the basic charge system was adjusted to incorporate variations in firm size and treatment charges for excessive pollutant discharges.

  After the Water Quality Preservation Act was revised on 29 December 1995, those who discharged pollutants within permissible limits also became subject to emission charges if water quality did not satisfy effluent standards. This new law applied also to wastewater treatment facilities.

  Firms that are liable for emission charge payments, but fail to pay charges on time must pay additional penalties in accordance with the National Tax Collection Act.

  2. Pollutants Subject to the Emission Charges

  Emission charges are imposed on business establishments discharging 10 types of air pollutants (e.g. sulfur dioxide), 17 types of water pollution (e.g. BOD and COD), and two types of livestock wastewater pollution (BOD and suspended solids). Offensive odors are also considered pollution under the law.

- The Deposit-Refund System

  1. Objectives

  The purpose of this system is to promote recycling of post-consumer waste. Under the Polluter-Pays Principle, producers and importers of items that generate large amounts of waste are required to collect and treat their products or wastes. They are also required to make cash deposits based on fixed rates to ensure faithful execution of their duty. The deposits are reimbursed according to performance of these duties.

  2. Items and Rates

  The Deposit-refund system went into effect in January 1992 in seven business areas. Originally, 17 different items falling into seven categories, such as containers for food, insecticides, butane gas products, and toxic products were covered, however some of
these were found to be inappropriate. As a result, the list was modified in June 1993 when the Enforcement Decree of the Act Relating to Promotion of Resources Saving and Reutilization was enacted. After modification of the list, cosmetics containers, insecticides, toxic products, and selected batteries were subject to a charge system instead of the Deposit-Refund System. Moreover, polyethylene bottles, medicine containers, and air conditioners were added to the list. The Enforcement Decree of the Act, revised on 28 December 1996, added refrigerators to the list, and transferred butane gas to a charge system. Currently, the Deposit-refund system covers 12 different items falling into six categories.

Table II-4. Pollutants Subject to Emission Charges

<table>
<thead>
<tr>
<th>Type</th>
<th>Pollutants</th>
<th>Target Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air (10)</td>
<td>Sulphur Oxides, Fluorine Compounds, Dust, Offensive Odors, Hydrogen Chloride, Chromium, Cyanide, Ammonia, Hydrogen Sulfide, and Carbon Disulfide</td>
<td>Pollutant-discharging facilities, both approved or non-approved, which have been ordered to rectify excessive discharge of pollutants; firms found to have exceeded permissible discharge standards in their operation</td>
</tr>
<tr>
<td>Water (17)</td>
<td>BOD or COD, Suspended Solids (SS), Lead with its Compounds, Cadmium with its Compounds, Cyanide Compounds, Organophosphate Compounds, Chromium 6+ Compounds, Arsenic with its Compounds, Mercury with its Compounds, PCB, Copper with its Compounds, Chromium with its Compounds, Phenols, Tetra Chloroethylene, and Trichloroethylene</td>
<td></td>
</tr>
<tr>
<td>Livestock</td>
<td>BOD, SS</td>
<td></td>
</tr>
<tr>
<td>Waste-Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Environmental Protection in Korea, Ministry of Environment, 1997.

- Waste Production Charges

- Purpose

Under the Act Relating to Promotion of Resources Saving and Reutilization, which went into effect in July 1993, a Waste Treatment Charge System was established to curb consumption of products and containers that are difficult to collect, treat, recycle, or likely to render waste management difficult. The system was introduced to fairly allocate environmental costs and promote environmentally sound items by incorporating
environmental costs into product prices.

② Items and Rates

Under Article 17 of the Enforcement Decree of the Act Relating to Promotion of Resources Saving and Reutilization, charges are imposed on producers and importers engaged in 12 business areas that produce 32 specific items. These items include containers for insecticides or toxic substances. However, firms manufacturing or importing products, materials, or containers for export purposes are exempt from these charges.

Water Quality Improvement Charges

① Purpose

Water Quality Improvement Charges were imposed on manufacturers and importers of bottled water beginning on 1 May 1995 when the Drinking Water Management Act was put into effect. The objective of the Water Quality Improvement Charge System is to make bottled water manufacturers responsible for the payment of costs related to protection of ground water because they are major users of ground water resources. Sales of bottled water are in direct conflict with the government policy on tap water. The government is responsible for supplying drinking water to the general public as well as preserving the quality of surface water and drinking water. Since these activities are closely linked to preserving bottled water quality, manufacturers and importers of bottled water should also be responsible for providing some of the financial resources necessary to protect water quality and help improve the quality of drinking water.

② Charge Structure

Under the Water Quality Improvement Charge System, local mayors or governors can impose a charge on bottled water manufacturers and importers registered in their jurisdiction equaling 20% of sales of bottled water. Charges are assessed based on sales value before Water Quality Improvement Charges and value-added taxes are levied. Of the total amount collected, 10% is allocated to the municipal or provincial local government to cover expenses incurred in collecting the charges; 45% to the city, county or district office to develop water intake to produce bottled water; and the remaining 45% to the Environment Improvement Special Account of the Ministry of Environment.

In regards to calculating charges, bottled water manufacturers and importers are
required to submit sales reports by the 20th of the last month of every quarter. Using these reports, the local mayor or government must calculate the correct charge and sends a bill by the end of the same month. Manufacturers and importers are obliged to pay their charges by the 15th of the following month. If the bill is not paid by its due date, penalties are imposed. If they are unable to pay the bill in time due to natural disaster or other unavoidable circumstances adversely affecting their business performance, the company in question can submit an application for a deferment or to pay for water improvement charges in installments. If the application is accepted, the company is granted a deferment or is allowed to begin making installation payments.

③ System Characteristics

Water Quality Improvement Charges are imposed not only on manufacturers, but also on importers of bottled water. The charges are not based on the amount of groundwater collected, but on the amount of bottled water sold. As such, the charge system is a type of indirect tax. The charge is considered to be a special consumption tax, in that tap water could be substituted for bottled water.

<table>
<thead>
<tr>
<th>Legal Basis</th>
<th>Objectives</th>
<th>Fundamentals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission Charge</td>
<td>Pollution reduction</td>
<td>Basic charge, additional charge</td>
</tr>
<tr>
<td>(since 1983)</td>
<td>Pollutie reduction</td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>Environmental</td>
<td>Establishment</td>
<td>Utility cost of public ground water resources</td>
</tr>
<tr>
<td>Improvement Charge</td>
<td>of a fund</td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>(since 1993)</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>Water Quality</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>Improvement Charge</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>(since 1995)</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>Deposit-Refund Charge</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>(since 1992)</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>Waste Production</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>Charge</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
<tr>
<td>(since 1994)</td>
<td></td>
<td>Polluter-Pays Principle</td>
</tr>
</tbody>
</table>

Table II-5. Environmental Charge Status in Korea
II. Korean Industrial Environmental Laws and Regulations

<table>
<thead>
<tr>
<th>Subject of charge</th>
<th>Emission facilities</th>
<th>Owners of large buildings or diesel-powered vehicles</th>
<th>Manufacturers and importers of bottled water</th>
<th>Manufacturers and importers of specified items</th>
<th>Manufacturers and importers of specified items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target charged</td>
<td>Air: 10 Specific air pollutants including sulfur dioxide and SOX</td>
<td>Buildings with a floor space exceeding of 160m²</td>
<td>Drinking water</td>
<td>12 different items of 6 categories</td>
<td>32 different items of 12 categories</td>
</tr>
<tr>
<td></td>
<td>Water: 17 specific water pollution including BOD and COD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>Permitted emission standard</td>
<td>Facilities: use, fuel, amount of water used, location, etc.</td>
<td>20% of Selling price</td>
<td>Cost of real recovery (30% of current level)</td>
<td>Real treatment cost (30% of current level)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vehcles: types displacement, location, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.3 Commentary

Command and control policies are a way to set specific standards and thereby establish minimum levels of performance. To allow enterprises to meet these objectives, it is important to establish effective, reasonable standards and implementation systems. However, Korean regulations have several limitations. First, more importance is placed on end-of-pipe regulations than on precautionary regulations. Second, regulations have been established and updated separately from one another, making integration of overlapping regulations difficult. Furthermore, environmental
policy assessment models that take into account unique regional conditions have not yet been established. Third, because environmental regulations do not take into account industry characteristics, they may place a heavy burden on industry. Fourth, the management of licensing separate from emissions control is not efficient.

During the 1990s a number of economic incentives were introduced as alternatives to the inflexible command and control regulatory structure. Though such incentives have both monitoring and punishing functions, they cannot fundamentally resolve many environmental challenges. As such, the incentives have contributed to a gain in financial resources available for environmental protection, but have not been able to increase the overall effectiveness of environmental policies.

Command and control regulations and economic incentives apply to all enterprises, including SMEs. However, pollution control costs for SMEs are typically large, resulting in a situation in which many SMEs cannot afford to invest in pollution control systems.

2. Industrial Environment Management Incentives

The government offers subsidies and tax incentives to firms that invest in environmental facilities, both to encourage new environmental investment and reduce the overall cost of investments.

2.1 Incentives Given for Investing in Environment Facilities

- Financial Support
  - Environmental Pollution Prevention Facilities Fund for SMEs
    
    The government provides long-term, low interest loans to help SMEs with financial difficulties install pollution prevention facilities. Provision of these loans is under the jurisdiction of the Ministry of Environment and the Environmental Management Corporation. The amount granted by the government varies depending on the type of facilities being developed: (i) KRW 2 billion for individual prevention facilities, and (ii) KRW 3 billion for public facilities. Loans are issued with preferential conditions, such as a 10-year-long term loan at a 7% annual interest rate with a 3-year grace period.
II. Korean Industrial Environmental Laws and Regulations

II. Korean Industrial Environmental Laws and Regulations

② Industrial Basis Fund

The Industrial Basis Fund is a support system to promote investment in green production and environmental protection facilities, and to encourage the environmental protection industry. Under the Industry Development Act and the Act Relating to Promoting the Switchover of Environmentally-Friendly Industrial Structure, the fund falls under the jurisdiction of the Ministry of Commerce, Industry and Energy. However, the Korea Federation of Textile Industry is in charge of supporting management of the funds used for the dyeing industry, and the Korea Association of Machinery Industry is responsible for supporting management of the funds for all other industry sectors. The fund issues loans payable in 5 years at a 7.5% annual interest rate following a 3-year grace period.

③ Energy Rationalization Fund

The Energy and Resources Business Special Account Fund supports companies that promote energy conservation and group energy supply. The Fund is used to develop energy technologies and diversify energy sources. Funds are either available directly for facilities or for the operation of energy conservation businesses. The fund is dispensed through loans payable over 8 years at an annual interest rate of 5.5% with a 3-year grace period. The amount obtained can reach up to KRW 200 million per year. The Energy Rationalization Fund is under the jurisdiction of the Ministry of Commerce, Industry and Energy, and the Korea Energy Management Corporation is charged with supporting fund management.

④ Tax Incentives

According to Article 25 and Article 11 of the Tax Special Restriction Law, 3 percent of investment expenses for pollution prevention facilities or 5 percent of investment made for plants and laboratory equipment can be deducted from income tax or corporate tax.

⑤ Tariff Reduction and Exemption System for Environmental Pollution Prevention Apparatus

Under Article 28 of the Customs Duty Act, imported environmental pollution prevention apparatus and waste treatment instruments enjoy reduction or exemption from tariffs. Apparatus imported for the prevention or treatment of pollutant emissions or waste treatment, enjoy a tariff reduction of 50%.
② Other Special Treatments on Tax

Under Article 48 of the Income Tax Law and Article 16 of the Corporation Tax Law, charges incurred for environmental improvement, environmental pollution prevention projects and waste treatment are considered as a necessary cost or loss.

2.2 Environmental Technology Support

The Environmental Technology Development Support Act was enacted on 22 December 1994 and later amended on 29 December 1995. The Act has several goals. It hopes to approach environmental issues more actively in the international forum, such as the WTO, and better address domestic environmental issues. Moreover, it focuses the basic direction of environmental policies on: strengthening measures to prevent pollution; strengthening follow-up measures for environmental pollution incidents; and establishing a support system to foster development of the environmental industry as a strategic export industry.

In May 1990 the Ministry of Environment opened a technical consulting center to provide systematic and effective technology consulting services. The center also extended environmental technology field support to pollutant dischargers on an experimental basis. In addition, in 1991 a Central Environmental Technology Support Team was established to provide technical assistance to companies. However, many companies perceived the government-led technical service team as an inspection unit that would be used to crack down on violators. Under these circumstances, most companies were reluctant to contact the support team, and even worse, to active steps to avoid it. In an attempt to change the negative atmosphere, the Central Environmental Technology Support Team was placed under the control of the Environmental Management Corporation in August 1994.

Technical consulting services were offered free of charge, and private sector environmental experts provided guidance to clients. Further, substantial efforts were made to maintain the confidentiality of sensitive corporate secrets. In addition, companies that received technical guidance were given preferred status in obtaining loans for expansion or improvement of pollution prevention facilities.

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3 Ministry of Environment, Environmental Protection in Korea, 1997.
II. Korean Industrial Environmental Laws and Regulations

Financial Support

① Environmental Technology Research-Development Project

Research institutions attached to a company or an industrial technology research association, developing environmental technology for practical use or import substitution, receive support of up to 75 percent of development costs.

② Environmental Technology Development and Industrialization Fund

The fund is a financial support system designed to give low interest loans to individuals or SMEs to develop environmental technology or to help commercialize developed environmental technology. Fund jurisdiction falls under the Environmental Management Corporation. Loans are payable in 8 years at an annual interest rate of 7.0% following a 3-year grace period. Loan amounts can reach KRW 200 million for technology development and KRW 1 billion for commercialization.

Information and Public Relations Support: Environmental Technology Verification (ETV)

Autonomous governments or private enterprises are reluctant to adopt a technology that has not been through a verification process, even though it maybe a highly sophisticated technology. The government can resolve obstacles to adoption of best available technologies through ETV. ETV reduces hesitation to adopt environmental technology by users and assists technology suppliers by officially verifying the efficacy of their technology.

The Environmental Management Corporation evaluates the performance of technologies in an objective and justifiable manner. Performance reviews focus on key elements such as treatment performance, treatment efficiency, core-technology, and maintenance cost. Certifications for environmental technologies are issued by the Minister of Environment and publicized by evaluation agencies.
2.3 Limitations

Contrary to expectations, support for environmental technology has not been effective. Such support is not actively utilized due to insufficient publicity campaigns, small loan amounts, and overly complicated procedures. Further, companies trying to avail themselves of the government support system have encountered a number of problems in actually obtaining their loans. For example, even after obtaining government approval companies were not allowed to collect loans without approval from a financial institution. In another example, companies were required to provide collateral in addition to submission of required documents.

SMEs are burdened by high compliance costs incurred to meet environmental regulations, thus such economic and technical support for investment in environmental facilities plays a very important role in corporate environmental management. However, lack of information and the existence of inappropriate requirements or conditions to obtain such support makes it difficult for SMEs to make use of government support systems to improve environmental management.

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4 Moon, Hyun-Joo, Ki-Bok Chang and Young-Soon Lee, Research for an Environmental Performance Improvement Plan through Flexible Industrial Environmental Regulation Systems, Korea Environment Institute, 1999.
Chapter III looks at voluntary pollution control approaches that can be used to leverage win-win opportunities in corporate environmental management. The voluntary approach currently used in Korea is largely divided into Government-Driven (e.g. Central and Regional) Programs and Private Sector Initiatives (categorized by Industries and Regions). Other relevant initiatives include Regional Environmental Agreements and Energy-Related Voluntary Environmental Management.

1. Voluntary Environmental Management

1.1 Government Driven Environmental Programs

- Environmentally-Friendly Enterprise Designation

  ① Overview

  Korea's Environmentally-Friendly Enterprise Designation Program is based on a proactive business management model. Enterprises are encouraged to voluntarily assess the environmental impact of their entire production process and make continual efforts to work towards specific performance goals, as opposed to simply observing environmental standards set by the government.

  Enterprises assess environmental impacts of all business activities from product design through production process and post-sales management. Raw materials, industrial water, fuel and energy consumption, types and volumes of pollutants discharged, and the current status of pollution prevention facilities are subject to voluntary environmental impact assessment by enterprises. Based on their environmental impact assessment, enterprises prepare detailed environmental improvement plans, stipulating strategies for reducing pollutants as well as implementation methods. The plans should also include ways to improve production processes, and manage pollution prevention facilities in an optimal manner.

  ② Background

  The rationale behind the introduction of the Environmentally-Friendly Enterprise Designation Program is based on the recognition that environmental management based

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1 Ministry of Environment, Environmental Protection in Korea, 1997.
Development of EMS for SMEs

on the entire production process is more efficient than end-of-pipe treatment. When comparing the economic efficiency of end-of-pipe treatment and cleaner production technologies, the latter requires significantly higher investment at the initial stage, but reduces production cost over time, eventually lowering overall production cost. For example, 3M is known to have saved US$ 650 million during the period from 1975 to 1995 by reducing pollutant generation and leakage. However, governments must devise institutional means to encourage enterprises to voluntarily continue improving environmental performance beyond legal standards. Enterprises will always play a key role in solving environmental problems because they are directly responsible for production and are equipped with the necessary capital and technologies.

③ Performance

To build a legal basis for introducing the Environmentally-Friendly Enterprise Designation Program, the Ministry of Environment drastically shifted environmental policy away from end-of-pipe treatment by legislating the "Regulations for Environmentally-Friendly Business Management System" and "Operational Guidelines for the Regulations" in April 1995.

Articles 10-2 of the Air Quality Preservation Act and the Water Quality Preservation Act were revised on 29 December 1995 to provide legal grounds for operating the system. Enforcement regulations for the Air Quality Preservation Act and Water Quality Preservation Act were respectively revised on 12 August 1996 and 14 September 1996 to provide legal grounds for designation of Environmentally-Friendly Enterprises.

As the end of December 1999, 122 workplaces had been designated as Environmentally-Friendly Enterprises (valid for three years). Unfortunately, all of these enterprises were large companies, and not one SME has been selected as an Environmentally-Friendly Enterprise.

Environmental Management Certification

The Korean Environmental Management System (ISO14000) was established in October 1996 followed by the Act Relating to Promoting the Switchover of Environmentally-Friendly Industrial Structure enacted in July 1996. The Ministry of Commerce, Industry and Energy assigned operation of environmental management and

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² Moon, Hyun-Joo, Ki-Bok Chang and Young-Soon Lee, Research for an Environmental Performance Improvement Plan through Flexible Industrial Environmental Regulation Systems, Korea Environment Institute, 1999.
quality management certification systems to the Korean Accreditation Board (KAB), the sole EMS accreditation body in Korea. KAB began accrediting EMS certification and auditor training bodies in July 1997. At present, KAB has accredited 10 certification bodies (KFQ, KMA-QA, ITEP-KTL, KOTRIC-QA, KPC-QA, K-QA, HSB-RS, SPEC, LRQA and CERIK), and 3 auditor training bodies (KSA, KMA and GYMSI). The ISO14000 certification procedure consists of 4 steps: Application, planning an inspection visit, certification inspection and certification. As of June 2000, 401 enterprises had been certified in ISO 14000 in Korea.

Table III-1. Yearly Status of ISO 14000s Certificates

<table>
<thead>
<tr>
<th>Year</th>
<th>Large Companies</th>
<th>SMEs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>34</td>
<td>20</td>
<td>54</td>
</tr>
<tr>
<td>1997</td>
<td>36</td>
<td>31</td>
<td>67</td>
</tr>
<tr>
<td>1998</td>
<td>21</td>
<td>38</td>
<td>59</td>
</tr>
<tr>
<td>1999</td>
<td>27</td>
<td>103</td>
<td>130</td>
</tr>
<tr>
<td>2000.6</td>
<td>5</td>
<td>86</td>
<td>91</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>278</td>
<td>401</td>
</tr>
</tbody>
</table>

Source: Korean Accreditation Board
Note: The figures shown above represent the number of certificates issued by CBs accredited by KAB.

Table III-2. Status of ISO 14000 Certificates by Industrial Sector

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Agriculture, Forestry and Fishing</td>
<td></td>
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<tr>
<td>Mining and Quarrying</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>48</td>
<td>51</td>
<td>39</td>
<td>71</td>
<td>52</td>
<td>261</td>
</tr>
<tr>
<td>Electricity, Gas and Water Supply</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>3</td>
<td>11</td>
<td>12</td>
<td>39</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>Wholesale and Retail Trade</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hotels and Restaurants</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Post and Telecommunications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Financial Institutions and Insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Activities</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>--------------------------</td>
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</tr>
<tr>
<td>Public Administration</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and Defense</td>
<td></td>
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<td></td>
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<tr>
<td>Education</td>
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<td></td>
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<tr>
<td>Health and Social Work</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Recreation, Cultural</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and Sporting Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Community, Repair</td>
<td>54</td>
<td>67</td>
<td>59</td>
<td>130</td>
<td>9</td>
<td>401</td>
</tr>
<tr>
<td>&amp; Personal Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Korean Accreditation Board
Note: The figures shown above represent the number of certificates issued by CBs accredited by KAB.

Eco-Labeling Programs

Overview

Eco-labeling programs are designed to certify environmentally-friendly products and bring consumers' attention to particular brands or models of products that were made available by less polluting and more energy-efficient manufacturing and distribution processes. Consumers are encouraged to use clean products, and their increased demand encourages manufacturers to develop and produce more environmentally-friendly products.

Current Status of Eco-Labeling Program

Consumers, industry, and the government are all involved in the eco-labeling program in different ways. The government enacts relevant laws and selects the kinds of products that will be eligible for the Eco-Mark. The Eco-Mark Association authorizes the use of the Eco-Mark and manages the labeled products.

The Eco-Mark Association, a private body established on 27 June 1994, is composed of representatives from consumer organizations, environmental organizations, businesses, distributors, and environmental experts.

When the program was launched in 1992, four categories of items including recycled papers and toilet paper were designated to carry the Eco-Mark. The number of

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3 Ministry of Environment, Environmental Protection in Korea, 1997.
categories of items carrying the Eco-Mark increased to 45 as of March 2000. In 1992, 81 specific products manufactured by 37 companies were authorized to carry Eco-Mark. As of March 1st 2000, a total of 146 products from 110 companies had been awarded the Eco-Mark.

Recycling Target Ratio Commitment System\(^4\)

This system aims to encourage businesses to voluntarily increase reuse rates for recyclable resources like paper and scrap. A business association determines recycling target ratios together with the government and individual companies are expected to meet the targets voluntarily. Under the Act Relating to Promotion of Resources Saving and Reutilization, the Reutilization Guidance for Reutilization Designation Entrepreneur was promulgated in 1993.

According to this system, designated companies engaged in the paper or glass manufacturing industry, iron and steel industry, and plastic manufacturing industry should report recycling plans and performance for wastepaper, used glass, used iron and used plastics to their respective business association. Designees should also establish target recycling ratios for recyclable resources and recycling technology development plans. The business association then submits general reports to the Ministry of Environment and the Ministry of Commerce, Industry and Energy.

Industrial Waste Reduction System\(^5\)

The Waste Treatment Act, revised in 1995, stipulates that businesses discharging industrial wastes must take steps to control waste generation. In December 1996 the Ministry of Environment and the Ministry of Commerce, Industry and Energy announced the Guidance for Industrial Waste Reduction in accordance with the Waste Treatment Act. This system aims to reduce waste through process improvement and recycling in 14 business sectors that generate specified wastes in quantities greater than 200 tons. Businesses that fall under the regulation must analyze manufacturing processes, reduction factors, reutilization capacity and control performance after establishing an industrial waste reduction plan.

Business associations analyze and assess the performance of each workplace implementing waste minimization plans. The business association may ask the director

of the local environmental office to award designation to enterprises with superior performance. Designated enterprises receive incentives, such as exemption from certain controls and inspections as stated in the Waste Treatment Act. Additional points are awarded towards receiving designation as an Environmentally-Friendly Enterprises, as well as loans for improving environmental protection facilities.

1.2 Regional Government Driven Environmental Programs

In January 1997 the Han-river Environmental Management Office introduced an Environmental Voluntary Management Team. The program was later adopted by the Kyong-in Local Environmental Management Office and the Kum-river Environmental Management Office. The Nakdong-river Environmental Management Office is in the process of introducing a Voluntary Environmental Management Agreement Program.

Under the program, teams made up of company managers and executives are formed voluntarily within an industrial complex to create a broader base of support for environmental management. The program gives team members a greater awareness of environmental management and raises their consciousness as to their responsibility for environmental problems in their regions. Each environmental manager is in charge of reducing pollutants through voluntary, proactive initiatives and for preventing accidents that could cause environmental pollution. Team members meet to exchange experiences, information, and technology related to environment.

1.3 Regional Environmental Agreement

Under a Regional Environmental Agreement, a council, made up of competent authorities and enterprises, works together to agree upon goals for environmental improvement, such as emissions reductions or increased recycling rates. After an agreement is reached companies have three months to present a year-by-year implementation plan for attaining the agreed-upon goals. The competent authority aids the company in implementing their plan by helping with public relations, technology, finance, mitigation, and inspection. In return, the company is required to submit annual reports and a final report to the authority, which is then passed on to Ministry of Environment. After monitoring a company’s business activities, the competent authority may recommend that a company with poor environmental performance negotiate a

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Regional Environmental Agreement.

Another common strategy employed by local governments trying to improve regional environmental quality is to adopt a Local Agenda 21. Local governments cooperate in other ways with companies under their jurisdiction to enhance industrial environmental quality in the region. For example, SK Evertec Corporation, located in Ulsan, concluded a voluntary environmental agreement with the local government in Ulsan, and the Korea Electric Power Corporation is building a power plant after reaching an environmental agreement with the local government in Inchon. In the latter case, permission to build the power plant was granted under the condition of a totally transparent construction and operation process and the governments' right to halt operations if the company does not observe the agreement.

1.4 Industry Lead Private Sector Initiatives

Environmental Management of Conglomerates

The conglomerate is an integral part of the Korean industrial structure. Korean conglomerates operate a wide range of industries including both manufacturing and distribution, and have management strategies that encompass their entire business operations. Environmental management is also carried out across business units.

Recently a number of major Korean conglomerates - Samsung, Hyundai, Daewoo, LG and Doosan - released environmental declarations which contained promises to lead their subsidiary companies through a transformation to become environmentally-friendly enterprises. As a result these companies have introduced Environmental Management Systems and have begun working together with local communities to improve regional environmental conditions.

Environmentally-Friendly Industrial Structure Switchover Program

The Korea Chamber of Commerce and Industry established the Private Promotion Headquarters for the Switchover to Environmentally-Friendly Industrial Structure in order to expedite environmental management by Chamber members. The President of the Korea Chamber of Commerce and Industry was appointed to head up the Private Promotion Headquarters. The Private Promotion Headquarters has regional branches that are affiliated with the members of local Chambers of Commerce and Industry.

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The Private Promotion Headquarters helps businesses to harmonize environmental performance with economic efficiency and to create an environmentally friendly business culture. The Private Promotion Headquarters also promotes environmental management systems and audit systems and the adoption of full life-cycle product responsibility. Its other goals include encouraging efficient use and handling of resources, observance of environmental laws, enhancing efforts to develop green technology and laying the foundation for an environmentally friendly society.

Environmental Management by Sector Based Business Associations

In each Korean industrial sector, entrepreneurs organize a business association in the same manner that they would organize a trade association (Table III-3 shows industries that have a serious impact on the environment). However, weak organizational systems and a lack of manpower prohibit business associations from encouraging or supporting better environmental management by their members.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Association</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>Korea Cement Industry Association</td>
<td>• Give recommendations to the government</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide information to members</td>
</tr>
<tr>
<td>Iron and steel</td>
<td>Korea Iron and Steel Association</td>
<td>• Conduct research to improve environment related laws</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Control technology, environment, quality, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conduct surveys on environmental management investment and waste treatment</td>
</tr>
<tr>
<td>Nonferrous metals</td>
<td>Korea Nonferrous Metals Industry Association</td>
<td>• Adopt industrial environment demonstration projects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Assess waste reduction</td>
</tr>
<tr>
<td>Petrochemical</td>
<td>Korea Petrochemical Industry Association</td>
<td>• Work in liaison</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Manage safety and recycling</td>
</tr>
<tr>
<td>Paper manufacturing</td>
<td>Korea Manufacturer’s Association</td>
<td>• Provide information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Report on paper recycling</td>
</tr>
<tr>
<td>Automobile manufacturing</td>
<td>Korea Automobile Manufacturers Association</td>
<td>• Give recommendations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Encourage car recycling</td>
</tr>
<tr>
<td>Industry</td>
<td>Association</td>
<td>Activities</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Electronics</td>
<td>Electronic Industry Association of Korea</td>
<td>• Give recommendations about environmental regulations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Manage Deposit-Refund System</td>
</tr>
<tr>
<td>Dyeing</td>
<td>Korea Dyeing Industry Association</td>
<td>• Manage fund for environmental facilities</td>
</tr>
<tr>
<td>Oil</td>
<td>Korea Oil Industry Association</td>
<td>• Give recommendations to government</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Work in liaison</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conduct environmental research</td>
</tr>
<tr>
<td>Textile</td>
<td>Korea Textile Industry Association</td>
<td>• Waste reduction planning</td>
</tr>
<tr>
<td>Glass</td>
<td>Korea Glass Industry Association</td>
<td>• Encourage waste reduction and recycling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Investigate and report</td>
</tr>
<tr>
<td>Leather</td>
<td>Korea Leather Industry Association</td>
<td>• Recommend environmental regulations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Share cleaner production technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recycling wastewater management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Work in liaison</td>
</tr>
<tr>
<td>Plating</td>
<td>Korea Plating Industry Association</td>
<td>• Investigate and report</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recommend environmental regulations</td>
</tr>
<tr>
<td>Casting</td>
<td>Korea Casting Industry Association</td>
<td>• Work in liaison</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Implement waste casting management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Research and provide information</td>
</tr>
<tr>
<td>Electronic</td>
<td>KEPCO</td>
<td>• Carry out environmental planning and policy making</td>
</tr>
<tr>
<td>Power</td>
<td></td>
<td>• Carry out long-term environmental planning and policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Relate to power planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conduct environmental technology development planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Establish countermeasures for environmental appeal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Implement industry waste management</td>
</tr>
</tbody>
</table>

Korea Environmental Manager Federation

The Korea Environmental Manager Federation is an interest group that aims to protect the rights and interests of environmental managers and contribute towards the creation of a pleasant living environment by preventing pollution. There are 16 local branches nationwide.

The Federation's main activities include: supporting pollutant treatment technology; holding debates or meetings for the presentation of research papers; providing education about pollution prevention; and publishing materials for environmental managers on environment related laws. The branches keep an eye on surrounding industrial complexes and rivers, and visit businesses that emit pollutants.

1.5 Regional Private Sector Initiatives

Environmental management associations for industrial complexes have been established to efficiently compensate individuals for injuries caused by environmental pollution. These associations generally aim to improve the health of local residents and preserve regional environmental quality. Activities carried out by such associations include the following: establishment and implementation of basic measures for joint environmental management and protection in the various regions; investigate environmental conservation in and around the regions; check factory pollution emissions; prevent accidents that may pollute the environment; and other general management issues relating to the environment. There are currently three such associations: the Ulsan Regional Environmental Management Association (established in September 1978), the Onsan Industrial Complex Environmental Management Association and the Yeochon Industrial Complex Environment Association.

1.6 Supply Chain Environmental Management

Some large conglomerates and multinational firms in Korea have begun to develop supply-chain environmental management (SCEM) policies, although examples of robust action are few. Companies are making efforts to set up their own environmental management, distribute EMS guideline booklets, and provide instruction to their subcontractors. Some companies are encouraging their subcontractors to receive ISO

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14001 certification and have begun considering environmental aspects in their purchasing decisions (such as giving preference to companies with good environment credentials when choosing purchasing partners.)

To strengthen regulatory compliance and gain a competitive edge, more companies are making a voluntary effort to implement environmental management in Korea and to form active partnerships with clients. The SCEM practices of some large firms are provided in the Appendix.

1.7 Voluntary Environmental Management Related to Energy

- Voluntary Agreement

Over 97 percent of the energy used in Korea comes from imported energy resources. Under these circumstances, energy conservation policies are often hostage to the fluctuation of oil prices and economic conditions. The Framework Convention on Climate Change and the recent Asian economic crisis, however, have created the need for greater company-level participation in energy management. In May of 1998 the Korean government established a National Energy Saving Promotion Commission which set the framework for voluntary agreements used to promote energy conservation and reduce greenhouse gases.

The government encourages companies to participate in the voluntary agreements to improve energy efficiency in order to help reduce CO$_2$ emissions. The government offers incentives to participants, including: the provision of information, assistance in setting practical goals, tax reduction or exemption, financial support for investment in necessary facilities, technical support and publicity when companies attain their goals. Participants set annual energy conservation goals and report implementation results, and the government regularly checks and monitors their progress. The government prevents free riders first by encouraging violators to re-implement the agreement, then by altering the level of support they receive, and finally by publicly announcing failure to comply.

Voluntary agreement programs are used to complement to other existing regulatory programs. There is a continuous process of communication between government and companies during the program, and throughout its course participants have the freedom to make their own decisions and seek the most economical measures available to increase energy efficiency.

The voluntary agreement program was introduced in 1998 and 11 companies, including POSCO and Samsung Corning, adopted it in the same year. As of April 2000,
105 workplaces belonging to 70 companies had concluded voluntary agreements.

Green Energy Family

Green Energy Family is a national energy saving program that was put into effect in October 1995 by the Korea Energy Management Corporation under the Ministry of Commerce, Industry and Energy. The program aims to help prevent global warming by promoting national energy efficiency, reducing environmental pollution, and minimizing energy expenses by reducing air pollution. The program consists of campaigns (e.g. events or planning announcements), partnerships between program headquarters and executors, and international cooperation. The Korea Energy Management Corporation, public institutions and private organizations take part in the Green Energy Family. Programs under the Green Energy Family are as follows:

- Green Lights Program: initiated in 1996, this program promotes wider use of high efficiency ratio lighting.
- Green Motors Program: initiated in 1998, this program promotes wider use of high efficiency ratio electric motors.
- Green Energy Design Program: initiated in 1999 this program promotes selection of high efficiency ratio equipment during the building design phase.

Green Energy Index

A Green Energy Index is determined by evaluating a company's level of environmental management and energy efficiency. The Korean Federation for Environmental Movement and Hankookilbo developed this index as an objective tool for evaluating the performance of environmental management systems and as a way to promote green energy management and improved energy consciousness. After receiving an application, the Korean Federation for Environmental Movement visits the company to conduct a field inspection. Companies that have done well both in energy efficiency and management performance aspects are selected as model companies. The Green Energy Index offers the following benefits:

- The index provides an integrated, indexed assessment of environment, energy and management.

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- Managers and workers can easily utilize the index to enhance production efficiency.
- The index positively motivates companies to improve instead of criticizing them.
- Consumers can identify green companies through the index.

2. The Limitations of Voluntary Environmental Management Systems

Voluntary environmental management systems are not used widely enough in Korea because government administrative mechanisms are mainly based on regulatory environmental management. Industry declarations of self-regulated environmental management lack consistency and tend to be used for external show. Another problem is that the governmental support system has not been sufficient to prompt industries to adopt voluntary environmental management programs. In general, there is also a lack of available programs developed to assist industry or business sectors. In the context of this study, it is also important to note that voluntary support systems designed to help SMEs adopt environmental management are insufficient.

The Designation of Environmentally-Friendly Enterprises is desirable in that it addresses the entire production process (and the pollutants generated by it). While this works well for large companies with sufficient proficiency in environmental management, it has limited potential to attract (or enable) SMEs to participate. Further, its absolute reach is further restricted from affecting an entire environment or business sector because it operates only at certain selected workplaces. In terms of the Recycling Target Ratio Commitment System, discussions between government and business to set goals are insufficient and the entire process is driven by command-control regulation rather than incentives. The Industrial Waste Reduction System does not provide sufficient analysis methods of waste types, production sources, etc. Although voluntary environmental management by Korean conglomerates began promisingly, a lack of voluntary evaluation or reporting systems allowed such efforts to disappear conspicuously after the advent of the Asian financial crisis. The intentions of environmental programs driven by Regional Governments are good, but suffer from a shortage of funding, resources and a primary implementation body.

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10 Moon, Hyun-Joo, Ki-Bok Chang and Young-Soon Lee, Research for an Environmental Performance Improvement Plan through Flexible Industrial Environmental Regulation Systems, Korea Environment Institute, 1999.
<Appendix> Supply Chain Management of Large Firms

1. Bayer Korea

   ① Responsible Care

   Responsible Care is an international movement by the chemical industry worldwide, in which they place high priority on matters relating to the environment, human health and safety. In other words, Responsible Care is a voluntary initiative by the world's chemical industry to continuously improve their performance in the areas of Safety, Health and the Environment.

   ② Bayer Korea Academy for Responsible Care

   Through RC activities, the chemical industry can restore confidence from the public, by improving the current status of ES&H. These activities will as a minimum expect compliance with existing regulations, to the benefit of the country and the chemical industry. RC must be approached as a matter of company morality, adding that in his view, RC is a movement for the chemical industry to pay their debts to society.

   The RC movement was launched in Canada in 1985. Thereafter, from Canada it spread to the USA, Europe, including Germany and the rest of the world. For several years, we at Bayer headquarters insisted that our overseas branches follow the movement of Responsible Care. Bayer Korea Ltd. has started preparing for the opening of Responsible Care Academy already four years ago.

   Bayer's vision for the Academy is to vigorously continue implementation of Responsible Care as part of our daily culture. The faculty members are Bayer AG, Inje University, Korea University, KISCO, KRCC, KCMA, KRICT and KRIIBB. This Academy still provide many voluntary courses on Responsible Care and Environment, Safety and Health subjects, as related to employees, partners and other stake-holders. Nobody will be required to participate in any compulsory courses.

   ③ Cultural Practice of Responsible Care at Bayer in Korea

   Bayer is a diversified, international chemical and pharmaceutical company. Its products help to satisfy basic human needs such as health, nutrition, clothing, housing, mobility and information. They serve to steadily improve the quality of life in all parts of the world and must therefore be safe to handle, safe to transport, safe to use and safe
to dispose of. Bayer is committed to conserving natural resources, operating its facilities safely and minimizing the environmental impact of its activities.

Comprehensive environmental protection, maximum safety, high product quality and optimum commercial efficiency are factors of equal importance for achieving our corporate objectives. The same standards apply at Bayer's subsidiaries throughout the world as at Bayer AG.

Success in the areas of environmental protection and safety requires a commitment by all the company's employees to apply their expertise responsibly in line with the principles of the international Responsible Care initiative. Appropriate training is provided for the employees, each of who must set an example by his or her behavior in regard to environmental protection and safety.

The schedule for cultural practice of responsible care at Bayer in Korea is following as:

- **Prevention**
  - Bayer Korea Academy for Responsible Care
  - Responsible Care Steering Committee of Bayer Group in Korea

- **Preparedness**
  - Guidelines for Responsible Care at Bayer
  - Make sure to have the right person, Equipment & Facilities at the right place

- **Response**
  - Emergency Response Committee
  - Emergency Response Network Internally & Externally
  - Emergency Response Application

- **Time Schedule**
  - The First Two Years (1998.7-1999.12): Pave the road for KRCC, KRCC is established on 1999.12.6, Bayer Korea RC Dept. is established and has a proven record.
  - The Next Two Years (2000.1-2001.12): Employees & Contractors of Bayer Korea are to be trained, Bayer Korea's Responsible Care is to be implemented.
  - The Future (2002.1-2003.12): 100% compliance to the Code of Management Practice (KRCC), Bayer Korea continues to be a champion in Responsible Care.

- **Hyundai Motors**

- **Award Program for the Environment of Cooperative Companies**

Hyundai Motors gives cooperative companies awards every year. One of them is the
award for technology, which contain environment. This is the program to give reward to the company that has a remarkable performance of environment. This aims to lead cooperative companies to environmentally-friendly business activities and participation of Hyundai Motors' environmental management, and make environmentally healthy and sustainable society.

奖赏评估标准

Hyundai Motors will reward environmentally-friendly part suppliers out of those who also match requirements of procurement department such as delivery due and R&D investment. The assessment manual is ASEM (The Assessment Scheme for the Environment of Cooperative Companies). It is applied to companies accredited as environmentally-friendly company or certified ISO 14000 when they attain great performance by environmental management. Assessment Criteria consist of general environmental management from awareness to pollution treatment. (Awareness and concern of environmental management, EMS, activities and publicity relevant to environment, R&D and application of green technology, emergency response network, public grievance and violation related to environment, pollution treatment, usage of energy and field supervision)

However, the company that has a record of an environmental accident in recent 3 years is excluded from the review even if they know that after award.

奖赏程序

They screen applications by general requisite and inspect a work place by ASEM. The examining committee selects final companies. The companies will be awarded at the end of the year after the approval of CEO. At the end of 1999, award companies in the environmental part are Dongwon Industry, Omyang, Siemens and OMRON Korea Co., Ltd.
IV. SMEs in Korea and Environmental Management

In order to understand the environmental management potential of Korean SMEs, it is first important to put into context the importance, history, industrial structure and influence of SMEs within Korean industry in general. Further, it is essential to understand both the domestic and international environment in which SMEs operate. Finally, issues of capacity (in terms of financial and human resources) must be addressed.

1. Definition and Status of the SMEs

1.1 Definition

The term small and medium enterprises (SMEs) is defined in Korea as a company employing less than 300 persons and with assets less than KRW 80 billion. There are exceptions however, and in some cases a company in a labor intensive industry may be classified as a small business even though exceeding 300 employees. On the other end of the spectrum, some companies with under 300 employees may not be classified as a small business due to their large capital assets.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Small and Medium Enterprises</th>
<th>Small Enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employees</td>
<td>Asset Amounts</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>300 or fewer</td>
<td>Less than 80 billion won</td>
</tr>
<tr>
<td>Transportation</td>
<td>300 or fewer</td>
<td>Standard not given</td>
</tr>
<tr>
<td>Construction</td>
<td>300 or fewer</td>
<td>Standard not given</td>
</tr>
<tr>
<td>Services</td>
<td>20 or fewer</td>
<td>Standard not given</td>
</tr>
</tbody>
</table>

Source: Framework Act on Small and Medium-sized Enterprises

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1 Hong, Soon-Yeong, Jang-Hyuk Park, Jong-Young Park, Status and Prospects of Small & Medium-sized Enterprises in Korea, Korea Small Business Institute, June 1999.
Data source: National Statistical Office
1.2 Importance of SMEs²

SMEs, in general, contribute to production expansion, income growth, job creation and technology development on a national level. SMEs fulfill a broad spectrum of important functions in enhancing regional development as well as strengthening the free market economy and democratic institutions. As of the present, Korean SMEs have played a vital role by creating jobs, raising incomes, and contributing to rapid economic growth through continuous technological innovation and production of quality goods.

SMEs have an advantage over conglomerates in their creativity, mobility, and ability to rapidly adjust to changes in their operating environment. Efficient provision of goods and services to fulfill customer needs helps to improve consumer lifestyles. However, SMEs are small scale operators and their excessive numbers have created fierce competition, resulting in a lack of capital, credit and marketing skills. Further, the difficulty for small scale operations to achieve an economy of scale poses a significant challenge for SMEs. SMEs require greater support to overcome these barriers and sustain growth. Sufficient support should be provided to SMEs for the following reasons:

- SMEs are the basic engine of economic growth in production, value-added, and employment. SMEs represent 99.2% of all manufacturing companies, and account for 70.5% of the total 2.32 million employees in the manufacturing sector. The value of SME production and value-added activities amounts to KRW 197 trillion and KRW 85 trillion, or 46.3% and 48.0% of the totals in these areas respectively.

- SMEs contribute to advancing the industrial structure and even development of industries and regions. SMEs have increasing influence within industry and growing mutual relationships through promoting balanced regional and sectoral development, serializing, and expertise sharing.

- SMEs contribute to increasing international competitiveness through innovation and product diversification. SMEs are adept at changing products rapidly in response to changing market conditions. SMEs are also able to create new industry sectors to fill specific market niches.

- SMEs contribute to social stability by reducing unemployment and unemployment driven poverty.

² Park, Jang-Hyeok, Comparative Analysis of local SMEs’ Competitiveness by Industry Sector, Korea Small Business institute, 1996.
IV. SMEs in Korea and Environmental Management

• SMEs provide goods and services in an efficient manner meeting consumer needs and improving consumers’ quality of life.

• SMEs contribute to equalizing distribution of economic growth. Many SMEs are located in and closely tied to suburban areas. They contribute to community development by providing income and employment.

SMEs are assigned a high degree of importance in the national economy because they perform a broad array of corporate activities and absorb new labor to create new workplaces to absorb excess labor and increase production. This function leads to stabilization and growth of the middle class. Furthermore, in a modern society, SMEs are able to produce small quantities of niche goods able to meet a wide range of consumer needs, increasing the importance of SMEs.

Above all, the importance of SMEs in the national economy is growing throughout the areas mentioned above, further justifying greater degrees of SME support. In addition, individual SMEs are not equipped to deal with many problems, such as growing economic localism and technical protectionism in overseas markets. Without adequate government support, it is possible that widespread failure of SME businesses could potentially lead to a national economic crisis.

1.3 Status Change of SMEs

Until 1976, growth of Korean SMEs was minimal because national growth strategy was centered around large conglomerates, focusing on the heavy chemical industry and exports. However, when government support became available in 1977, SMEs began to find business opportunities. The number of SMEs grew rapidly after 1980 and SMEs took an important position in the Korean economy.

The Framework Act on Small and Medium-sized Enterprises was passed in 1966. There are more than 79,000 small and medium manufacturing enterprises in Korea with a number of employees ranging from five to 300 persons.

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3 Park, Jang-Hyeok, Comparative Analysis of local SMEs’ Competitiveness by Industry Sector, Korea Small Business Institute, 1996.
Table IV-2. Status of SMEs

(Units: Number of Firms, Persons, %)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>SMEs</th>
<th>SME Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enterprises</td>
<td>Employees</td>
<td>Enterprises</td>
</tr>
<tr>
<td>All Industry</td>
<td>2,629,868</td>
<td>10,177,797</td>
<td>2,607,710</td>
</tr>
<tr>
<td></td>
<td>(2,697,098)</td>
<td>(11,100,491)</td>
<td>(2,672,983)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>99.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(99.1)</td>
</tr>
</tbody>
</table>

Note: ( ) is the number recorded at the end of 1997

Table IV-3. Number of SMEs by Year in Manufacturing Industry

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprises</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Number of Firms)</td>
<td>Total</td>
<td>91,372</td>
<td>96,202</td>
<td>97,144</td>
<td>92,138</td>
</tr>
<tr>
<td></td>
<td>SMEs</td>
<td>90,447</td>
<td>95,285</td>
<td>96,241</td>
<td>91,324</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>(99.0)</td>
<td>(99.0)</td>
<td>(99.1)</td>
<td>(99.1)</td>
</tr>
<tr>
<td>Employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,000 person)</td>
<td>Total</td>
<td>2,930</td>
<td>2,952</td>
<td>2,898</td>
<td>2,698</td>
</tr>
<tr>
<td></td>
<td>SMEs</td>
<td>2,026</td>
<td>2,034</td>
<td>2,006</td>
<td>1,870</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>(69.1)</td>
<td>(68.9)</td>
<td>(69.2)</td>
<td>(69.3)</td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(billion won)</td>
<td>Total</td>
<td>299,246</td>
<td>364,821</td>
<td>401,953</td>
<td>434,895</td>
</tr>
<tr>
<td></td>
<td>SMEs</td>
<td>143,421</td>
<td>169,785</td>
<td>187,926</td>
<td>201,464</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>(47.9)</td>
<td>(46.5)</td>
<td>(46.8)</td>
<td>(46.3)</td>
</tr>
<tr>
<td>Value Added</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(billion won)</td>
<td>Total</td>
<td>129,611</td>
<td>159,448</td>
<td>174,215</td>
<td>181,085</td>
</tr>
<tr>
<td></td>
<td>SMEs</td>
<td>63,768</td>
<td>73,808</td>
<td>82,281</td>
<td>84,148</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>(49.2)</td>
<td>(46.3)</td>
<td>(47.2)</td>
<td>(46.5)</td>
</tr>
</tbody>
</table>

Note: SMEs employing more than 5 person

At present, Korean SMEs are concentrated in seven manufacturing sectors - machinery and equipment, fabricated metal products, textiles, apparel and wool products, food and beverages, and rubber and plastic goods - representing 55.2% of all manufacturing firms in Korea and they are responsible for 42.8% of Korea's total exports. Of total SME exports in 1997, electronics and electric products account for 27.1%, textiles 23.5%, machinery and transportation equipment 17.0%, plastic, rubber and leather goods 6.5%, iron, steel and metal products 6.6%, and others 19.3% . SMEs account for the largest proportion of economic growth and are an undeniably
vital part of the Korean economy.

currently, Korean SMEs are increasing their influence to the industry and deepening their mutual relationships through well-balanced development and systemizing of various industries and regional distribution.

**Table IV-4. SME Status by Industry**

(Unit: Number of Firms, Person, %)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Total Enterprises</th>
<th>Total Employees</th>
<th>SMEs Enterprises</th>
<th>SMEs Employees</th>
<th>Enterprises Ratio</th>
<th>Employees Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>2,111 (2,344)</td>
<td>23,962 (29,660)</td>
<td>2,104 (2,337)</td>
<td>17,961 (22,288)</td>
<td>99.7 (99.7)</td>
<td>75.0 (75.1)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>278,923 (305,847)</td>
<td>2,979,763 (3,312,103)</td>
<td>278,068 (304,861)</td>
<td>2,149,274 (2,372,123)</td>
<td>99.7 (99.7)</td>
<td>72.1 (71.6)</td>
</tr>
<tr>
<td>Gas</td>
<td>267 (307)</td>
<td>8,999 (8,238)</td>
<td>188 (221)</td>
<td>1,587 (1,788)</td>
<td>70.4 (72.0)</td>
<td>17.6 (21.7)</td>
</tr>
<tr>
<td>Construction</td>
<td>63,186 (69,290)</td>
<td>711,225 (981,783)</td>
<td>62,932 (68,893)</td>
<td>463,740 (620,595)</td>
<td>99.6 (99.4)</td>
<td>65.2 (63.2)</td>
</tr>
<tr>
<td>Wholesale and Retail Trade, Repairing</td>
<td>963,162 (998,226)</td>
<td>2,433,235 (2,634,586)</td>
<td>955,171 (988,858)</td>
<td>1,999,779 (2,140,396)</td>
<td>99.2 (99.1)</td>
<td>82.2 (81.2)</td>
</tr>
<tr>
<td>Hotel and Restaurant</td>
<td>578,175 (583,892)</td>
<td>1,335,601 (1,402,179)</td>
<td>576,670 (582,330)</td>
<td>1,256,828 (1,311,393)</td>
<td>99.7 (99.7)</td>
<td>94.1 (93.5)</td>
</tr>
<tr>
<td>Transport, Storage and Communication</td>
<td>215,011 (212,294)</td>
<td>719,310 (725,563)</td>
<td>213,558 (210,764)</td>
<td>559,548 (560,166)</td>
<td>99.3 (99.3)</td>
<td>77.8 (77.2)</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>8,708 (8,687)</td>
<td>64,201 (83,957)</td>
<td>7,969 (7,896)</td>
<td>45,177 (45,092)</td>
<td>91.5 (90.9)</td>
<td>53.7 (53.7)</td>
</tr>
<tr>
<td>Real Estate, Rent and Business Service</td>
<td>149,466 (148,459)</td>
<td>830,129 (855,330)</td>
<td>143,494 (142,223)</td>
<td>408,078 (413,308)</td>
<td>96.0 (95.8)</td>
<td>49.2 (48.3)</td>
</tr>
<tr>
<td>Education</td>
<td>72,034 (78,194)</td>
<td>198,341 (224,177)</td>
<td>71,450 (77,617)</td>
<td>177,885 (202,965)</td>
<td>99.2 (99.3)</td>
<td>89.7 (90.5)</td>
</tr>
<tr>
<td>Health and Social Work</td>
<td>38,145 (35,426)</td>
<td>322,773 (300,400)</td>
<td>36,788 (34,367)</td>
<td>137,319 (126,438)</td>
<td>96.4 (97.0)</td>
<td>42.5 (42.1)</td>
</tr>
</tbody>
</table>
SMEs record higher investment efficiency compared to large conglomerates because their activities, such as parts production, processing, assembling and various service provisions are carried out at a relatively low cost and complement the activities of large conglomerates. One of main reasons behind the increase of Korea's foreign debt was excessive, overlapping investments, which led to an inefficient use of funds during Korea's economic development. However, because investments in SMEs tend to be small and have short payback periods, SMEs have been able to contribute to reducing foreign debt. In this aspect, SMEs are valuable, both directly and indirectly, in improving the balance of international payments. SMEs earn foreign currencies through direct export or by working as subcontractors for large conglomerates. Looking at the history of SME exports, SMEs recorded negative export growth until 1983. Exports grew quickly from 1984 to 1989, and but slowed again in the 1990’s. Despite such a mediocre performance, the growth ratio recorded by SMEs is high, as can be seen in the Table IV-5, and they continue to increase their proportion of total exports, accounting for 42.6% of exports in 1998.

**Table IV-5. SME Export Status by Year**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total exports</th>
<th>SMEs</th>
<th>SMEs/Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>180</td>
<td>42</td>
<td>23.3</td>
</tr>
<tr>
<td>1970</td>
<td>1,004</td>
<td>323</td>
<td>32.2</td>
</tr>
<tr>
<td>1975</td>
<td>5,427</td>
<td>1,871</td>
<td>34.5</td>
</tr>
<tr>
<td>1980</td>
<td>17,505</td>
<td>5,624</td>
<td>32.1</td>
</tr>
<tr>
<td>1985</td>
<td>30,283</td>
<td>8,414</td>
<td>27.8</td>
</tr>
<tr>
<td>1990</td>
<td>65,016</td>
<td>27,382</td>
<td>42.0</td>
</tr>
<tr>
<td>1995</td>
<td>125,058</td>
<td>49,474</td>
<td>39.6</td>
</tr>
<tr>
<td>1996</td>
<td>129,715</td>
<td>54,205</td>
<td>41.8</td>
</tr>
<tr>
<td>1997</td>
<td>136,164</td>
<td>56,910</td>
<td>41.8</td>
</tr>
<tr>
<td>1998</td>
<td>132,313</td>
<td>56,349</td>
<td>42.6</td>
</tr>
</tbody>
</table>

Source: SMBA and Korea International Trade Association
2. Environmental Management and SMEs

2.1 Changes in the International Setting

There is no doubt that the global economy is undergoing a process of reorganization. As testament, over 180 international agreements, including the Frame Convention on Climate Change, have been concluded, and 38 of which had been signed by Korea as of 1998. As governments sign onto international agreements they commit themselves to reducing pollutant emission and limiting the use of designated substances in their countries. As governments begin enforcing these changes SMEs are under pressure to adopt new management practices in order to meet growing environmental requirements both at home and in foreign markets. Domestic environmental measures taken by foreign governments have led SMEs exporting goods and services overseas to include environmental consideration in designing their production processes. Furthermore, as international standards of environmental management gain recognition, certification in one of the environmental management schemes has become a prerequisite for business in some cases or an advantage during the bidding process. Current environmental management trends are moving in the direction of industry standards. Furthermore, environmentally advanced corporations are beginning to exercise direct and indirect influence on SMEs that are export oriented or subcontract to them.

2.2 Domestic Situations and SME Capacity

As of the end of March 1999, Korea had 22 laws and 643 regulations relating to environment. Of these, 475 regulations are directly relevant to business activities, representing 75 percent of total environmental regulations. The Rio Declaration in 1992 precipitated increased expectations that enterprises take social responsibility for their environmental pollution, and today an environmental accident can render permanent damage to a company's image. Today, as thinking about the environment increases in sophistication, the conceptual framework for environmental investments is shifting from end-of-pipe treatment to pollution prevention, and it is recognized that early introduction of environmental management tools can give companies a competitive advantage.4 In Korea, SMEs are highly susceptible to supply chain pressures, and thus to demands that SMEs provide environmentally friendly products or resources.

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Korean SMEs have serious financial constraints due to relatively lower capital ratios and higher debt ratios as compared to large enterprises. Raising funds directly from the capital market is also difficult (compared to SMEs in advanced countries) due to the immaturity of the Korean capital market. Worse, a chronic customary collateral loan system prevents SMEs from obtaining funding from financial institutions such as banks. Financial institutions are reluctant to lend money to SMEs due to their inability to meet requirements for excessive collateral and compensatory deposits.\(^5\)

Though the Korean government provides some financial assistance for SMEs, many SMEs are unable to avail themselves to such aid. The procedure for obtaining assistance is complicated and the total funds available are too small to directly support all SMEs. In addition, SMEs often lack the expertise needed to understand and follow frequent legal and regulatory revisions.

Even when SMEs make an effort to overcome these difficulties and implement environmental management practices, they are confounded by a lack of easy access to information on the environment. This may be caused by a lack of expertise and the fact that locating information is time-consuming and expensive. This impediment is paralleled by the difficulty of finding and adopting appropriate environmental technology. Existing government support systems for technology are generally out of step with the needs of individual SMEs. In the face of limited resources, high quality management skills to optimize resource use are critical. However, most SMEs have poor integrated management skills and are unable to properly balance resources against limits to find the best possible solution.

<table>
<thead>
<tr>
<th>By support/ by scale of experts</th>
<th>Total number of firms</th>
<th>Using more than one</th>
<th>No using</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial support</td>
<td>100 (560)</td>
<td>12.7</td>
<td>87.3</td>
</tr>
<tr>
<td>Less than 20</td>
<td>100 (138)</td>
<td>5.1</td>
<td>94.9</td>
</tr>
<tr>
<td>21-50</td>
<td>100 (187)</td>
<td>12.3</td>
<td>87.7</td>
</tr>
<tr>
<td>51-100</td>
<td>100 (138)</td>
<td>13.8</td>
<td>86.2</td>
</tr>
<tr>
<td>101-200</td>
<td>100 (69)</td>
<td>18.8</td>
<td>81.2</td>
</tr>
<tr>
<td>More than 201</td>
<td>100 (28)</td>
<td>32.1</td>
<td>67.9</td>
</tr>
</tbody>
</table>

(1) Relationship between SMEs and Large Enterprises

Korea's economic development was founded upon export intensive industries and assembly intensive conglomerates. Greater division of work between SMEs and large conglomerates has made possible increased economic growth and development of a vibrant SME sector. The proportion of subcontracted manufacturing has increased from 25.6% in 1980 to 53.4% in 1990. Large enterprises provide a growing and diversified range of support to SMEs. Unfortunately, there is a limited collaboration between large enterprises and SMEs in the areas of technology innovation, core competencies that increase competitiveness, and finance. SMEs’ lack of technology leads to unequal negotiations with large companies, adversely affecting SME unit sales costs, resulting in SME impoverishment. In Korea, subcontractors work almost exclusively for a small number of customers. To understand the Korean context for SMEs, it is important to understand the high level of dependence of Korean subcontractors, even higher than that of Japan, which is generally acknowledged as having a very high rate of dependency. Of all subcontracting firms, 21.8% have business relations with a single large company and 62.0% do business with 5 companies or less. Unfortunately, these corporate relationships do not lead to competitive strength, and instead allow larger companies to take advantage of SME business partners.

Promissory notes present another serious problem in Korea. On average, 57.0% of settlement measures is promissory note, and from 1992 to 1996 its payback period was 136 days. As seen from the last economic crisis, such a situation can lead to a chain reaction of bankruptcies.

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(2) Financial Capacity of SMEs

It is noteworthy that Korean SMEs depend heavily on indirect financing, especially banking, and approximately 60% to 79% of their external financing comes from banking institutes. SMEs have a lower capital ratio and higher debt ratio than large enterprises. SMEs recorded 19.3% in stockholder’s equity to total assets and 418.4% in debt ratio at the end of 1997. Meanwhile, large enterprises showed 20.4% in stockholder’s equity to total assets and 390.0% in debt ratio. Companies in Japan and the USA recently moved to improve their financial structures because of the difficulty in remaining internationally competitive with a high debt ratio.

The establishment of small and medium-sized venture companies has been increasing, especially in the light of problems recently made apparent with centering an economic system around large enterprises. Financial restructuring resulting from the international trends and domestic conditions mentioned above has prompted financial restructuring which has been beneficial for SMEs. (See Table IV-7, 8 and 9)

<table>
<thead>
<tr>
<th>Table IV-7. Weighted Average Interest on Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Unit: %)</td>
</tr>
<tr>
<td>Weighted Average Interest</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Large Enterprises</td>
</tr>
<tr>
<td>SMEs</td>
</tr>
</tbody>
</table>

Note: Foreign bank branches are excluded.

<table>
<thead>
<tr>
<th>Table IV-8. Corporate Bond Issuing</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Unit: billion won, %)</td>
</tr>
<tr>
<td>Issues of corporate bonds</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Large Enterprises</td>
</tr>
<tr>
<td>SMEs</td>
</tr>
</tbody>
</table>

---

7 Baek Nag-Ki How to Vitalize Financing for SMEs, Korea Institute for Economics & Trade, 1998.
### Table IV-9. Stock Issue Status

(Unit: billion won, %)

<table>
<thead>
<tr>
<th></th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>Difference (b-a)/a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Amount of Stock Price</strong></td>
<td>27,736 (972)</td>
<td>136,334 (1,813)</td>
<td>358,572 (24,201)</td>
<td>163.0 (1,234.0)</td>
</tr>
<tr>
<td><strong>Large Enterprises</strong></td>
<td>21,683 (220)</td>
<td>133,798 (1,733)</td>
<td>347,364 (17,067)</td>
<td>159.6 (884.8)</td>
</tr>
<tr>
<td><strong>SMEs</strong></td>
<td>6,052 (752)</td>
<td>2,536 (80)</td>
<td>11,208 (7,134)</td>
<td>342.0 (8,871.5)</td>
</tr>
</tbody>
</table>

Note: Firms registered with KOSDAQ
Source: Financial Supervisory Board, Korea

(3) Human Resource Status of Small and Medium sized Manufacturing Firms

According to a survey conducted by the Small and Medium Business Association, as of the end of April 2000 small and medium sized manufacturing firms on average fell 4.8% short of the human resources necessary to run their operations. Compared to other companies, SMEs experienced a significantly greater shortfall of labor to perform both "expert" and "simple" work. Firms smaller and poorer faced more shortages than others did. The lack of manpower, especially high-quality human resources, has increased over the last 3 years.

### Table IV-10. Manpower Shortage Trends in SMEs

(Unit: %)

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average</strong></td>
<td>0.69</td>
<td>4.00</td>
<td>4.80</td>
</tr>
<tr>
<td><strong>Expert</strong></td>
<td>3.30</td>
<td>5.80</td>
<td>8.12</td>
</tr>
<tr>
<td><strong>Engineer and Quasi-Expert</strong></td>
<td>1.85</td>
<td>3.60</td>
<td>6.27</td>
</tr>
<tr>
<td><strong>Technical Service</strong></td>
<td>0.93</td>
<td>4.60</td>
<td>4.74</td>
</tr>
<tr>
<td><strong>Labor for Simple Work</strong></td>
<td>0.40</td>
<td>4.80</td>
<td>5.20</td>
</tr>
</tbody>
</table>

Source: Research on the Actual Condition of Human Resources, SMBA, August 2000.

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8 Research on the Actual condition of Human Resources, SMBA, August 2000.
2.3 SMEs’ Environmental Management Status

Environmental management is greatly affected by company leadership, especially in SMEs. The chart below shows the level of importance SME managers attached to environment, based on a 1998 survey.

![Figure IV-1. Relative Importance of Environment](image)


According to a recent survey, only 34.7% of Korean SMEs have a person designated with full responsibility for environmental issues. However, most SMEs do not employ anyone holding a relevant environmental license. These surveys serve to demonstrate the difficulties SMEs face in finding proper environmental managers.

<table>
<thead>
<tr>
<th>Table IV-11. Employment of the Person Qualified for Environmental Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Unit: Number of Firms)</td>
</tr>
<tr>
<td>No. of Employees</td>
</tr>
<tr>
<td>Enterprises</td>
</tr>
<tr>
<td>(Ratio)</td>
</tr>
</tbody>
</table>


---

Table IV-12. Number of Person who is in Charge of Environmental Management

<table>
<thead>
<tr>
<th>Enterprises (Number of Firms)</th>
<th>None (156)</th>
<th>1 (257)</th>
<th>2 (63)</th>
<th>3-5 (72)</th>
<th>6 or more (12)</th>
<th>Total (560)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprises (Ratio)</td>
<td>(27.9%)</td>
<td>(63.6%)</td>
<td>(15.6%)</td>
<td>(17.8%)</td>
<td>(2.8%)</td>
<td>(100.0%)</td>
</tr>
</tbody>
</table>


Few SMEs have obtained a certification for environmental management. This is in stark contrast with the proportion of SME companies that have received ISO 9000.

Table IV-13. Number of SMEs Certified as Environmental Management

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 9000</td>
<td>67</td>
<td>292</td>
<td>846</td>
<td>1,763</td>
<td>2,930</td>
<td>5,177</td>
<td>11,075</td>
</tr>
<tr>
<td>ISO 14000</td>
<td></td>
<td>17</td>
<td>33</td>
<td>37</td>
<td>100</td>
<td>187</td>
<td></td>
</tr>
</tbody>
</table>

Source: Statistic relevant to SMEs Small and Medium Business Administration, 2000

Facility investments by SMEs are small when compared to large enterprises. This ratio is far too small in comparison with the relative importance of SMEs in areas such as employment and value-added. SMEs’ poor investment ratio on the environment is another area in urgent need of improvement.
### Table IV-14. SMEs' Facility Investment in Manufacturing Industry

(Unit: 100 million won)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SMEs</td>
<td>65,128</td>
<td>64,810</td>
<td>50,087</td>
<td>18,323</td>
<td>34,821</td>
</tr>
<tr>
<td>Total</td>
<td>336,265</td>
<td>389,308</td>
<td>321,822</td>
<td>164,597</td>
<td>163,461</td>
</tr>
</tbody>
</table>

Source: Industrial Bank of Korea, The Korea Development Bank

### Table IV-15. SMEs' Facility Investment by Purpose

(Unit: %)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity Increase</td>
<td>60.2</td>
<td>55.1</td>
<td>59.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Old Facility Repair</td>
<td>52.4</td>
<td>47.7</td>
<td>48.3</td>
<td>49.3</td>
</tr>
<tr>
<td>Automation</td>
<td>31.6</td>
<td>33.9</td>
<td>25.6</td>
<td>22.7</td>
</tr>
<tr>
<td>New Product</td>
<td>16.4</td>
<td>17.7</td>
<td>18.2</td>
<td>17.5</td>
</tr>
<tr>
<td>New Business</td>
<td>6.8</td>
<td>8.0</td>
<td>7.3</td>
<td>5.7</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>2.4</td>
<td>3.3</td>
<td>7.8</td>
<td>7.0</td>
</tr>
<tr>
<td>FA·OA Infomationization</td>
<td>4.4</td>
<td>3.6</td>
<td>3.1</td>
<td>4.8</td>
</tr>
<tr>
<td>Environmental Pollutant Prevention</td>
<td>5.8</td>
<td>4.4</td>
<td>3.6</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Note: Ratio reflects multiple checks.

Source: Industrial Bank of Korea
<Appendix 1> Structure of Laws Relevant to SMEs\textsuperscript{10}

Korean laws relevant to SMEs consist of the Constitution, six general laws (including Local SME Act), three special acts and five relevant acts.

Article 123 of the "Constitution" protects and promotes SMEs, and encourages self-help organizations by the government.

"Framework Act on Small and Medium Enterprises" stipulates subjects and directions for SME promotion policies.

"Support for Small and Medium Enterprise Establishment Act", "Act on Special Measures for Supporting the Small-scale Businesses" and "Act on Special Measures for the Promotion of Venture Businesses" stipulate support systems encouraging business start-ups of SMEs, promotion of small companies and facilitation of start-up venture companies.

"Promotion of Small and Medium Enterprises and Encouragement of Purchase of Their Products Act" and "Act on Special Measures for Supporting the Structural Improvement and Managerial Stabilization of Small and Medium Enterprises" stipulate systems to procure goods made by SMEs, expand SME market and improve structure and management of SMEs.

"Act on the Protection of the Business Sphere of Small and Medium Enterprises and Promotion of Their Cooperation" and "Act on the Subcontract Trade Fairness" stipulate systems required to prevent large companies from intruding SME business sphere and conducting unfair trading, thereby inducing enhanced mutual cooperation among companies.

"Small and Medium Enterprise Cooperative Act" stipulates systems concerning organization of cooperatives and operation of Mutual Assistance Fund.

"Act on the Balanced Region Development and Promotion of Regional SMEs" and "Act on Special Measures for the Deregulation of Corporate Activities" stipulate systems to facilitate the start-ups, company management and induce balanced development between large cities and provinces by promoting regional SMEs.

The Industrial Bank of Korea, Korea Credit Guarantee Fund and Korea Technology Credit Guarantee Fund have been respectively established under the "Industrial Bank of Korea Act," "Korea Credit Guarantee Fund Act" and "Act on the Support for New Technology Business Finance". They are resolving fund-raising difficulties that SMEs face by providing loans and credit guarantees.

\textsuperscript{10} Hong, Soon-Yeong, Jang-Hyuk Park, Jong-Young Park, Status and Prospects of Small & Medium Enterprises in Korea, Korea Small Business Institute, June 1999.
<Appendix 2> Major Supporting System for SMEs

(1) Structural Improvement and Stronger Competitiveness

① Cooperation between Business Enterprises

Comparatively weaker than large business enterprises in economic terms, SMEs may launch joint projects to combine their organization and business resources to strengthen their negotiation and lobbying power for better and expanded business opportunities. The Small and Medium Enterprise Cooperative Act has been used for this purpose and for the inauguration and operation of SME cooperatives.

Viewing the fact that restructuring of large businesses are affecting SMEs taking the form of outsourcing, the government enacted the Act on the Protection of Business Sphere of SMEs and the Promotion of Their Cooperation to help SMEs cope with the changing business climate in January 1995. Under provisions of this law and otherwise, the government has been promoting business linkage between SMEs, transfer of business from large companies to SMEs and fair trade practices with respect to SMEs.

② Support for Small-Scale Enterprises and Women-Owned Business

The SMBA now made it possible for SMEs to apply for government supports by just presenting their business registration certificate. It reflected the fact that it is hard for small-scale enterprises with less than 50 employees to qualify required conditions suggested by the government because of their business scale and financial status. This office also has a mutual credit fund raised jointly by small businesses for emergency loans.

The Women-owned Business Promotion Act is being drafted for legislation with the objective of giving priority to women proprietors in SME support programs and of helping businesswomen start or improve their own businesses.

(2) Support for Business Stabilization

Conditions for obtaining loans are made easier and scope of unsecured loans is expanded for SMEs in financial difficulty. In addition, due measures are planned to relieve the manpower shortage at SMEs and expand the market for their products by

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means of improving distribution systems and otherwise.

1. Financial Assistance

The Financial Impediment Report Center is operated to ease loan conditions for SMEs that have weak credit ratings and little collateral. This center either provides information or offers consultation services and organizes meetings with representatives of financial institutions and other related organizations in the interest of SMEs.

Special financial support is extended to SMEs possessing promising technology and business prospects but are in danger of bankruptcy due to the insolvency of other businesses that owe them payment for goods or services supplied. Recommendations have been made to tax authorities concerning a change in the tax law to favor SMEs undertaking restructuring.

2. Credit Guarantees for SMEs

The government is operating a Credit Guarantee Fund for SMEs that have no way to provide collateral for loans. In addition, the Technology Credit Guarantee Fund has been established to better support those who have new technology as the basis for venture companies or other such businesses. These two funds issue credit guarantees on behalf of promising business concerns which need them to raise funds.

In order to protect SMEs from becoming insolvent or going bankrupt because of dishonored commercial bills they have received in payment for products or services they have supplied, a commercial bill insurance system has been put into operation. Under this system, companies can insure commercial bills for compensation in case these bills cannot be collected due to the collapse of the companies that have issued them.

3. Support for Manpower Development

The Foreign Industrial Technical Trainee System and the Industrial Skilled Worker System have been put into practice to supply manpower to SMEs. The former is significant in that it offers training in advanced technology in Korea for trainees from developing countries and the latter makes it possible to assign surplus military draftees to SMEs to substitute for their military service, providing SMEs with quality manpower.

Currently under promotion is the institution of vocational training courses in formal education curricula for the uninterrupted supply of technical manpower and the expansion of childcare facilities for women so that they may have greater opportunities
to participate in economic and productive activities.

As another means to ease manpower shortages and supply quality manpower for SMEs, a stock option system is widely applied together with programs promoted to use military draft-age young people for industrial research programs in lieu of regular military service and attract high quality business managers to venture business companies.

Programs for training of skilled workers and retraining of retired manpower are expanded as well.

(3) Technology Innovation Assistance

① Assistance for SMEs to Develop Technology

The government is implementing technology innovation development project by investing money in SMEs so that they can develop technology. This is designed to help such companies enhance technology and spread technology innovation environment.

Moreover, the central government and local autonomous organizations have created funds aimed at providing support to provincial SMEs when they take advantage of technology available at nearby campuses and research organizations. Technology development projects have been encouraged via establishing a consortium involving industry, academia and research institutes.

In addition, the government is pursuing the Korea Small Business Innovation Research Program by channeling part of the government budget for research and development (R&D) to help SMEs develop technology.

② Technology and Quality Guidance for SMEs

In cooperation with its provincial offices, SMBA is providing on-site technology guidance. When companies have difficulty in securing technology in the process of production, they can get advice and consultation services from professors and research fellows through the coordination of the SMBA provincial offices.

A 100-PPM quality innovation movement is implemented to help SMEs improve their quality management capability. Information on quality management techniques and know-how is provided to SMEs with the aim of reducing defects in production.

In addition, the administration has teamed up with the ISO, IEC and European Union to disseminate information on global standardization technology.
③ Technological Competitiveness Analysis of SMEs

A regular survey of corporate technology demand has been instituted to develop the real picture of technological competitiveness of SMEs. On the basis of the surveys, the administration provides guidance and information to SMEs through its Comprehensive Technology Assistance Center.

SMBA provides technology solutions to SMEs through the National Technology Quality Institute. An entrustment research system has been put in operation for the purpose of developing technologies on behalf of SMEs and transfer technology to them.

The Home Doctor System is another of the key features of SMBA's technology assistance program for SMEs. Under this program, researchers visit individual SMEs to provide technical assistance and guidance. The administration also tests, analyzes and evaluates products aimed a helping SMEs improve the quality of their brands.
V. International Environmental Management Precedents

SME environmental performance is a problem around the world. Over the last twenty years, substantial progress has been made in motivating large companies to improve their environmental performance. Progress has been due to a combination of factors. The biggest influence has been increased consumer/public pressure that has demonstrated itself through market channels and investment habits. New consumer attitudes have also encouraged governments to improve regulatory controls, especially enforcement. Unfortunately, despite major steps by large companies, many SMEs have consistently performed poorly and tend not to use new environmental management tools such as EMS.

Poor environmental performance is already a serious problem for government and is becoming a problem for business. SMEs do not consider environment a priority, and typically use out-dated or low-tech manufacturing approaches that often create serious pollution problems. Dirty SMEs pose a serious challenge for government agencies seeking to maintain environmental quality. At the same time, large companies are becoming concerned about poor SME performance. Large companies are now increasingly held responsible for the actions and environmental performance of their SME suppliers. Even when a business relationship does not exist, large companies with high visibility often worry that poor behavior by smaller companies will create a bad image for their industry sector. Usually, poor industry image is more of a problem for large, well-known companies than SMEs. In searching for a solution, both governments and large businesses are looking at EMS. An EMS provides the internal framework that supports environmental performance improvement, and allows companies to adopt other tools such as cleaner production, pollution prevention, and waste minimization. Therefore, governments and large business both see EMS as the first step in improving SME environmental performance.

The internal reasons for SMEs not using EMS are well known. SMEs lack manpower or money to invest in environmental protection. SMEs lack technical expertise. Many SMEs don't understand environmental laws and requirements. SME culture does not emphasize environmental protection. Equally important are external factors. Fundamentally, SMEs are not pushed to improve. Weak enforcement by environmental agencies allows SMEs to operate without fear of significant penalty. Few environmental agencies have the money, the manpower, or the political strength to pursue rigorous enforcement against SMEs. Secondly, SMEs lack a business incentive to improve their
environmental management. Most SMEs operate in markets where their environmental performance is unimportant or their actions are invisible. Nobody tracks SME performance on a consistent basis. SMEs do not have brand name products to defend and many sell to customers who do not ask about their environmental performance.

This chapter looks at some of the new approaches by the government and business communities in the United States, Taiwan, Europe, and Mexico to overcome these obstacles and push SMEs to adopt better environmental management practices. Both government and industry groups have started their own programs. There are also several new examples of Government Industry Synergy Programs (GISP) that use the strengths of both government and business to target SMEs.

Programs designed by government agencies tend to rely on government for a rule-maker/judge and its ability to provide resources. The review looks at the programs undertaken by environmental agencies in the United States, Taiwan and the Netherlands to promote EMS amongst SMEs. The USEPA combines technical assistance, public recognition, and preferential regulatory treatment for SMEs who attempt to implement EMS. In Taiwan, financial assistance for EMS has been coupled with a Corporate Synergy System designed to reach SMEs through larger customer companies. In the Netherlands, the government works through industry groups such as trade associations to introduce EMS to SMEs.

The private sector has also taken independent actions to influence SMEs using supply chain relationships. Demands by purchasers to improve environmental performance have a powerful impact on SMEs and create a business incentive to adopt EMS. Both individual companies and industry groups have developed guidelines for evaluating supplier environmental performance that can be used in the procurement process. One example is the Computer Industry Quality Conference (CIQC) that has developed a questionnaire for use by companies in the electronics industry. In addition to industry group efforts, individual companies also use a number of tools to encourage suppliers to improve environmental performance. Companies are typically motivated by a desire to minimize risks and potential liabilities caused by suppliers. This review provides an overview of efforts by individual companies and then reviews the CIQC standard.

A third type of program is emerging in the form of government-private sector partnerships that leverage the strengths of each group. Such programs are designed and implemented by the private sector and supported by resources from government agencies. The programs benefit government by expanding their reach into the supply chains of major companies at a low cost. Industry benefits from an improved image, additional resources to support their efforts, and less likelihood of new government
regulation. This review looks at the example of the Taiwan Responsible Care Association established by the chemical industry and the Guadalajara Environmental Management Pilot in Mexico.

So far, no one approach has offered a complete solution. Government programs benefit from having financial resources available, but lack reach and do not create a motivation for SMEs to participate. Industry programs create a strong incentive for SMEs and provide access to valuable technical experience. However, the number of supply chain programs is limited and companies must still balance their environmental expectations against traditional buying criteria such as cost and product quality.

The solution to the SME problem lies in a combination of various approaches being tried. This review presents an overview of programs underway in public and private sector. Sections are broken into:
- Government programs
- Government Industry Synergy Programs (GISP)
- Private Sector Supply Chain Environmental Management

Each program profile is followed by summary conclusions and recommendations. The final section summarizes recommendations for KMOE initiatives to promote EMS adoption by SMEs. This chapter is based on an extensive review of secondary literature supplemented by direct communications with program administrators where feasible.

1. Government Programs

1.1 United States Environmental Protection Agency

The US Environmental Protection Agency (USEPA) promotes environmental management systems as part of their effort to move companies "beyond compliance". Although not all programs / policies directly target EMS or SMEs, they provide an idea of incentives or drivers which could be adapted by KMOE. In addition, local governments in the US have initiated a number of EMS or SME-targeted programs. In general, the programs outlined in this section will focus on alternatives to command-control regulation. The USEPA programs selected are based on voluntary participation. Although the effects of these programs are still limited in scale, voluntary participation and use of business intermediaries has been key in reaching SMEs that are otherwise invisible to regulators. Informal USEPA estimates are that roughly 20% of program participants to date have been SMEs.
Program Components

Most government regulatory programs are aimed at ensuring SMEs comply with the law. EMS is not a legal requirement, and is viewed by SMEs as a burden because no incentive is given to adopt EMS. To solve this problem, the USEPA has experimented with:

- Regulatory policies,
- Traditional outreach programs, and
- Incentive based voluntary programs

New Regulatory Policies

These policies remove regulatory obstacles to SMEs adopting EMS. SMEs are often mistrustful of government assistance efforts. Many SMEs fear that government assistance will lead to increased inspections or fines if problems are discovered. Removing this mistrust is key if SMEs are to accept government help in establishing EMS. The USEPA passed a number of regulations providing a legal mechanism to reassure SMEs of the government’s good faith. These include the Small Business Regulatory Enforcement Fairness Act, the Enforcement Response Policy, the Policy on Compliance Incentives for Small Business, and the Final Policy on Self-Auditing and Self-Disclosure among others. These regulations essentially:

- Provide SMEs with legal protection for problems discovered during the administration of technical assistance, and
- Provide protection from fines for voluntary disclosure of environmental problems

For example, SMEs enjoy a six-month grace period to correct violations discovered through technical assistance, audits, or voluntary disclosure. Similarly, all civil penalties are waived when the SME makes a good faith effort to correct the problem, such as accepting technical assistance or implementing an EMS.

Traditional Outreach Programs

Traditional outreach programs give SMEs the tools necessary for EMS implementation. The USEPA has identified SMEs as a target group for EMS adoption and made a significant effort to provide them with resources to enable EMS adoption. This includes:

- EMS implementation assistance materials (such as a simplified EMS guide)
- Established an office dedicated to providing information and assistance to SMEs
- Organized training and workshops
- Drafting a cross-agency USEPA EMS promotion plan which includes SMEs
Copies of this information are widely available.

3 Incentive Based Programs

USEPA incentive programs combine elements from new policies and outreach programs, but go a step further in providing incentives for companies to adopt EMS. EMS is a prerequisite for participation in most USEPA programs aimed at encouraging companies to voluntarily exceed environmental requirements and improve overall environmental performance. By participating in these programs, companies enjoy a number of incentives, including:

- Public recognition
- Regulatory flexibility
- Peer mentoring opportunities
- Technical assistance and financial benefits

4 Public Recognition

The USEPA's "Performance Track" program (which began summer 2000) will publicly recognize companies with an exemplary EMS (including the performance, evaluation, and reporting aspects of an EMS). Participation in a widely publicized program can provide some companies with an advantage in the marketplace. While public recognition does not provide a tangible business incentive for SMEs, it may motivate larger companies to become involved in programs that would require their assistance to SME suppliers or customers (see section on SCEM).

5 Regulatory Flexibility

The term "regulatory flexibility", or "regulatory relief" refers to environmental enforcement agencies offering special regulatory incentives for top environmental performers. Examples of regulatory flexibility include:

- Fast track permitting,
- Reductions in the number of inspections, paperwork, or fines, etc

These benefits are not available to companies with poor environmental performance records. Reduced inspection costs and saved time, both of which are particularly meaningful for SMEs, provide a business incentive for SMEs to go beyond compliance and adopt an EMS. In the Environmental Leadership Program, a pilot project that led to Performance Track, companies with a top of the line EMS were exempted from routine regulatory inspections and received a grace period to correct environmental violations.
Peer Mentoring

While SMEs are wary of government assistance efforts, industry peers provide a safe and cost-effective way of improving environmental performance. Programs that provide peer mentoring are more effective at reaching SMEs. For example, John Roberts Company (JRC), a printing company, mentored four smaller printers while participating in the Environmental Leadership Program. JRC helped smaller companies develop their EMS through personal visits and calls. It also helped them to develop concrete tools, such as organizational systems and guidelines, to ensure regulatory compliance. Mentoring also helps larger companies to better understand their own EMS (see also section on GEMP for more on the problem of large companies and EMS). Other large-scale programs, such as those included in Partners for the Environment, allow participants to join an industry network of partner companies to share experiences, best practices, and problem solving methods.

Technical Assistance & Financial Benefits

Reasons not to adopt EMS by SMEs commonly include lack of technical and financial resources. Government programs that can resolve these problems remove an important obstacle to SME adoption of EMS. The question remains of whether government agencies themselves have the technical and financial resources available to offer wide scale assistance. Partners for the Environment Programs combine technical assistance and financial incentives to encourage company participation. By joining the one of the programs under Partners for the Environment, companies are given access to technical assistance through USEPA manuals, software, workshops, technology demonstrations, and peer networks. EPA manuals include some EMS material, but also a significant amount of technical recommendations on pollution prevention. The USEPA widely advertises cost savings companies make by participation. For example, GTE (a large telecommunications company) saved US$ 2.4 million in waived environmental fines. The numbers for SMEs are less impressive, but meaningful for smaller companies. One SME, Centerplex, saved US$23,000 through adoption of energy efficiencies. There are over twenty different partnership programs under the "Partners for Environment" framework, aimed at helping companies to better manage resource use, waste production, and pollution to air, water and land. Although these programs are not specifically aimed at EMS or SMEs, an EMS based program should also successfully convey the idea of cost savings to be persuasive for SMEs.
Outcome and Lessons Learned

One of key lessons from the USEPA experience is that government agencies must find a way to encourage SMEs to come forward and participate in programs. SMEs generally are cautious about participating in programs since they might call attention to themselves. Finding the right incentive is not easy. Government lacks the strength of a direct business relationship and offers of public recognition, regulatory forgiveness, and technical assistance will vary in value among different SME groups. To date, USEPA efforts are still very broad and there are no programs focusing exclusively on promoting EMS to SMEs.

Despite these questions, structure of the USEPAs voluntary programs does offer a model worth considering the KMOE could consider building on USEPA experience by creating a pilot program to promote voluntary EMS program for SMEs which:

- Publicly recognizes companies that mentor SMEs in EMS adoption.
- Provides regulatory relief, such as reduced fines, and guarantees protection from violations discovered through government EMS assistance.
- Combines EMS with training in specific skill areas such as waste minimization which will lead to reductions in environmental costs (such as noncompliance fines or waste disposal fees).

A successful pilot project could be easily scaled up to the national level. The government can try to draw SMEs into the regulatory net voluntarily by offering incentives such as recognition and promises of suspended fines in return for establishing an EMS. Once brought into the framework, KMOE can continue to work with the SMEs and track their improvement.

1.2 The Netherlands

The Netherlands approach to EMS combines many aspects of government-industry partnerships discussed elsewhere in this document. The Netherlands encourage SMEs to adopt EMS using a consensual, indirect, steering model. This section draws on the work done by Theo de Brujin and Kris Lulofs as described in their article, “Driving Small and Medium sized Enterprises towards Environmental Management Policy Implementation in Networks.” In this model, government agencies work indirectly through trade associations to persuade, inform, and guide SMEs based on voluntary agreements. This has been successful according to de Brujin and Lulofs survey the program.
Program Components

② Background Voluntary Agreements

To understand more about the Netherlands promotion of EMS, a little background on the Dutch government’s environmental policy regime is needed. With formation of the first National Environmental Policy Plan (NEPP) in 1989, the Dutch government radically altered its approach to environmental problems. The NEPP identifies environmental themes, such as waste disposal or acidification, sets goals for improvement, and identifies responsible sectors. Responsible sectors, such as industry or agriculture, are then engaged in negotiations to determine how these goals will be met. It is this partnership approach, based on consensus and voluntary agreements that is the hallmark of the Dutch environmental regime.

However, the Dutch government discovered early on that policy goals are often set without regard to the ability of SMEs to meet them. The 1989 Memorandum on Environmental Management was intended to address this need by having companies adopt EMS. EMS gives companies a formal system and tools to meet their obligations under voluntary sector agreements.

② Players and their Roles

Within this policy framework, the roles of principle organizations (companies, industry and government) change from traditional command-and-control regimes. The roles of the various groups can be summarized as follows:

<table>
<thead>
<tr>
<th>Major players and their roles in the Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Government: Identifies environmental themes, sets goals and determines responsible sectors</td>
</tr>
<tr>
<td>- Industry/Trade Associations: Represents companies in negotiations, provides guidance/information on how to meet environmental obligations and exerts pressure on free-riders</td>
</tr>
<tr>
<td>- Companies: Responsible for meeting their obligations under voluntary sector agreements</td>
</tr>
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Under this framework, the government works only indirectly with SMEs. However, the government still retains a number of regulatory tools to punish free riders if industry sectors fail to meet their obligations. These include:
- Direct regulation
- Permit controls
- Increased inspections
Direct regulations deny companies any flexibility in determining how they meet their obligations, so it is generally in their favor to fulfill voluntary agreements.

3. Promoting EMS through Industry Networks

It is well documented that governments are ineffective at reaching SMEs due to their distance and infrequent interactions. Trade Associations however are directly in contact with SMEs, and viewed as much more credible when promoting EMS concepts. The theory is that by providing information and support through trade associations, the cost and risk of EMS implementation can be reduced enough to make it appealing to SMEs.

In the Netherlands model, government agencies worked to establish reliable network connections, and increase the frequency of communications between trade associations and their members on EMS. Distribution of information and guidance tools through these networks is more effective than through government networks. By increasing the exposure of SMEs to EMS concepts and tools, their willingness to adopt EMS also increases.

A study by De Brujin and Lulofs showed that trade associations were effective at advancing the concept of EMS. Of companies surveyed, almost all were familiar with EMS terminology, over half had supporting materials or attended informative meetings, and 43% received implementation support through the trade association. Furthermore, 90% of companies were either orienting their EMS efforts or had begun initiating EMS. Further research revealed a positive correlation between the active industry networks and the adoption or attitude level towards EMS by SMEs.

Admittedly, it is difficult to prove a direct connection between trade associations and SME adoption of EMS, and 100% reliance on trade associations is probably too risky for most government agencies. However, these survey results provide strong evidence that industry networks are effective at convincing and supporting SMEs in the adoption of EMS.

Conclusions

The Netherlands case provides further evidence that a cooperative approach between government and industry is effective in the promotion of EMS in SMEs. However, the Dutch context may not be totally representative of conditions in Korea. Dutch society stresses consensus based decision-making processes, and the idea of partnerships or voluntary agreements to improve environmental performance are generally accepted. The role of the trade association in the Korean regime and its effectiveness in promoting EMS may be limited. However, in combination with other policy initiatives, industry
networks can be useful, especially in light of their ability to distribute information to SMEs. Suggestions for the government include:

- Clearly defining the role of EMS in the KMOEs environmental policy regime
- Explorative studies on the effectiveness of Korean trade associations in affecting SME behavior
- Allocating resources (financial, technical, and informative) that can be provided to SMEs through extension networks

Pending study results, KMOE may want to initiate pilot trade association programs with select industry groups to promote EMS to SMEs. Program goals could be established through voluntary agreements and allow the associations to determine how to meet goals. SME assistance resources could be distributed through industry networks.

1.3 Taiwan Industrial Development Bureau

With 652 certified firms, Taiwan is No. 2 in Asia and No. 6 in the world for ISO 14001 registration. This achievement is attributed to the Taiwan Industrial Development Bureau's (IDB) decision to aggressively push companies to adopt certified environmental management systems (EMS). This decision grew from IDB's early work on industrial waste minimization (IWM). In providing assistance for firms to set up IWM programs, IDB became aware that without an effective environmental management system, IWM efforts would be short-lived or limited in their effectiveness. The decision to promote ISO 14001 over other EMS was due to ISO's widespread international acceptance. However, IDB sees the limits of ISO alone and is broadening the scope of its EMS program. At the same time, IDB was also heavily influenced by concern over international competitive trends. Many experts believed that Taiwanese suppliers would soon require ISO 14001 certification in order to remain competitive in European, Japanese, and North American markets.

Program Components

Taiwan's success in EMS promotion is due in large part to the establishment of a comprehensive framework of policies, programs and agencies. The government has built this program by:

- Holding an effective public awareness and information dissemination campaign
- Targeting EMS promotion efforts at industry sectors most likely to be receptive to ISO
- Providing financial assistance.
While a large number of companies have become ISO 14001 certified through these efforts, there is still little documentation of the tangible environmental benefits, especially for SMEs. However, the IDB is currently conducting an in-depth evaluation of the environmental performance of companies with ISO 14001 certification and results should soon be available.

③ Public Awareness and Information Dissemination

When the ISO 140001 standards were first released, the IDB began to sponsor a series of 2-3 day training courses to raise awareness, and launched a newsletter (which is also available online). Since the program began in 1994, over 170 workshops have been held with over 10,000 participants. A number of implementation guides, videos, and technical manuals have also been compiled. The goal of the materials is to provide SMEs with information on key technical areas, such as environmental aspects, that are difficult for SMEs. There are currently nine sector specific EMS guidance manuals available or being prepared, including the printed circuit board, metal parts fabrication, synthetic resin industry, ceramic tiles, stone products, paper, textile dying and finishing, electrical equipment and appliances, and information industries.

② Targeting Promotion Efforts

Part of IDB’s success comes from centering EMS / ISO 14001 promotion efforts in Taiwan around new industries as opposed to sunset industries. Around 30% of certified firms fall in the electronics industry, and 20% in chemical manufacturing. Because these industries are globally competitive, they are more susceptible to international pressures for EMS certification. For example, an association of Japanese electronics manufacturers recently came together to require all of their Taiwanese suppliers to obtain ISO 14001 certification within two years.

③ Financial Assistance

Another important component is the large sums of financial assistance available to Taiwan companies through the IDB to reduce the costs of implementation. Sufficient financial help has had a major influence on companies’ willingness to invest in ISO 14001 certification. Nearly 25% of Taiwan’s certified companies received financial assistance from the IDB. Firms selected for IDB demonstration projects receive from 40-60% of their costs after receiving certification. Because of the limited financial resources of SMEs, and to encourage them to adopt EMS, SMEs can receive financial assistance of up to 60% while larger firms are limited to 40%.
The Taiwan EPA is also considering offering regulatory privileges to certified companies pending the results of studies on the performance of ISO 14001 certified companies. Privileges may include reduced paperwork, fast track permitting, and reduced auditing and inspections.

Going Beyond EMS

Both domestically and internationally in Taiwan, there is a growing realization that companies are more receptive to an integrated as opposed to a piecemeal approach. The former combines a range of tools including IWM, environmental performance evaluation (EPE), LCA, and company environmental reporting (CER) within the EMS implementation/certification framework and the latter separately teaches each skill/tool. For this reason, the IDB now provides integrated technical assistance for environmental management. Linking EMS to other tools also helps guarantee that an EMS has concrete applications within a company. Besides beginning to require that technical assistance providers integrate training on traditional EMS components such as IWM or EPE, the IDB is now encouraging firms to include health and safety in their EMS. In addition, all 65 firms receiving financial assistance in FY2000 will be required to prepare CERs.

Taiwan's Corporate Synergy System

While Taiwan is a world leader in ISO 14001 certification, only 15% of certified firms are SMEs. To stimulate greater SME adoption of EMS the IDB developed a program called the Corporate Synergy System (CSS) to target SMEs using supply chain relationships. CSS was modeled on a Taiwanese Supply-Chain Quality Management Program and adapted to address environmental issues. Under CSS, large companies ask their suppliers to accept training in IWM and EMS. IDB provides the technical assistance and financial resources to support the program. The large companies benefits from cleaner suppliers that reduce their liabilities and can support the large company’s EMS/waste minimization efforts. SMEs are less susceptible to public or regulatory pressure, so CSS leverages the influence larger companies have over their SME suppliers/buyers. Government then provides the pull by offering free cleaner production/EMS assistance, a benefit for both the SME and the large company.

Origin and Current Status

The CSS initiative in Taiwan originally arose from two sources,
- Complaints by Taiwan’s legislature that IDB efforts had not extended sufficiently to SMEs, and
- Requests by larger companies for assistance to help their suppliers better manage environmental responsibilities.

There are currently 13 CSS programs involving 150 companies under implementation. Furthermore, the IDB is currently considering giving preference to companies involved in CSS for awarding technical assistance. This would greatly increase the incentives for large companies to involve their suppliers/buyers in CSS or risk losing technical assistance crucial to their market competitiveness.

**Starting a CSS**

The IDB publishes an annual bulletin of companies suitable to serve as the central company in a CSS. Qualified companies are experienced in CP or EMS, have commitment from top management, and a sufficient number of SMEs suppliers to participate. A CSS starts when a large company agrees to join and use their leverage to gain the support of top management in its suppliers/buyers, or satellites. CSS introductory classes are held, and a screening process initiated to select suitable satellite companies. Once top management from both sides have agreed to support the initiative, program goals, framework, implementation teams, and a schedule are set. The government encourages both central and satellite firms, as well as providing funding for technical consultants to assist both in program implementation. The central company plays an important role throughout the program, providing incentives to satellites as well as overseeing their progress (through audits or reviews) and providing technical assistance when necessary.

**Program Implementation**

Programs generally start with training for the staff from participating companies. Training for management is focused on (i) convincing them of the benefits of EMS or cleaner production, and (ii) on specific technical issues for operations staff. Next, teams are assigned from company staff to carry out audits of plant facilities and employee feedback is used to determine the key tasks for the SME's program. Finally, after the review of the options, an action plan is developed. Once the program is in place continuous improvements should be made. Throughout the process, the government and the central company provide technical assistance and help with developing pollution reduction strategies.

The success of a program depends on:
- Relationship between the central and satellite companies
- Participation of large companies (especially procurement staff) in facility audits of satellite companies
- Attitude of satellite companies

If the central company is a major customer, satellite companies are highly responsive to requests for participation. If the business relationship is not strong, SME participation is weak. When the program begins, if the central company sends staff to accompany government trainers, results are better. This is especially true when procurement staff are sent, because a direct business link is provided. In addition, once procurement staff is involved in a CSS, they begin to include environment when dealing even with suppliers outside the CSS program. This significantly expands the benefits of CSS. Finally, internal company culture or education levels also affect results.

4 CSS & EMS

CSS programs began by providing assistance to SMEs to implement clean production (CP). However, the potential of CSS to encourage adoption of EMS by SMEs is clear, and IDB now incorporates EMS, as well as safety management, in all CSS programs. Because of their interrelationship, this does not create an extra burden for participants. Furthermore, as in IWM, EMS is crucial to the overall sustainability of CP efforts. Because CSS leverages the dependence of SMEs on larger customer companies, it is effective at attracting SMEs that would otherwise not seek assistance or do not have the technical ability to implement EMS or CP.

5 Financial Benefits

Financial benefits are also important in CSS, and information available shows that average investment paid off is less than 4 months. For example, a CSS begun in 1997 by the electronics manufacturer SAMPO resulted in US$980,000 in CP investments by participants with total savings of US$5.5 million that year. Admittedly, most CSS programs are initially targeted at easy improvements with the highest cost-benefit ratio, and it remains to be seen whether economic benefits are sustainable in the long run.

Outcome & Lessons Learned

The Taiwan experience in promoting EMS can be summed into a number of short conclusions.

a) Linking business incentives to EMS is important even for big companies. The
biggest reason that Taiwan has 600+ certified organizations is that the companies believe there is significant demand within the international marketplace for certification. IDB was highly successful by helping companies draw this connection and then providing the tools for companies to act.

b) Government outreach programs can be highly successful in motivating large companies by offering training and technical support, but will likely fail to attract SMEs.

c) For SMEs to be able to adopt EMS, sufficient financial and technical subsidies are necessary. However, for SMEs to be willing to adopt EMS, pressure must come from their larger suppliers or customers.

d) Business and government can effectively complement each other’s resources and needs through programs such as CSS.

2. SCEM

2.1 The Interest in Supply Chains

The previously described government programs are starting to take advantage of emerging trends surrounding supply chains within the private sector. Supply chains have traditionally been of interest to companies for competitive/business reasons. Since the mid-1990s supply chain environmental performance has also emerged as a competitive issue. Major companies are increasingly being held responsible for the performance of their suppliers and contractors. The most prominent example is Nike who has suffered heavily in sales, market share, and stock price due to the controversy around its suppliers’ labor policies. Less publicized are examples of chemical companies held responsible for poor transportation or storage practices of their suppliers. Likewise, poor SME performance creates problems for the whole sector, which is a bigger risk to the highly visible leaders.

Since the impact of recent events tied to suppliers has been on the business and the overall image of the large companies, many industry leaders view SCEM increasingly as a competitive issue. While companies do not necessarily see significant positive, bottom-line value from good supplier environmental management, it is an essential part of overall risk management for the company. Left alone, these forces will appear likely to continue to grow and increase pressure on SMEs to improve performance as part of maintaining business relationships. However, since it is not a core issue for major companies in creating value, there will be a limit to how much this pressure can grow.
The emerging practices present an opportunity for government, however, as has been seen in some of the previously described programs. The following section describes some of the current industry practices that have a potential synergy with government goals. At the moment, both government and industry have mutual benefits to gain from working together on these issues.

**Overview of Supply Chain Environmental Management (SCEM)**

The term SCEM refers to initiatives to manage the environmental issues associated with a supply chain. The concept is still in the early stages of development and many programs are still evolving. Most SCEM programs today are in:

- High-risk industries such as chemical manufacturing
- Resource extraction industries such as forestry
- Industry sectors that manufacture complex consumer products such as automobiles or electronics that are frequently subject to product take-back or recycling regulations and/or consumer expectations

In discussing SCEM, it is important to recognize that companies have many different kinds of suppliers, and large companies may have up to several thousand suppliers. For example, United Technologies Corporation formerly had 150,000 suppliers worldwide. Different types of suppliers include of:

- Raw materials/inputs
- Services such as waste management or maintenance
- Machinery
- Finished components for use in product assembly (e.g. motherboard for a computer)

Companies will have different needs and different priorities for each type of supplier. For example, nature of the potential environmental risks and opportunities differ greatly between a supplier of waste management services and a supplier of manufacturing machinery.

Generally, there are three different types of SCEM:

1. **TYPE I: Improving supplier in-house/on-site environmental performance**
   
   Steps to require a minimal level of environmental performance from suppliers within their own manufacturing sites. Most of these programs focus on measuring the level of EMS implementation rather than actual pollution performance.

2. **TYPE II: Seeking to develop more environmentally friendly products for the purchaser**
Many consumer technology products are actually just assemblies of components purchased from other suppliers (such as an IBM computer). Companies like Xerox are now working with their suppliers to reengineer components to make the final product more environmentally friendly. At the moment, work is focused on enhancing the marketability and speed of market entry for the major corporation’s product. This type of an option, however, does NOT always require the supplier to improve environmental performance at its own factory.

3. TYPE III: Improving purchasers EHS performance

Many large companies have realized that their own EHS performance is directly linked to the quality of the products, technologies, and service that they receive from their own suppliers. The best example is production machinery which will affect the overall levels of safety, pollution, and resource usage in the purchasers factory. Companies are now expecting a higher standard of expertise and cooperation from their suppliers and have undertaken outreach programs including pre-screening, training, etc. to enhance this relationship.

This paper focuses on SCEM Type I. SCEM Types II and III do not create direct incentives for SME suppliers to develop EMS for their own operations, but rather stimulate the development of DfE and green R&D expertise. Type II and III programs will sometimes have a spillover that leads to improved supplier performance, but they are fundamentally focused on the corporate purchasers performance rather than that of the supplier.

2.2 Link between SCEM and Government Agenda

The potential of SCEM Type I programs for improving SME performance is enormous. Most large companies have several thousand suppliers who are SMEs. Suppliers operate in a highly competitive environment and normally would invest scarce resources in environmental improvements. They see environment as a cost with no benefit. By including environmental criteria in procurement decisions, large companies create a business driver for the supplier to improve performance. Large companies also have the potential to provide technical assistance or partner with external agencies to obtain support for the suppliers. However, industry programs are limited by the resources of individual companies. Most large companies can only supervise and assist a portion of their suppliers.

For a government agency, supporting SCEM Type I programs can extend the reach of the agency and provide a push to SMEs. To date, the design and implementation of pilot
SCEM Type I programs has varied. The task for government agencies is to understand why corporations undertake SCEM and how to encourage more corporations to use SCEM. An additional benefit is that SME suppliers who are required by their customers to meet environmental requirements will sometimes also apply similar requirements to their own suppliers.

2.3 Motivations for SCEM Type I Programs

At the moment, there are a limited number of companies with SCEM Type I programs. The basic goal of SCEM programs is to: a) Minimize risks or liabilities associated with the environmental chain and b) improve overall performance by finding cost savings or cooperating on design improvements.

Specific concerns regarding risk include:

- Limiting liability to supply
  
  Environmental laws are becoming stricter and highly polluting SMEs can be shut down or temporarily closed. Any slow down in production can mean supply shortage for the purchaser. Screening suppliers for environmental performance helps guarantee reliable supply.

- Reduce public relations liabilities
  
  As Nike’s case demonstrated, poor supplier performance can become a public relations problem for the customer. Screening out bad suppliers can reduce the risk of a public relations disaster.

Drivers to improve performance include:

- Corporate commitments
  
  Major companies are under strong pressure to be good corporate citizens. Many have made public commitments to customers regarding their product characteristics such as recyclability or low production footprint. Often meeting public commitments requires cooperation from suppliers. In addition, companies with ISO 14001 certification must review supplier performance as part of their EMS.

- Efforts to reduce the overall footprint of the product
  
  Companies are now increasingly evaluating the entire life cycle of their products in measuring the environmental impact. Some companies are finding opportunities to reduce the total footprint of their product by working with their suppliers.
• Search for cost savings

Often smaller suppliers use inefficient manufacturing processes that raise production costs. By encouraging suppliers to adopt EMS or other practices, companies can help reduce overall supply chain costs.

Generally, SCEM motivations are driven more by business goals and concerns than environmental. This aspect is very important to note when considering how to encourage SCEM or work with companies on the issue.

2.4 Strategies

There are several approaches to motivating suppliers to improve in-house/on-site performance including:

① Incorporating environmental criteria in the procurement process

A number of companies have begun requesting environmental information from suppliers as part of the procurement process. Typically, companies are requested to respond to questionnaires regarding their environmental practices. Questionnaires generally seek to determine whether or not the supplier has the basics of an environmental management system in place including an environmental policy, systems for ensuring compliance, and systems for setting performance improvement targets. Some companies also supplement questionnaires with visits to supplier operating sites. Results then become part of the procurement decision.

② Requiring ISO 14001 certification

As an alternative to questionnaires, a few major companies are now requiring their suppliers to obtain ISO 14001 certification. Ford and General Motors (GM) have already made such an announcement. Other companies such as Nike and several of the major Japanese electronics manufacturers have also publicly discussed instituting a similar requirement. While these companies are concerned about their suppliers’ environmental performance, many feel that it should not be their responsibility to oversee the specific plans and achievements of their suppliers. ISO 14001 is seen as an acceptable way of guaranteeing that suppliers are in compliance with regulations and taking proactive steps to improve their environmental performance. Some companies may also arrange additional meetings with suppliers to review their performance under ISO, but practices vary between companies.
Providing technical assistance or advice

One approach taken by companies such as United Technologies Corporation (UTC) has been to provide technical advice to suppliers. In 1998, UTC participated in a supplier outreach program in Malaysia sponsored by the US-AEP program. UTC toured with a number of their major Malaysian suppliers and provided recommendations on opportunities to improve environmental performance. Other companies in the chemical industry have taken a similar approach with key suppliers who demonstrated poor environmental performance.

Inform suppliers of expectations and needs

Several companies seeking to initiate SCEM programs have taken steps to formally notify suppliers of the purchasing companies environmental expectations. Notification has been done through letters directly to suppliers and many purchasers such as Hewlett Packard now have information on their web sites for prospective suppliers. Hewlett Packard requires that a company: a) Has an environmental policy; b) has an implementation plan with well-defined metrics; c) has eliminated ozone-depleting substances from their product; and d) has complied with the CIQC 0014 environmental questionnaire.

Regular, informal communications with suppliers to underline importance

Several companies emphasized the importance of maintaining regular communications with suppliers on environmental issues. Companies such as Hewlett-Packard meet with suppliers on a regular basis to assess their progress in environmental management. Such communication helps reinforce to the supplier the buyers’ interest in environmental issues and creates a sense of partnership.

2.5 Lessons Learned from SCEM

There is no statistical data available to quantify the impact of SCEM programs. Most companies that initiate programs are pleased with the results. They believe that the programs help reduce risk and lead to improved concern about environment among suppliers.

Most companies would argue that the best way to give suppliers an incentive to improve their environmental performance is by incorporating relevant criteria into the sourcing decision. However, a key issue is where in the process to incorporate the criteria. Certain criteria, such as regulatory compliance or elimination of ozone-depleting substances, can be included as strict pre-qualification requirements. It is
important that such requirements be a general industry consensus. If only one company uses criteria, suppliers may simply decide to do business with other purchasers. In some cases, the most effective approach is to apply environmental requirements as criteria for continuing a business relationship (as opposed to a single purchase). Most suppliers will not make significant changes to their environmental management for the possibility of a new account, but most will make adjustments in order to keep an important existing account.

Within the purchasing corporations, it is important to integrate environmental concerns into overall company policy in order for an SCEM program to be successful. SCEM typically requires the cooperation of the procurement department as well as logistics. Typically, these departments do not view environment as their responsibility and will not support environmental criteria unless there is a clear corporate commitment that makes EHS part of their job description and responsibilities. In many companies, EHS plays only a minor role in the implementing supply chain procurement efforts.

Despite their power to motivate, SCEM Type I program does not usually enforce very strict standards. Most companies are not willing to disqualify suppliers based on environmental performance alone and are primarily driven by quality and cost concerns. When all factors are equal, the decision will be made based on environmental performance. Most companies use SCEM Type I to ensure that suppliers are taking some action to address their environmental performance. Corporate goals are to protect business interests rather than police social good.

Most companies can only supervise a limited number of suppliers. While SCEM is important to large companies, program resources are limited and supervision requires significant effort. SCEM programs typically only cover the most important suppliers. In addition, programs often have limited quality checks on supplier data. While some companies include site audits of suppliers to check the accuracy of data reported, many companies simply trust the statements of their suppliers.

3. Government Industry Synergy Programs (GISP)

The term "Government Industry Synergy Program", or GISP, describes a promising trend of government-industry cooperation to voluntarily improve environmental performance. GISP combines the strengths of both government and industry, and provides each with worthwhile benefits. Government agencies offer support in the form of financial or technical assistance, combined with regulatory incentives, and in turn are
able to use industry networks to reach SMEs. The government is also rewarded by improved environmental performance on the part of industry, with reduced expenditure of financial and human resources. Industry participants enjoy government assistance to fulfill their regulatory obligations and help improve the environmental performance of SMEs. Furthermore, industry members are allowed the operating flexibility that voluntary measures allow and the reduced likelihood of new environmental regulations.

While GISP may seem a "win-win" proposition, a number of issues remain to be resolved. The problem of mutual trust must be addressed, governments must develop a mechanism to consistently draw industries to the table (in sufficient numbers), and must also ensure that SME participation truly results in improved environmental performance. In addition, as most GISP programs work through supply chains or industry networks to reach SMEs, the existence of large companies willing and able to participate is a prerequisite. As the term "GISP" is a new one, it is open to interpretation. The following sections represent examples felt to representative of the spirit of cooperation embodied by GISP.

3.1 Taiwan Responsible Care Association (TRCA)

The Responsible Care movement is an industry driven program to establish performance standards for small and large chemical companies through the use of management codes of practice. While Responsible Care Associations are industry run, national governments have been active in supporting their development in some countries such as in Taiwan. This section describes the development of TRCA, its structure and potential to improve environmental performance. To briefly summarize the following paragraphs:

- TRCA was driven in response to public pressure and established by the major industry players with high visibility
- A key future challenge is ensuring that greater numbers of SMEs are involved and identifying suitable drivers/incentives
- Tangible performance results are not yet available, but a solid framework for improvement of member performance has been set through the development of management codes of practice

② History

Responsible Care was first born in the 1980s as a response by the U.S. and Canadian chemical industries to growing negative public sentiment. Due to its effectiveness in
improving community relations, public image, and environmental, health and safety (EHS) performance in North America, national Responsible Care Associations have since been established by chemical companies across the globe, often with financial and policy support from government regulatory authorities. These associations share a common set of principles/policies/organization structures to allow the dissemination of management best practices. The Taiwan Responsible Care Association, established on 16 January 1998 by the largest multinational (MNC) and local corporations was the first national RC body in Asia to be managed and supported by both local and international chemical firms.

② Drivers for TRCA

During the mid-1980s the Taiwan chemical industry experienced a number of spills and other incidents that resulted in community protests. Formation of the TRCA was precipitated by a growing awareness among Taiwan chemical industry MNCs that a proactive response was needed to improve the increasingly negative image of the industry. The trend of continued industry pollution and safety incidents was leading to stricter regulations and community protests, and threatening operations and margins of all companies the industry regardless of how well they individually operated. High industrial density in Taiwan makes individual companies indistinguishable to both environmental regulators and the public in many cases. Poor performance by one company creates public relations problems for everyone in the industry - MNCs concluded that a mechanism for improving EHS performance and communication throughout the Taiwan chemical industry was needed.

③ Pathway to SMEs

One important aspect of the Responsible Care movement is that it provides a potential pathway to reach smaller companies. SMEs proliferate in Taiwan, making up 98% of all businesses. MNCs in Taiwan are linked to these SMEs through a web of suppliers, shippers, downstream production, joint waste disposal etc. When a problem occurs anywhere in this web, all share the repercussions. This was demonstrated in an incident where a downstream company used a drum bearing the logo of two global MNCs to illegally dump toxic waste. While not involved in the dumping or waste production, the MNCs were hurt by negative publicity in news reports and asked to help clean up the site. Larger companies hoped to use the actions or decisions made by TRCA to affect SMEs throughout Taiwan. Codes of Practice implemented by TRCA will require SMEs to make accommodations to their customers’ new expectations.
Government-Industry Partnership

TRCA is an example of government acting as a facilitator for an industry-driven program. While the TRCA is an industry led movement, resources and support from the Taiwan Industrial Development Bureau (IDB) were important in getting the program started. Last year the IDB provided NT$1.35 million (US$44,000) to support TRCA training activities and meetings. IDB also sends representative to attend certain activities, and consults with TRCA on the effects of new environmental regulations. However, IDB is not actively involved in managing TRCA. Member companies provide all technical training sessions and assistance. Up until this year, operating revenues for TRCA were drawn from both member fees, US$1,200 per year, and funding from the IDB. However, after this year TRCA will no longer receive IDB funding, and it remains to be seen how this will affect operations.

The outcome has been that for a minor investment of resources, the IDB facilitated development of a program to encourage industry to voluntarily improve performance and now has a mechanism with the potential to reach and motivate large numbers of SMEs to better manage their environmental aspects. Industry has increased their credibility with government regulators and the community, and can draw on peer resources to reduce the liabilities created by poor performers.

Program Components

The TRCA program components address many goals of government agencies, such as training companies in good environmental management practices. While not fully realized in Taiwan, the program design offers many opportunities for government-industry cooperation towards common goals such as improving SME performance. The TRCA program effectively serves as an intermediary between government and individual companies.

The TRCA program components can be roughly divided into:

- Membership
- Management Codes of Practice
- Training Activities
- TRCA Committees
- Public Relations (disclosure)

The RCA program in Taiwan is still relatively young. While mature RCAs in the U.S. and Canada can report noticeable improvement in environmental performance (RCA members in the US reported a 52% reduction in toxic releases from 1988 to 1994),
**Development of EMS for SMEs**

TRCA has yet to record such achievements. TRCA estimates it will take 7 years to fully implement management codes of practice. National regulators must weigh the benefits of potential future improvements against current environmental demands when contemplating support for such an initiative.

### 4. Membership

Much of the technical impetus for TRCA came from MNCs. However, the true goal of TRCA is to reach all of Taiwan's large and small local chemical firms. TRCA currently has over 70 members, most of which are local companies. TRCA has been able to expand its member base and influence throughout Taiwan by working through local company networks. Member companies must support the TRCA's guiding principles, and are committed to helping with the organizations’ development. They must also implement participate in TRCA activities to the best of their ability. Through these networks, the TRCA is able to reach companies outside the normal range of government regulatory frameworks, such as SMEs. TRCA has tried to also expand its member base by offering "partial memberships", which would allow firms to participate in training with a lower annual fee. This is particularly helpful for smaller companies where limited resources are an issue. Membership provides access to training materials, peer mentoring, and channels to lobby government agencies. TRCA membership is not yet a requirement for doing business in Taiwan. Most SMEs still see no benefit in improving environmental performance even at a minimal cost. For this reason expanding the member base to include greater numbers of SMEs will rely on proving the value (economic or otherwise) of membership.

TRCA hopes to significantly expand SME membership in the future. Current membership is composed mainly of larger companies and roughly 10% of member companies are SMEs. Plans are currently underway to create a document explaining the value of membership, and distribute it to SMEs. The early membership drive for TRCA was focused on large corporations. Once most large corporations are brought on board, SMEs can be forced to participate through sourcing or training/preparedness agreements. Such actions are only possible with concerted effort by large companies in the chemical sector, which is possible through an organization such as TRCA. Again, pressure from large customers creates business value for SMEs to improve environmental behavior. There is also sentiment among TRCA leadership that the format is especially helpful for SMEs because of their relative ease in adopting management codes, compared with larger companies with complex, formal management systems already in place.
Management Codes of Practice

The most important function of the TRCA is to act as a channel to introduce the best EHS management practices to companies without significant EHS experience. These practices are outlined in a set of codes that are explained to members through training. Members are committed to making continuous improvements once a code is in place. In mature RCAs, such as the US, members that do not meet their obligations have been expelled from the organization. This has not yet happened in Taiwan. There are currently five codes in the TRCA at varying stages of development:

- Transportation Safety Code ensures that chemicals are transported safely without incidents that could endanger public safety or the environment.
- Emergency Response Code requires companies to prepare proper emergency response plans, and inform local communities.
- Waste Management & Minimization Code guides companies to structure and monitor continuous reduction in contaminant and pollutant releases to the air, water, and land from all company facilities and care for products from cradle to grave.
- Process Safety Code is designed to prevent accidents that could endanger public health or the environment through proper facility design and operation.
- Contractor Safety to ensure that contractors are trained sufficiently to reduce risks to the contractor, company employees, the public, and the environment.

The Waste Minimization Codes of Management Practices includes working with clients and suppliers to improve their performance and environmental management (similar to SCEM Type I). Similarly, the Transportation and Contractor Safety Codes allows TRCA to enforce proper handling, loading, and distribution practices by contracted haulers who are mostly SMEs. The definition of contractors includes maintenance and repair companies, distributors, hauling and shipping companies, raw material suppliers, original equipment manufacturers (OEM), and engineering and design companies. Because SME manufacturers are particularly reliant on these same contractors, such as waste haulers, this is also an effective method of reducing the environmental liability of SME manufacturers.

Other codes, such as the Process Safety Codes of Management Practices, are not solely targeted at environmental issues, but provide companies with an organized framework to manage issues that affect the environment, such as proper handling of toxic substances to avoid environmental releases. Most important, the Codes are voluntary, and allow companies flexibility in choosing practices that work best for their company.
3. Training Activities

Because many smaller companies do not have the resources to implement the Codes, the TRCA uses a number of tools to provide the necessary support, both technical and managerial. Many companies prefer industry-implemented training because it addresses sector-specific problems and there are no fears of disclosure of sensitive information to government inspectors.

TRCA training formats include:
- Mentoring
- Training sessions
- Expert Groups

4. Mentoring

One method commonly employed by the TRCA is the "buddy system", where experienced companies mentor 2-3 other companies during Code implementation. This "cascade" approach ensures that each company that receives assistance can in turn provide assistance to 2-3 other companies. This is important in building industry capacity for better environmental management.

5. Training Sessions

One type of training, executive training, consists of senior executives of RC companies directly presenting participation benefits and objectives to smaller counterparts. In addition, TRCA regularly organizes training sessions where an industry expert teaches companies how to implement codes. Meetings to share experiences provide an interactive environment for companies to exchange successful ideas with peers. TRCA also organizes meetings, such as the "CEO Breakfast", to ensure commitment from top management. Collecting annual EHS data and disclosing them to public voluntarily require individual companies to quantitatively track performance. Larger firms must often educate smaller firms on proper quantitative standards and data management procedures. These training tools disseminate best practices through industry networks and are aimed at building environmental management skills for SMEs.

6. Expert Group

A technical expert group will be formed this year to provide companies with voluntary expert technical assistance when necessary.
TRCA Committees

The TRCA has formed a number of committees to carry out work, including a:
- Steering Committee
- Codes Committee
- Regulatory Committee
- Implementation Committee, and
- Verification Committee

In particular the Verification Committee plays an important role in auditing companies’ adherence to the codes. This year members will complete self-assessments of Code performance to be reviewed by the Verification Committee. Each company must evaluate their progress in adopting codes into their management systems as: i) no action, ii) evaluation, iii) developing action plan, iv) implementing action plan, v) management practice in place, or vi) reassessing management practice in implementation. The verification and peer review process ensures that companies feel pressure to continue progress. The degree of rigor of the verification and peer review process will obviously be very important to any government agency that is considering supporting an industry led program such as RCA. The verification process serves as quality control for the program and needs to be transparent enough to be credible.

The Regulatory Committee provides a valuable service for members by keeping them up to date on regulatory developments and helping mobilize companies for lobbying efforts. This is especially valuable for SMEs with limited knowledge of legal requirements and no way to make their voices heard during the process of drafting new regulations.

Public Relations (Disclosure)

To make the TRCA useful in the long run, companies must communicate the results of their work to the public. This is done through the collection and voluntary disclosure of EHS performance data. TRCA members completed a pilot EHS reporting project, where Productivity Asia gathered data from 12 companies participated. Eventually, trend data will be gathered from all members and disclosed to the public. Training companies to collect such data also gives them the tools to measure and improve their own environmental performance. A National Advisory Panel (NAP) will also be formed to oversee and review the TRCA. The NAP intends to compose itself of non-industry community members to provide suggestions on how to improve TRCA efforts.
Outcome & Lessons Learned

TRCA is an industry led initiative that is supported and sponsored by the government, making it an excellent example of GISP. Although TRCA is not dedicated only to resolving environmental issues, it provides a concise set of voluntary management practices that help companies to systematically deal with emissions to air, water, and solid waste and prevents accidental releases. TRCA effectively plays the same role as the government: it sets rules, trains members, and verifies their performance. However, it will often not be as strict or impartial as a government agency.

In summary, the following points should be made:

- At the present both industry and government are satisfied with the progress of TRCA. Industry has appreciated government support for its efforts. While TRCA does not eliminate the need for an environmental agency, it has made government’s job easier in many respects.
- TRCA is a practical vehicle for transferring best practices. Businesses will trust TRCA more than a government organization. TRCA is also able to use members’ experience, skills, and relationships to promote training.
- TRCA can reach SMEs through industry networks, but has not yet been effective at convincing them of the merits of participation. This ineffectiveness has been one of the weaknesses of the program. In the United States, the problem was finally solved by the Chemical Manufacturers Associations decision to require all members to join TRCA. It is unclear what will happen in Taiwan.
- Establishment of a TRCA-style program requires heavy external pressure on the industry and/or a core set of committed CEOs. If chemical companies had not developed image problems in the 1980s, they most likely would not have designed Responsible Care.
- The development of TRCA demonstrates the government’s potential to serve as a facilitator. Government’s early support of TRCA allowed the development of an independent, but highly useful organization.
- TRCA is a cost efficient environmental management initiative for providing broad training. TRCA draws mainly on resources of member companies for training activities. Further, members pay a fee of only US$1,200 annually, while the government contributes only US$44,000 per year to support the initiative.
3.2 Guadalajara Environmental Management Pilot

In 1996, at the request of the Mexican Ministry of Environment, Natural Resources and Fisheries (SEMARNAP), the Guadalajara Environmental Management Pilot (GEMP) was initiated. GEMP was targeted specifically at improving the performance of SMEs by helping them to adopt EMS over a two-year time period. Previous results of a World Bank survey of Mexican industry in 1995 showed that companies leading in environmental performance were more likely to have elements of an environmental management system in place. These companies were five times more likely to have the commitment of senior management, 80% had environmental policies, and 90% maintained a pollution prevention plan - all key elements of an EMS. However, while a later survey showed a majority of large companies had implemented key EMS components, the same was true for less than 20% of SMEs. Although GEMP was requested by SEMARNAP, government involvement in the project was limited, as the project was financed and led by industry, with partial funding from the World Bank. As with the TRCA, the Guadalajara project demonstrates the effectiveness of industry-led EMS mentoring. It also shows a potential partnership model where hands-off government support creates conditions for larger corporations to build on supply chain relationships to secure SME participation in EMS implementation.

Program Development

Similar to other GISP programs, government provided the resources to enable the program to function, and large companies motivated their SME suppliers to participate. In this case, a government request served as a catalyst, but large companies were willing to support the government's program. Eleven large companies signed a voluntary agreement with SEMARNAP to participate in the program, and recommended 1-3 of their SME suppliers. The supply chain business relationships were the key to motivating the SMEs to join. Nearly half of the SMEs in the project expressed that they would not have agreed if the government had invited them to join the project. Similarly, SME participation was particularly strong when the large company performed additional quality or environmental auditing. One of the main reasons for success was that government did not get deeply involved in the project implementation allowing SMEs to feel more secure in participating. In structure, the program was very similar to Taiwan's CSS program. The fact that similar programs could be catalyzed by government request (Mexico) or industry request (Taiwan) further demonstrates that there are common interests between government and industry regarding SME
development of EMS for SMEs

program components

GEMP was designed to lead SMEs through the process of developing an EMS. It consisted of: (i) selecting an appropriate EMS model; (ii) a system of on-going training classes and peer support, and (iii) review of implementation progress.

1. Selection of EMS Model

After signing agreements to participate in the project, a discussion was held on which EMS framework to use during the project. In the end, ISO 14001 was chosen as a suitable EMS framework for SMEs, based on the understanding that fewer significant aspects in most SMEs required a less complex EMS under ISO 14001. However, one area for possible change noted by SME participants during the project was simplification of the ISO 14001 documentation system. Another important step, suggested by SME participants, was a training session for top management to teach them the benefits of EMS and secure their commitment to its implementation.

2. EMS Training

GEMP demonstrated the need of SMEs for substantial assistance during EMS implementation and a useful model for resolving the need through a combination of peer group support and outside consultants. Each SME participant designated a cross-departmental working group to attend EMS training and review sessions. A U.S. consulting firm, the Lexington group, gave regular training sessions at each stage as the participants worked their way towards establishing an ISO 14001 system. Also important to the projects’ success, 17 university students were given EMS training and designated as local contacts for the SMEs to assist them on an as needed basis. The students were able to provide valuable assistance, and more importantly will contribute to building long-term EMS capacity. One discovery during the project was that large companies had limited or insufficient knowledge of EMS. This reduced their ability to act as effective project mentors. This has been played out in other case studies, and is something to consider when initiating a project or selecting mentor candidates.

3. Progress Review

Regular sessions were scheduled to review each SME’s progress, and targets were set for each stage of EMS implementation. These targets provided an important framework for SMEs during the project, and the review sessions allowed participants to exchange
ideas and experiences. The ongoing training (as opposed to a handful of workshops) was an important aspect of the program. Similar to the MESH program, companies were led through the process of establishing an EMS rather than simply being instructed in EMS design and then left to handle implementation alone.

The training phase of GEMP ended in February of 1998, and the observation phase was to continue through February 1999. Data from the observation phase has not yet been available, but some conclusions can be drawn from the results of the training phase.

**Outcome & Lessons Learned**

While most SMEs had not completed ISO 14001 by the end of the training phase, most participating companies saw improvements in environmental performance. Over 80% reduced environmental releases, while others saw improvements in areas such as waste handling, legal compliance, and resource efficiency. Because ISO 14001 was the first time many SMEs were introduced to formal management systems and EMS concepts, the project also induced a cultural change. SME participants changed their perception of environmental issues and as a result were more likely to continue making improvements in the future.

Several aspects of this project are relevant to developing KMOEs’ broad strategy. Specifically:

- Importance of support from major corporate purchasers
- Success of using ISO 14001 trainers and peer group approach
- Hands-off approach of government
- Value of using university students as advisors
- Need for greater mentor screening / training
- A government agency served as a catalyst for private sector action

The GEMP project reinforces the idea that some form of cooperation with major companies is necessary to draw in SMEs. Once they are enrolled in a program however, supplying trainers and creating a peer group is sufficient to generate results. Government is clearly important as a catalyst, but ideally should not become deeply involved in implementation. For a country seeking to build up grassroots EMS capabilities, the use of university students offer a chance to give them hands-on experience.
Background

Starting in the early 1990s, the electronics industry came under increasing pressure to remove ozone-depleting substances from their products. Due to the pressure from global treaties, most companies started programs to screen their suppliers to guarantee the removal of ozone depleting substances.

The effort to remove ozone-depleting substances stirred a broader interest within the industry to improve environmental management within their supply chain. Many companies began to send questionnaires to their suppliers to evaluate environmental management practices. The wide number of questionnaires was time-consuming for the suppliers and was an inefficient way to consolidate information. Recognizing that many companies had common information interests, twenty of the largest computer companies organized a committee under the auspices of the Computer Industry Quality Conference (CIQC) to develop a standardized questionnaire.

Structure of Questionnaire

The questionnaire was drafted in 1996 under the name of CIQC Standard 0014. The standard was designed with a number of key features in mind:

- Able to meet the basic environmental information needs of any company in the industry
- Applicable to a broad range of suppliers
- Usable by procurement teams without an environmental background

The questionnaire focused specifically on the environmental practices within supplier operations rather than the product offered.

The questionnaire was divided into two parts:

1) Continual improvement and compliance assurance
2) Risk assessment

Part one asks questions to determine whether or not a company has the basics of an environmental management system in place in their operations. The questions do not specifically refer to ISO 14001, but they clearly reflect the key elements of an ISO 14001 EMS (e.g. environmental policy, objectives and targets, ability to identify non-conformance). In addition to questions related to EMS, part one also addresses whether or not a company is in compliance with legal requirements.
Part two is designed to assess the potential risk of an environmental problem that could disrupt production. Given the increasing pressure to deliver products just-in-time, it is important for many computer companies to be confident that their supplier will be able to maintain supply.

The questionnaire specifically does not ask for environmental performance data such as wastewater volumes, etc. The companies believe that the responsibility for tracking and improving performance lies with the suppliers. Therefore, the CIQC companies choose a strategy of designing the questionnaire to confirm whether or not the supplier had an EMS in place capable of driving continual improvement within the supplier’s organization.

Impact of the Questionnaire

There are no statistics available to track the specific level of improvement amongst suppliers due to the program. Each company in the association has applied the questionnaires to different degrees. Hewlett-Packard (HP) is the only company that has required all major suppliers related to production to complete the full questionnaire. Other companies use portions of the questionnaire. HP meets with each supplier on a regular basis to discuss the results and the suppliers’ environmental strategy. Some of HP’s larger suppliers have become very enthusiastic about the program and now try to use their environmental performance as a marketing tool. HP does not offer mentoring or technical advice about supplier industrial processes.

One interesting aspect of the CIQC standard is that it has moved supplier environmental management from the Environmental, Health, and Safety (EHS) department of companies into the Procurement Divisions. For companies like HP, supplier relations are handled exclusively by Procurement with only occasional input from EHS.

The use of the questionnaire itself varies somewhat from location to location. Local procurement offices are often given freedom to decide how much to weight responses in managing supplier relations. In situations where suppliers are equal in all respects, environmental performance can become the deciding factor. However, in general the traditional factors such as cost and quality still drive the purchasing decision. However, once a supplier has entered into a business relationship with a company, it then must begin regular consultations on its environmental performance.
<Appendix 2> Case Study: NIKE’s MESH Program

Nike’s program for Management-Environment-Safety-Health (MESH) is an example of the potential response from large corporations to public pressure and threats to corporate image. Similar to TRCA, initiatives such as MESH can help accomplish the goals of government agencies in motivating and training SMEs. MESH is a program run by Nike to help their Asian footwear suppliers implement effective EMS. Nike has been criticized for responding to problems only as they come into the public eye, but MESH, (which falls into the category of a Type I SCEM), is relatively advanced when compared with other corporate supply chain initiatives. The MESH program can be broken down into the following components:

- Corporate commitment
- Factory analysis and EMS training, and
- Building communications.

EMS designed through MESH is ISO 14001 compatible, but includes additional safety and health elements. Nike also plans to expand the MESH program beyond footwear to their apparels business.

Organizational Commitment

MESH falls in line with Nikes Corporate Responsibility values, which are a set of principles used to guide the companies’ actions. Nike has also shown organizational commitment by having the CEO speak to employees about environmental issues, and through its participation in the Natural Step (a system to help companies improve environmental behavior). Nike's corporate policy statement includes commitments to:

- Promote Nike’s practices throughout the supply chain and seek business partnerships with suppliers who operate in a manner consistent with Nike’s values.
- Educate Nike employees, customers, and business partners to support our goal of achieving sustainability.

In line with these principles, Nike has set a goal for all footwear suppliers implement an effective EMS by 1 June 2001.

Factory Analysis and EMS Training

MESH is carried out through training sessions held for supplier companies by Nike
contractors. Before training sessions begin, a management audit is undertaken for each factory in the workshop country to better understand their current level of implementation. Afterwards, nine two-day workshops are organized over the year, which must be attended by designated supplier personnel. Between workshops companies are given implementation tasks, and their progress is reviewed at the next meeting. Companies are also provided with EMS tools, including a step-by-step implementation process.

The process is similar to the GEMP program organized in Mexico except that it is fully implemented by the company. Nike has involved around 40 suppliers in MESH, and while concrete performance data were not available, the program does demonstrate that major companies can play a powerful role in changing supplier environmental practices when so motivated.

Building Communications

Nike learned that gathering suppliers together helps to foster a multilateral dialogue between Nike and suppliers. Suppliers share best EMS or CP practices with each other, and work with Nike to reduce the environmental impact of their products. As poor communication is often viewed as a critical obstacle to fully utilizing supply chain forces (regardless of whether to increase productivity or improve environmental behavior), increased dialogue is between involved parties is crucial.

Nike has a well-defined goal and program to encourage EMS adoption by its suppliers. In addition, the program goes beyond most supply chain initiatives by requiring actual factory visits and setting concrete EMS implementation goals. MESH offers a good model for other companies in proactive SCEM. To the extent that government agencies can encourage companies to develop programs such as MESH, they will make their own job easier. MESH does not guarantee a performance standard, but it does drive SMEs to establish an EMS that can then help the company achieve the performance standard set by the government.
PART I: Continuous Improvement and Compliance Assurance

1. Does the company/facility have a written environmental policy statement? 
   If "yes," please attach a copy. 
   Does the policy statement include a commitment to continuous improvement of environmental performance? 

2. Does the facility have written environmental performance objectives/targets and implementation plans to reduce cost or risk? Please describe three significant environmental performance objectives/targets, performance plans, and measures for the next 12 months. 
   (Examples of cost-reducing or risk-reducing environmental performance improvements may include: waste minimization, pollution prevention, source reduction including recycling and reuse targets, energy use, water consumption, packaging programs incorporating targets for reduction, reuse and recycled content, and enhanced training. These examples are not meant to exclude other types of programs, which you may be implementing.) 

3. Is a management representative assigned responsibility for facilitating compliance with environmental regulations? If "yes," please give name and title. 

4. Does the facility have a system to track environmental laws and regulations that apply to the operations of the facility? If "yes," is there a system for communicating this information and training to the appropriate personnel? 

5. Are periodic environmental regulatory compliance audits of the facility’s operations conducted? 

6. Does the company have documented processes to implement corrective action plans for nonconformance to environmental laws and regulations? 

7. Does the company have a documented supplier environmental program that ensures conformance of its suppliers to legal requirements? 
   Note: This questionnaire does not address two important issues, that is, the elimination of ozone-depleting substances, and the suppliers obligation to comply with applicable legal requirements. Most companies already have systems in place (contracts, standards, bid specifications, and so on) that address these issues. Users of this supplier review questionnaire may want to consider incorporating relevant questions here to address their needs if not otherwise addressed in their system.
PART II: Risk assessment

1. Environmental permits, chemical registration and compliance status

1.1 Is the facility required to have any types of environmental permits or registrations?
   Please check those apply below:
   - Industrial wastewater discharge
   - Hazardous waste storage
   - Hazardous waste treatment
   - Hazardous materials use/storage
   - Air emissions
   - Storage tanks
   - Radioactive materials
   - Other (please list)

1.2 Does the facility monitor its operations, emissions, or discharges to check compliance with permit requirements? Do regulatory agencies regularly monitor and/or inspect the facility? Is the facility in compliance?

1.3 Has the company obtained all necessary chemical registrations and submitted all necessary notifications for substances imported, exported, or used at the facility?

   (Examples include but are not limited to the United States Toxic Substances Control Act [TSCA], European Inventory of Existing Commercial Substances/European List of Notified Commercial Substances [EINECS/ELINCS], and Canadian Domestic Substances Lists.)

2. Hazardous waste management

2.1 Does the facility generate hazardous waste? If "no," go to question 3.

2.2 Are hazardous wastes that are stored, treated, or disposed of on site managed in properly designed facilities that will prevent future environmental impacts?

2.3 Are off-site transporters and treatment, storage, or disposal facilities properly licensed?

3. Industrial wastewater and air emissions management

3.1 Does the facility treat its industrial wastewater prior to discharge? Please describe.

3.2 Is the facility required to control its industrial emissions? If "yes," does the facility have air emission control equipment installed? Please describe.
4. Environmental release potential

4.1 Does the facility use chemicals that, if released accidentally, could create a business interruption?
   (Examples include but are not limited to high volume chemicals, either pressurized gases or liquids that are flammable, highly toxic, or radioactive.)

4.2 Does the facility have written emergency response plans in case of a release to the environment?
   (Examples include but are not limited to training, drills, chemical hazard communication, hazard identification, high-risk area audits, mutual aid relations, emergency response, and disaster recovery equipment.)

5. Company environmental standards

5.1 Does the company have minimum company environmental standards that apply to the facility’s operations regardless of the country in which the facility is located? If "yes," please describe.

6. Business interruption potential

6.1 Is the company/facility aware of any chemicals used in the facility’s manufacturing processes whose availability is currently restricted or scheduled to be restricted in the future due to environmental requirements (e.g., CFCs)? Please list chemicals that apply. If yes, does the company/facility have written plans to eliminate these chemicals or otherwise accommodate their reduced availability?
VI. Conceptual Framework of EM and EMS

This Chapter reviews the environmental management concepts that will identify common limiting factors and define the SME-VEM conceptual framework. It contains excerpts from a number of expert articles exploring the basic definition of environmental management and a number of its key concepts. Excerpts are divided into two main sections: (i) those pertaining to environmental management and (ii) those pertaining to environmental management systems. This literature is included as an attempt to lay out the fundamental environmental management concepts that were used in this study. In this sense these works form the conceptual basis that was used in designing the survey, case studies, and recommendations produced during this project.

In the first section including a work by European Environmental Agency\(^1\) first provides a definition of environmental management and then delves into some of the benefits associated with environmental management. And the following includes a work by Gerstenfeld and Roberts\(^2\) which lays out the drivers and barriers peculiar to SMEs and EMS, and includes a diagram by Angell and Rands\(^3\) outlining the conceptual framework of environmental change. The first section closed out with an article by R. Starkey\(^4\) analyzing the specific EM tools available to a company's and how this relates to successful environmental management.

The second section opens with a work by European Environmental Agency defining environmental management systems and analyzing the costs and benefits of SME-VEM, and then provide the conceptual framework for SME-VEFS. Section two closes with an article by R.Hillary\(^5\) that discusses in detail the costs and benefits of SME adoption of EMS.

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1. Environmental Management

1.1 Definition of Environmental Management\(^6\)

Environmental management is management of firm activities that have or can have an impact on the environment. Business activity has a substantial impact on the environment. Product manufacturing involves extracting raw materials from the environment and processing them to produce saleable items. As a result of the production process, various forms of waste (solid, liquid and gaseous) are created. The activities surrounding the manufacturing process such as maintaining plants and infrastructures or packaging and transporting have environmental impacts. And products that are manufactured will eventually be disposed of and thrown out as wastes polluting the environment. The provision of services also results in a significant environmental impact because service companies use various products and energies to deliver their services, both of which result in wastes polluting the environment.

1.2 Reasons to Undertake Environmental Management\(^7\)

There are a number of advantages for undertaking environmental management.

1. Cost savings

Most, if not all people, wish to protect the environment. However, many SMEs fear that protecting the environment by improving their environmental performance will cost money. They fear there will be a conflict between their desire to protect the environment and their desire to keep down costs and run a successful business.

① Process Efficiency

- Improving the efficiency of existing processes

Optimizing existing process performances minimizes raw material and energy usage and/or waste production. Reducing raw materials and energy usage and waste production are both good for the environment. Also reduced resource costs and waste disposal costs are good for business. Proper equipment maintenance is important as it minimizes costs from equipment downtime and resource wastes that are often associated with shutdown and start-up periods.

- Introducing more efficient processes
   Introducing new and more efficient processes reduces resource use and waste generation. Many companies have been able to realize large cost savings by reducing the amount of raw materials, energy and water they use.

  ② Product Design

   It is often possible to redesign a product so as to reduce the amount of resources it contains while still maintaining the level of service it provides.

  ③ Waste Disposal - Making Money from Wastes

   As mentioned above, improving process efficiency will reduce the amount of waste that a process produces. However, once waste is generated it is often possible to reuse or pass it on to other companies that can make use of it and avoid the cost of waste disposal.

  ④ Raw Material Sourcing

   Changing the source of raw materials used in a particular process can result in cost savings.

  ⑤ Infrastructures

   It is also possible to realize savings by making efficiency changes to the infrastructure e.g. installing energy efficient lighting, insulating buildings, and improving the efficiency of heating systems.

  ⑥ Packaging and Transportation

   Once goods have been produced, they need to be packaged and transported. It is possible to make cost savings in these areas and improve environmental performance at the same time.

  (2) Ensuring Legislative Compliance

   By ensuring that it complies with relevant environmental legislation, a firm can avoid the possibility of being fined by the regulatory authorities for non-compliance and the adverse media publicity that can accompany such fines.
3. Anticipating Future Legislation

Developing an awareness of likely changes in environmental legislation allows firms to plan for these changes and make appropriate investment decisions. If a firm is not aware of proposed legislation, it may make investments that it then finds are not appropriate if and when the new legislation is enacted. Alternatively, a firm may find out about a legislative change at the last minute and be forced to make rapid investments to comply with new requirements. Prior knowledge of likely changes allows a longer time period over which to make the necessary investment and prevents possible cash flow problems.

4. Reduced Environmental Risk

Environmental risk is the single largest hidden risk for many companies. By undertaking environmental risk assessment as part of the environmental management process it is possible to reduce the risk of events occurring that could have adverse environmental and financial consequences.

5. Meeting Supply Chain Requirements

An increasing number of large organizations are requiring their suppliers to demonstrate sound environmental management and are prepared to terminate relationships with those that fail to do so. In some cases, having an environmental policy is not considered sufficient proof of sound management and evidence is required that a firm is taking action to meet commitments set out in their policies. Hence, undertaking effective environmental management will increasingly be necessary to gain or maintain supplier status with large organizations.

6. Improved Relations with Regulators

The ability to demonstrate sound environmental management may lead to environmental regulators taking a more “hands-off” approach to regulation e.g. a reduction in the number inspection visits required per year.

7. Improved Public Image and Community Relations

By publicizing its efforts to improve environmental performance, a firm can improve its public image, thereby enhancing its position in the market place. And by demonstrating sound environmental management, a firm can reassure the local
community about its activities and thus build up good community relations.

(8) Increased Market Opportunities

Lower production costs resulting from environmental management, and good public image resulting from publicizing good environmental performance, can result in a firm increasing sales and gaining a larger market share.

(9) Employee Enthusiasm

The environment is an issue about which many people are concerned. Undertaking environmental management can generate a lot of enthusiasm within a firm as it allows employees to express their environmental concern in a practical way by contributing towards improving environmental performance.

1.3 SME Environmental Management

Given the many benefits that can result from undertaking environmental management, surprisingly few SMEs have made advancements in this area. People that work with SMEs on environmental issues report the same findings again and again. SMEs do not undertake environmental management as they feel that they have neither the time nor the money to do so. SMEs often have to concentrate their efforts on matters of day-to-day survival such as paying bills, providing weekly pay packets and keeping orders coming in. Environmental management requires time to implement and money to undertake, time and money that SMEs feel they do not have available. In short, environmental management is seen as a luxury that SMEs cannot afford.

(1) Why Environmental Management

There are three reasons for SMEs to implement environmental management. The first, and of ultimate importance, is that increased implementation of environmental management will improve corporate environmental performance and consequently improve the prospects for global sustainability. However, while this reason is praiseworthy and essential for long-term survival, for the average small shopkeeper or medium-scale widget-maker it may not be of immediate concern. Thus the second and

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third reasons for implementing an EMS, i.e. the 'stick' - avoiding the business costs of not implementing environmental management, and the 'carrot' - reaping the immediate and long-term benefits of doing so, are more likely to be of prime concern.

While SMEs play a vital role in our socioeconomic systems, they are experiencing mounting pressures to adopt EMS, and are collectively responsible for a considerable percentage of our past and present global environmental impacts. Unfortunately though, we are still in a situation where there are serious barriers and deterrents preventing the SME sector as a whole from embracing environmental management. Clearly, the solutions currently offered to overcome these problems do not satisfy the concerns of SMEs or remove the barriers they experience. Consequently, to improved environmental performance, a different approach and better support and information dissemination mechanisms are needed.

Ultimately, SMEs need a solution offering support that concentrates more on the day-to-day running of small companies, increases the availability of advice and reduces the cost of consultancy through more detailed, less generic, developments for each industrial sector based on best practices and not on strategic management systems. The fact remains that companies are increasingly recognizing the opportunities offered by improved environmental performance.

(2) Pressures Driving the Implementation of Environmental Management in SMEs

① Legislative Pressures

One of the clearest and least contestable pressures experienced by SMEs is created by present legislation - be it the fear of fines, liability or closure: ‘what little action SMEs are taking appears to be driven by legislation' (ENDS 1995)

② Business-to-Business Pressures

While it is irrefutable that, for many SMEs, legislative compliance is a matter of business survival, and is likely to be their single largest motivator, business-to-business pressure is another dominant factor behind the implementation of environmental management. While some maintain that ‘legislation is by far the most significant driving force in persuading firms to effect an environmental improvement’ (Griffin et al 1995), others hold that business-to-business pressures are by far the most prevalent

③ Stakeholder Pressures

For the SME, the enforcing authorities, local residents, insurers, bankers, employees,
customers, interest groups and the general public are increasingly the source of pressure to improve environmental performance.

Furthermore, while some of the aforementioned pressures are felt equally by large and small firms alike, SMEs, unlike their larger counterparts, are much more transparent and thus susceptible to and influenced by the concerns of these stakeholders.

④ Supply Chain Drivers

Like the role that retail consumers play with large corporations, SMEs are asked to satisfy industrial clients’ quality, safety, and environmental performance demands. Major companies often see environmental performance as related to quality and reliability for suppliers. The larger firms also see environmental performance as a way to reduce the risk of negative media exposure from upstream or downstream incidents. Interest among SME management in VEM programs can be generated through environmental performance audits and training by (larger) industry consumers and/or suppliers. Corporate audits and SME-VEM performance demands are often prerequisites to continued business relationships.

Internal corporate environmental performance evaluation has already achieved a high level of sophistication and detail, but similar standards for supply chain remain relatively basic. Some industry sectors such as chemicals and electronics have initiated industry-wide voluntary programs on environmental management. Globally, such programs are still in their early stages, particularly in developing economies. In selecting suppliers internationally, many major companies use easily measurable indicators such as ISO 14001 certification and transportation safety audits.

However, major companies rarely gather detailed supplier environmental performance data. Large companies that do gather individual supplier information performance usually do not have averages or good country or sector performance benchmarks to provide a context for the data. Even for these companies, limited data is available outside of developed countries. Since industrial clients rarely evaluate individual SMEs by detailed performance targets or benchmarks, SMEs rarely see a link between their environmental performance and their market competitiveness. This further reduces the opportunity for supply chain drivers. Government resources for training and industry demand for quality can be matched to promote improved environmental management within SMEs.

There is a significant potential synergy of government extension programs and supply chain initiatives. Two keys to further increase the effectiveness of supply chain drivers are: (i) the adoption by industry leaders of standard environmental performance
indicators and (ii) the education of SME executives on how to collect/manage the information contained. Actual data on industry environmental performance can then be gathered through voluntary reporting mechanisms and made available for use by business and government. Companies could then use the information to rank and select suppliers and government could use (international/domestic/sector) reporting comparisons to tailor technical extension programs. The partnership would combine push from government extension with the pull from supply chains. The result would be a strategy that raises SME interest in environmental performance improvement by making it a strategic business concern.

3) Barriers to Implementing Environmental Management in SMEs

One characteristic of the SME sector that is of undeniable relevance is its diversity. Thus when addressing the shortfalls of the present state of affairs with respect to SMEs, there will be barriers, issues and difficulties that will be common to some SMEs but not to others. These will depend on the firm’s size, location, sector, organizational structure and so forth. This discussion is meant to identify problems that are resident within the SME sector generally but not necessarily universally common across the sector as a whole. By identifying problems, whether experienced unanimously throughout the sector or not, a solution is more likely to be of merit to a majority of the sector.

When one considers the practical barriers to environmental management implementation for SMEs, the obstacles seem to be as numerous as the sector is diverse. However, like the definition of ‘SME’ itself, while there are many propositions and differences, there are, too, a number of widely repeated and common barriers. In simplest terms, lack of money, time, experience, access to information, support and a general misconception and lack of interest in both the standards and the environment are echoed throughout most surveys, questionnaires and academic papers on the subject.

1) Lack of Training and Awareness

There seem to be two ‘educational’ issues that arise when dealing with environmental management implementation in the SME. First, there is a general lack of awareness about the environment and the benefits of improved environmental performance and second, there seems to be a serious lack of expertise and understanding about actually implementing environmental management. A program of support for SMEs must therefore provide general information and assistance to encourage the next step of more complete assistance and education. Education must obviously then be delivered in a fashion that encourages its own perpetuation and thus address the benefits of the steps
taken and the advantages of taking the next step.

Subsequent to awareness training, and in light of a number of clear indicators, SMEs need specific training on environmental management and how to implement it in their businesses and realize the benefits from doing so.

2) Lack of Legislative Support

One fact about the SME sector that is resoundingly clear is that there is an alarming lack of knowledge and application of the environmental legislation by which they are bound. Clearly, in conjunction with the training needs addressed above, the SME sector needs assistance to become aware of relevant legislation and abide by it.

Obviously, the ‘general awareness of environmental legislation and regulation is low in SMEs’ (Hutchinson and Chaston 1995) and they are ‘unreceptive or unable to interpret the relevance of environmental legislation to their business’ (Hillary 1995). Additionally, with a forecast for considerable increase in the volume and severity of environmental legislation, a further issue confronts SMEs. Not only are they unaware or unreceptive to present laws and regulations but they need to be made more aware of their activities.

In short, smaller companies in particular need support to understand what they must do to comply with regulations and thus, in the first instance, a program should be designed to get the environmental management process started and, in the second, to increase the understanding and application of the law.

3) Lack of Sector/Industry-Specific Support and Solutions

As has been identified in the preceding material, SMEs perceive the environmental management process as generic and biased to larger companies. As a result, there is also a wish for an environmental management standard that is uniquely catered to SMEs and respects the individuality of each and every one. However, as the objective is not to redesign a standardized EMS for SMEs, it is instead necessary to educate the SME with reference to the present approach to EMS implementation, but in doing so allow them to create something that is inherently unique to themselves.

Clearly, for an EMS to be effective improving the environmental performance of an individual, it must be wholly unique to that company as ‘the environmental management strategy adopted by business will depend on its own market situation and environmental pressures as well as the internal resources available’ (Coopers & Lybrand and BiE 1995) by its very nature.

Ultimately, then, a support mechanism for SMEs must allow them to learn and
implement in their own language and using their own frames of reference.

A support system cannot merely provide generic EMS implementation - support that is then subsequently altered or watered down by the SME - it must cater to the development of an EMS for the SME from the onset.

4 Expenses Involved

SMEs’ management of daily affairs is often based on critical incident management with a day’s work generally spent dealing with issues and incidents in an ad hoc and reactive manner. In this situation, management’s opportunity costs are very high and, thus, ‘unless environmental issues are a bottom line pressure, SMEs’ focus tends to be on survival and maintaining competitiveness’ (Line and Vogt 1996).

Simultaneously, significant management resources will be required for EMS implementation, detracting from other parts of the business thus environmental management receives little or no attention in most SMEs. Simply, where there are no bottom line or business-to-business pressures, typical perceptions are that the time and costs associated with implementation of a more structured approach to environmental management are prohibitive thus environmental management receives low priority in relation to other business pressures (Line and Vogt 1996).

5 Lack of Relevant Information

Evidently, even if an SME has overcome the initial resource barriers and summoned the necessary courage to engage in environmental management, they are by no means in the clear. An obvious problem is that small businesses do not have access to environmental information, or the expertise to introduce complex management systems without assistance (Welford and Ggouldson 1993), and seeking answers to the ongoing questions is time-consuming and very expensive (van Wijngaarden 1995).

The issue of environmental management information dissemination for SMEs is central for the success of every environmental program on domestic or international level. It is also of utmost importance to recognize the fact that information in itself is not enough to trigger change. Information will be a powerful tool for change only when it is communicated to a target group, turned into knowledge and put into practical use. This may seem evident, but communication remains a problem. Therefore, it is important not only to provide information, but also to know the target group and to determine what delivery vehicles should be used to achieve the best results.

Even though lack of information is frequently cited as one of the major impediments to improving environmental performance, one must note that there is yet another aspect
to be considered in the need for relevant information. Smaller firms often find themselves in one of two possible situations:

- Smaller firms do not, for a number of different reasons, have access to environmental management information
- Smaller firms have access to an overwhelming flood of data but are unable to identify the relevant information

In both cases it is unlikely that the SME will be able to improve its environmental performance. Communication and information screening are therefore central concepts when developing and disseminating environmental information for SMEs.

Understandably, ‘poor knowledge or understanding of a particular issue often introduces a confidence gap’, but ‘where these issues are addressed and it can be demonstrated that the nature and extent of the environmental risks are clearly understood, the confidence gap decreases’ (Line and Vogt 1996). Therefore, in developing a program to assist and streamline information requirements, accessibility to that support, and knowledge of its existence, is certainly necessary. Important also is the fact that ‘few SMEs seek the help available because the support services do not match their needs’ and it is often claimed that ‘regulators present contradictory messages’ (Hillary 1995).

Consequently, SMEs need a mechanism that provides accessible, clear and ongoing advice and information that is relevant and understandable to them.

6 Environmental management standards are ill-suited for SMEs

When examining the present environmental management standards (ISO14001 and EMAS) through the eyes of an SME, three clear incongruities appear. First, a common concern is that the standards are strategic approaches to management and SMEs generally do not approach management strategically. Second, standards are generic and SMEs are specific and third, standards are market-based instruments that rely on market-based pressures that presently are not felt extensively by the SME sector.

Thus if the fact that standardized EMSs are more suited to those organizations with an existing strategic management structure and that SMEs generally do not employ strategic management structure are accepted, there is a fundamental problem for SMEs when it comes to the implementation of the present standards. In light of the fact that the EMS approach is generic and the SME sector is so diverse in nature, it cannot possibly provide an environmental management panacea for all companies without seriously compromising its effectiveness. The needs, requirements, abilities and limitations of the business community as a whole are irregular and disparate, while the
standards, by definition, are not. This of course leads to a situation where the standards are an attempt to be all things for all people at the risk of providing little for a few.

A further problem for SMEs is that the present environmental standards are 'market-based instruments; they are voluntary codes and rely on the assumption that the market will reward companies for participating (Hillary, 1995). Thus if there are no immediate market rewards - which appears to be the case for many SMEs - the instruments are flawed as mechanisms for improving environmental performance for businesses.

Ultimately, it has been shown that ‘a voluntary standard of this type is not tailored to the needs of the SMEs in any realistic way’ (Hutchinson & Hutchinson, 1995) thus the EMS approach, in its present form, is seriously deficient when one considers the SME.

7 Other Barriers

While the aforementioned barriers are considerable and often prohibitive, they are by no means the only hindrances to the implementation of environmental management in an SME. Some claim that ‘the lack of evidence of a substantial uptake by SMEs to the development of environmental management is often related to perception of the requirements involved, while others hold that the problems than be aware of them’ (Line and Vogt, 1996).

Other issues of definite consequence are a lack of commitment from top management (ENDS, 1996) and, in the case of EMAS, the level of detail of information to be released within the environmental statement would be a task well beyond the ability of most SMEs who are simply not capable of preparing statements of that nature about the internal workings of their companies (Coopers & Lybrand and BiE, 1995).

In short, many of the barriers preventing SMEs from adopting a more formalized approach to environmental management relate to their perceptions of the regulators and their role and the potential for environmental management to impact on the commercial aspects of the business (Line and Vogt, 1996).

1.4 Process of Environmental Change

The diagram below provides an overall context for environmental change in firms. The diagram suggests that a series of pressures that are external to the firm are recognized and interpreted in light of a variety of factors that make up the firm’s

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business context, including organizational characteristics, general management systems, and environmental management program characteristics. These contextual factors, coupled with the external pressures, result in the development of internal drivers for, and barriers to, environmental action. The implementation of environmental changes affects the organization in two ways: First, some change occurs in operational and environmental performance and second, some organizational learning occurs. Performance outcomes and organizational learning feed back to the business context, and thereby impact the interpretation of future external pressures and the development of future internal drivers for environmental action.

![Conceptual Framework of Environmental Change in Overall Context](image)

*Figure VI-1. Conceptual Framework of Environmental Change in Overall Context*
1.5 Environmental Management Tools\textsuperscript{10}

Here we describe a range of environmental management tools - tools that a firm can use to effectively manage its environmental affairs.

As SMEs are by no means homogeneous - varying in size, complexity and activity - it is merely stating the obvious to say that not all of these tools will be relevant to all SMEs all of the time. What is important is that each SME is in a position to choose the most appropriate tool or tools for its particular environmental management needs.

(1) Environmental Policy

An environmental policy is a document that sets out a company’s overall aims and intentions regarding the environment. Increasingly, SMEs will find it useful to have such a policy. Large customers are increasingly concerned to see evidence of environmental management on the part of their suppliers and an environmental policy can go some way to providing this. In order to write a relevant policy, a firm needs to make an appraisal, and have some understanding, of its environmental aspects. And, in order to meet the aims set out in the policy, it will need to take some action, possibly utilizing one or more of the tools described below.

(2) Environmental Management Systems

A system can be thought of as ‘a number of interrelated elements functioning together to achieve a clearly defined objective’ and hence an environmental management system can be described as a number of interrelated elements that function together to achieve the objective of effective environmental management. Recently, a common model for an EMS has been formulated by ISO that standardizes the elements that an EMS should contain. The model has been designed to be applicable to organizations of all types and is set out in the standards ISO 14001 (ISO 1996a) and ISO 14004 (ISO 1996b).

The second EMS specification in use is the EU Eco-Management and Audit Scheme (EMAS). EMAS is an EU Regulation (as opposed to a standard) and only companies in EU member states may participate. The EMS requirements contained in EMAS are very similar to those contained in ISO14001 but, unlike ISO 14001, EMAS also requires

firms to produce an environmental statement and to have their EMS and statement verified by a third party as meeting the requirements of the Regulation (i.e. self-declaration is not possible).

So are these various EMS documents relevant to SMEs? The authors of ISO 14001 and 14004 certainly think their standards are. ISO 14001 states that ‘it has been written to be applicable to all types and sixes of organizations and to accommodate diverse geographical, cultural and social conditions’ (ISO1996a) and ISO 14004 states that ‘it can be used by organizations of any size. Nonetheless, governments and business are increasingly recognizing the importance of SMEs. This guideline acknowledges and accommodates the needs of SMEs’ (ISO1996b).

While the writers of ISO 14001 and EMAS consider their documents suitable for use by SMEs, others are less sure, regarding these schemes as too complex and bureaucratic for companies with lower employees and less formal management structure. The first rather obvious point to make is that, given that a number of SMEs have become certified to ISO 14001 and/or EMAS, the above view does not accurately reflect the reality for all SMEs.

There is a problem, if, as has been argued, there could be something better for SMEs than a choice between ISO 14001/EMAS or nothing. The argument goes that the idea of a certifiable/verifiable EMS is worthwhile but what is needed is a simpler, more straightforward version for SMEs as this alternative sill be much more relevant to most SMEs. However, there could be nothing in the requirements of ISO 14001 that necessities the development of a complex and bureaucratic system. It is possible to meet its requirements by developing an effective system that is both simple and user-friendly.

(3) Environmental Auditing

An environmental audit is a tool for checking whether a firm is doing what it should be doing or, to put it slightly more technically, for evaluating whether particular environmental activities, conditions, management systems and so on conform with audit criteria. For instance, a legislative compliance audit checks that those activities of the firm covered by environmental legislation actually comply with that legislation. A waste management audit will tell a firm whether its waste management practices conform with the industry sector best-practice guidelines it has committed itself to following. Hence, any SME that needs to check its environmental management activities will use this tool.
(4) Environmental Indicators

Environmental indicators allow a firm to make measurements related to its environmental performance. Indicators can be used within an EMS to check that a firm has met the targets it is required to set for itself, but can equally well be used in firms that have not developed an EMS. ISO 14031, the international standard on environmental performance evaluation (ISO 1999a), sets out guidance on how organizations can develop and use indicators to evaluate their environmental performance. The standard defines indicators into three categories: One, management performance indicators that provide information about management’s efforts to influence environmental performance. Two, operational performance indicators that provide information about the actual environmental performance of an organization’s operation. Three, environmental condition indicators that allow an organization to assess its impact on the environment by measuring the condition of the environment over time. The standard makes it clear that the standard can be used by all organizations ‘regardless of type, size, location and complexity’ (ISO 1999a).

(5) Ecobalances

An ecobalance records the various raw materials, energy, resources, products and wastes entering held within and leaving a company over a specified period of time. In other words, it provides a record of a company’s physical inputs, stocks and outputs. Once a company knows exactly what is coming in and going out, it can begin to assess the particular environmental impacts of those inputs and outputs. An ecobalance therefore enables a firm to undertake the comprehensive environmental review of its activities required by ISO 14001 and EMAS. It also provides relevant data for operational performance indicators so that progress toward meeting targets can be tracked.

(6) Life Cycle Assessment

Life Cycle Assessment (LCA) is a tool for identifying and assessing the various environmental impacts associated with a particular product. LCA takes a ‘cradle-to-grave’ approach, looking at the impacts of the product though its life cycle - i.e. from the raw materials acquisition (the ‘cradle’) through its production and use to its final disposal (the ‘grave’). LCA allows manufactures to find ways of cost - effectively reducing the environmental impact of a product over its life cycle and to support their claims about the environmental impact of their products. LCA is a complex process for
which SMEs will almost certainly not have the in-house expertise. LCA is also expensive to carry out and so, while used by some SMEs, it is likely to be interest to only a limited number.

(7) Environmental Labeling

Environmental labeling schemes award an environmental label to those products that are judged to be less harmful to the environment than others within the same product group. Firms that wish their products to be considered for a label must apply to the scheme organizer. To be awarded a label, a product has to meet a set of environmental criteria drawn up for its product group by the scheme organizer. The criteria relate to the complete product life cycle and are drawn up using LCA. They are set so that only a certain percentage of products within a group, say 20%-30%, can meet them. Hence, environmental labels can be used as marketing tools as they signify that a product is one of the least environmentally harmful products in its group.

(8) Environmental Reporting

Having undertaken various environmental management initiatives to improve its environmental performance, a firm may wish to communicate the results of these to the outside world. One way of doing this is by publishing an environmental report. Issuing an environmental report can improve a firm’s public image and lead to improve relationships with stakeholders. To date, it is mainly large companies that have issued such reports, although some SMEs have also done so.

2. Environmental Management System

2.1 Definition of Environmental Management System\textsuperscript{11}

An ‘Environmental Management System (EMS)’ aims to systematize procedures, controls and responsibilities so that environmental issues become a strategic part of an organization’s overall management system. EMS consists of a number of interrelated elements that function together to achieve the objective of effective environmental management.

Each company could design its system to meet its particular needs. These systems

contain a differing combination of elements. Recently, however, international EMS certification programs, such as ISO 14001 and the European Union’s Eco-Management and Audit Schemes (EMAS), are part of a rapidly growing trend and are widely used internationally.

ISO14001 is a specification standard that consists of a set of requirements, in this case for establishing and maintaining an EMS. By demonstrating compliance with these requirements to the outside world, a firm can signal that it has a credible management system in place. One way in which a firm can demonstrate that it has met the requirements of the standard is by ‘self-declaration’ meaning that the firm checks its own compliance. However, a firm may feel it carries more weight with the outside world if an independent third party checks its compliance with the requirements of the standard. If this third party is satisfied that the requirements of the standard have been met, then ‘certification’ can occur: Certification is defined as the ‘procedure by which a third party gives written assurance that a product process of service conforms to specified requirement’ (ISO/IEC, 1996).

The second EMS specification in use is the EU Eco-Management and Audit Scheme (EMAS). EMAS is an EU Regulation (as opposed to a standard) and only companies in EU member states may participate. The EMS requirements contained in EMAS are very similar to those contained in ISO14001 but, unlike ISO14001, EMAS also requires firms to produce an environmental statement and to have their EMS and statement verified by a third party as meeting the requirements of the regulation (i.e. self-declaration is not possible).

2.2 The Reason to Implement an Environmental Management System

While there are obviously costs involved in setting up and operating an environmental management system, the system can also bring great benefits. A firm should establish an environmental management system if it believes that the benefits from doing so will outweigh the costs involved.

(1) Cost

The costs involved can include staff, time spent establishing and maintaining the system, payment of consultants, if used to help establish the system, and payment of ISO 14001 certifier/EMAS verifier.

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VI. Conceptual Framework of EM and EMS

(2) Benefits

Some of the benefits that arise from establishing an EMS are set out below.

① A Cost Effective Approach

An EMS takes a systematic approach to environmental management and a systematic approach is a cost-effective approach. The environmental review highlights all the areas of the firm where improvement in performance is possible. With this information, a firm can assess which improvements will produce the greatest benefits in terms of cost savings and reduction of risk, and deal with these areas first. The firm can then set targets that benefit both itself and the environment.

② Targets Not Just Set but Met

An EMS not only requires firms to set themselves targets but also ensures that they meet them. A firm must devise a management program for achieving its targets, ensure that the resources are available for it to be carried out, monitor its environmental performance to check it has met its targets and take corrective action if it finds it has not.

③ Legislative Compliance Ensured

As well as bringing about a continual improvement in environmental performance, EMS enables a firm to ensure it is complying with relevant legislation and regulations. The environmental review identifies all the legislation and regulations with which the firm should be complying and the firm must then establish procedures for checking compliance and taking corrective action should it discover instances of non-compliance.

④ Improved Public Image and Increased Market Opportunities

Not only do ISO 14001 and EMAS enable a firm to meet its environmental policy commitments and its objectives and targets, they also enable the firm to demonstrate sound environmental management to stakeholders. There may be considerable public relations benefits and increased market opportunities for a firm that can demonstrate to the outside world that it has a sound system of environmental management.

⑤ Viewed More Favorably by the Regulator and the Financial Sector

Having a management system can mean less supervision from environmental regulators and preferential treatment from banks and insurers. The fact that an EMS demonstrates sound environmental management may well improve the ability to attract investment.
2.3 Conceptual Framework for Small and Medium Sized Enterprises Voluntary Environmental Management System (SME-VEMS)

The purpose of SME-VEMS is to allow organizations to maintain control of their environmental agendas. By maintaining control over their environmental agenda they are able to lower costs such as fines, penalties, insurance premiums, legal costs, mediation costs, and future liabilities. SME-VEMS allows organizations to reduce the uncertainties inherent in the future.

(1) PDCA Cycle

Most important, maintaining control of the agenda allows organizations to add to shareholder value, because confidence in their future and public goodwill are important assets. The Plan-Do-Check-Act cycle (PDCA) of improvement shown in Figure VI-2 may suggest a reasonable conceptual framework for SME-VEMS.

The ‘Planning’ phase of an effective SME-VEMS includes the following elements:
- Creating an environmental policy
- Identifying environmental aspects with significant impacts
- Identifying and communicating legal and other requirements
- Identifying interested parties and their needs, concerns and demands
- Establishing improvement objectives, measurable targets, and performance indicators
- Creating plans that assign responsibilities and resources for achieving the objectives and targets, and which describe how to achieve them
- Defining structure and responsibility
- Creating a SME-VEMS summary manual (sample SME-VEMS manual)

The ‘Doing’ phase of the PDCA cycle includes the following elements:
- Conducting training
- Creating communication plans
- Controlling operations to prevent significant environmental impacts
- Preparing systems for documentation control
- Preparing and responding to emergencies

The ‘Checking’ component of the PDCA includes the following elements:
- Monitoring and measuring
- Investigating and completing non-conformance and preventive and corrective action
- Conducting an EMS audit

The ‘Acting’ component of the PDCA has the following element:
- Conducting a management review

(2) Factors and Elements Influencing the Introduction of EMS

Due to the existence of a wide variety of SMEs of different natures, a number of factors must be considered prior to setting up the conceptual framework of VEMS for SMEs. Figure VI-3 shows possible factors and elements that affect the introduction of VEMS.

![Figure VI-3. Elements and Factors to Consider for the Introduction of EMS](image-url)
Environmental driving forces may include:
- Laws (regulations)
- Lawsuits
- Government policies
- Banks
- Investors
- Accounting systems
- Employees
- Markets
- Costs
- Public and ENGOs
- Industry codes and standards
- Self-regulation
- International factors

Factors affecting current practices may include:
- Energy
- Water
- Wastewater
- Solid waste
- Licenses
- Education and training
- Management structure
- Pollution prevention and control

Some possible barriers to the introduction of SME-VEMS may include:
- Lack of recognition for VEMS needs
- Perceived costs of VEMS and underestimation of the benefits
- Resistance to complexity
- Multiple stakeholders with conflicting interests
- Lack of knowledge or expertise
- Resource problems (money, time and skills)
- Resistance to complexity
- No delegated responsibility, or responsibility without the resources to implement change
- Application of inappropriate solutions
- Isolation of the environmental issues from other aspects of the organization
- Reluctance to use external assistance
- Concerns about legal issues

2.4 EMS Adoption of SMEs\textsuperscript{13}

The various EMS documents relevant to SMEs’ ISO\textsuperscript{14001} states that ‘it has been written to be applicable to all types and size of organizations and to accommodate diverse geographical, cultural and social conditions’ (ISO, 1996) and ISO\textsuperscript{14004} states that ‘it can be used by organizations of any size. Nonetheless, governments and business are increasingly recognizing the importance of SMEs. This guideline acknowledges and accommodates the needs of SMEs’ (ISO, 1996). While writers of ISO\textsuperscript{14001} and EMAS consider their documents suitable for use by SMEs, others are less sure, regarding these schemes as too complex and bureaucratic for companies with fewer employees and less formal management structures.

There is a problem, if there could be something better for SMEs than a choice between ISO\textsuperscript{14001}/EMAS or nothing. The argument goes that the idea of a certifiable/verifiable EMS is worthwhile but what is needed is a simpler, more straightforward version for SMEs as this alternative will be much more relevant to most SMEs. It is possible to meet its requirements by developing an effective system that is both simple and user-friendly. As Annex A of ISO\textsuperscript{14001} states: The level of detail and complexity of the environmental management system and the resources devoted to it will be dependent on the size of an organization and the nature of its activities. This may be the case in particular for SMEs.

(1) Internal and External Benefits of SMEs adopting EMS

Numerous internal and external benefits are expected from the implementation of formal EMSs such as ISO\textsuperscript{14001} and EMAS.

Internal benefits are positive outcomes from the implementation of an EMS that relate to the internal operation of an SME. The internal benefits could be grouped into the following three categories: (i) organizational benefits, (ii) financial benefits, (iii) people benefits.

### Organizational Benefits
- EMS enhanced quality and Investor in people system
- ISO14001 possible to combine with quality system (ISO9000 series)
- Quality of management improved
- Improved quality of training
- Improved working conditions and safety
- Improved quality of environmental information
- Legal compliance is documented and can be demonstrated
- Encourage innovation
- Review and improve procedures
- Stimulate process, transport, raw materials and packaging changes
- Demonstrate environmental responsibility
- Provide a strategic overview of environmental performance

### Financial Benefits
- Cost savings from material, energy and waste reductions and efficiencies
- Improved economic condition of SME

### People Benefits
- Increased employee motivation, awareness and qualification
- Improved employee morale
- Enhanced skills and improved knowledge in SME
- Creates a better company image among employees
- Provides a forum for dialogue between staff and management

External benefits are positive outcomes from the implementation of an EMS that relate to the external interactions of an SME. The external benefits could be grouped into three categories: i) commercial benefits, ii) environmental benefits, iii) communication benefits.
VI. Conceptual Framework of EM and EMS

Communication Benefits

- Create a positive public image
- Develop better customer relationships
- Develop better co-operation and relationships with regulators and administrative bodies
- Improve communication with stakeholders
- Set an example for other companies in a sector

(2) Disadvantages of SMEs adopting EMSs

Disadvantages are negative outcomes or non-materialization of benefits from the adoption of EMSs. The disadvantages identified in the studies are summarized as follows.

| Resource: cost/time/skills | · Higher than expected staff costs  
| · Unexpected capital expenditure required  
| · Certification fees higher than expected  
| · Time and cost required to develop EMAS environmental statement |

| Lack of Rewards | · Lack of market rewards |

| EMS Surprises | · Consultants over-emphasize documentation and over-complicate system  
| · Paperwork emphasized instead of environmental performance  
| · Underestimation of external communication aspects of EMSs  
| · Problems meeting different stakeholders demands  
| · Linking the EMS to quality system restricted the scope of the EMS and disrupted the quality system  
| · Non compliances identified  
| · Complexity of approach  
| · EMAS audit cycle can be set at less than three years |

(3) Internal and External Barriers to the EMS Adoption by SMEs

Internal barriers are obstacles that arise within the firms and prevent or impede EMS implementation.
### Resources
- Lack of management and/or staff time for implementation and maintenance
- Inadequate technical knowledge and skills
- Lack of training
- Multifunctional staff easily distracted by other work
- Loss of environmental champion
- Lack of specialist staff
- Transient workforce
- Requirement for capital expenditure

### Understanding and Perception
- Lack of awareness of benefits
- Lack of understanding of EMAS environmental statement or value of reporting
- Lack of knowledge of formalized systems
- Uncertainty and concern over possible de-registration for minor breaches of legislation
- Perception of bureaucracy
- Perception of high cost for implementation and maintenance
- Confusion between ISO14001 and EMAS and how they relate

### Implementation
- Implementation is an interrupted and interruptible process
- Inability to see relevance of all stages
- Internal auditor independence difficult to achieve in a small firm
- Doubts about ongoing effectiveness of EMSs to deliver objectives
- Difficulties with environmental aspects/effects evaluation and the determination of significance
- Uncertainty about how to maintain continual improvement

### Attitudes and company culture
- Inconsistent top management support for EMS implementation
- Management instability
- Low management status of person spearheading EMS implementation
- Resistance to change
- Lack of EMS internal marketing
- Negative view or experience with ISO9000 Standards rubs off on ISO14001’s acceptance

External barriers are obstacles that arise outside the firms to prevent or impede EMS implementation.
Small and medium-sized firms face internal and external barriers when seeking to address their environmental issues and adopt and implement EMSs, but it is the internal barriers that, initially, have the more significant role in impeding progress. Negative company culture towards the environment and the disassociation between positive environmental attitudes of personnel and taking action cause the uptake of environmental performance improvements and EMS adoption to stumble at the first hurdle.

On top of this general culture of inaction on the environment, SMEs are also very
skeptical of the benefits to be gained from making environmental improvements. In many cases, especially for the smaller organizations, low awareness and the absence of pressure from customers (the most important driver for environmental improvements and EMS adoption), along with insufficient other drivers, mean that few efforts are made to address environmental issues. SMEs also face the problem of locating, and having the time to locate, good-quality advice and information.

Once a smaller company has embarked on EMS implementation the process is often interrupted and resources are frequently diverted to core business activities. It is the lack of human resources, not financial ones, that SMEs find most difficult to secure and maintain for EMS implementation: this is particularly the case for micro firms. The more multi-functional the staff, as is common in micro and small companies, the more likely it is that the process of implementation will be interrupted. Some studies indicate that SMEs, once on the route to certified EMSs, face inconsistency and high charges in the certification system and poor-quality advice from consultants.

Customers and the key drivers for the EMS adoption have influence far beyond any of the other stakeholders cited in the analyzed studies. Paradoxically, customers also show lack of interest in, or are satisfied with, SMEs’ current environmental performance. Micro enterprises, in particular, found their customers to be uninterested in their environmental performance. This may be because the customers, like the micro firms themselves, consider micro firms’ environmental impacts to be negligible. Legislation and the regulators are more important drivers for general environmental improvements in SMEs than customers.
VII. Environmental Management of Korean SMEs: Survey

In the course of this project a survey was carried out to investigate the current status of environmental management practices of Korean small and medium sized enterprises (SMEs).

The survey dealt with seven distinct subjects: Environmental management in general, the structure of environmental departments, difficulties encountered and efforts made in environmental management, supply chain management, environmental subsidies and assistance programs, quality management and the environment, and organizational commitment to environmental management.

Questionnaires were distributed to 200 companies that met a certain level of proficiency with environmental systems, such as those that had obtained ISO 14001 certification or were recommended by local environmental departments or the Korean Environmental Labeling Association. Of the total 200 companies selected, 101 responded to the survey, and analysis was performed on the information they provided.

In addition to this, specific aspects of environmental management were analyzed in accordance with sizes and business types of SMEs, respectively. Regarding size, companies were classified into three groups according to the number of employees, i.e. less than 100, 100 to 300, and more than 300 employees. Industry-specific characteristics of environmental management were examined for the following industries: Metal/machine, electric/electronic, food, and chemical industry. The majority of respondents were evenly distributed throughout these industry sectors. Also, efforts were made to draw correlations between several factors derived from the questionnaire analysis.

1. Environmental Management in General

This survey aims to investigate the environmental management status of Korean SMEs that are trying to control and/or manage the environmental issues faced by their organizations. Figure VII-1 to Figure VII-4
presents the distribution by business, sales volume, size, and market channel of the 101 companies that responded to the survey.

Metal/machine, electric/electronic, food, and chemical industries accounted for 75% of the surveyed firms as can be seen from Figure VII-1. Others included the pulp/paper, textile, construction, pharmaceutical, and glassware industries.

Companies with more than KRW 10 billion sales volume per year accounted for 70% (see Figure VII-2).

The surveyed companies were distributed evenly according to the number of employees (see Figure VII-3).

![Figure VII-2. Companies by Sales](image1)

![Figure VII-3. Companies by Size](image2)

Most firms deliver their products directly and/or indirectly to consumers through larger firms, although some supply their products via other SMEs (see Figure VII-4). It is noteworthy that about 40% of the firms with less than 100 employees distribute their products directly to consumers (see Figure VII-5).
2. Organizational Commitment to Environmental Management

All surveyed companies had someone committed to management of environmental issues (see Figure VII-6). Of the total, 79% had environmental commitments at the CEO level and only 17% committed at only the environmental department level. Firms acquired information on environmental management from
many sources. Some of these sources include mass media, industrial association, and the CEO himself (see Figure VII-7).

![Figure VII-7. Companies’ Information Sources on Environmental Management](image)

As shown below, companies with less than 100 employees had no information from the government at all (see Figure VII-8). Medium-sized companies (100~300 employees) were more sensitive to their management and industrial associations and relatively less influenced by mass media.

![Figure VII-8. The Recognition Sources of Environmental Management (by size)](image)
The level of organizational commitment tends to influence types of environmental management activities. The activities can be classified into two groups: End-of-pipe technology and pollution prevention. End-of-pipe technology usually refers to ‘improvement/introduction of treatment facilities’, while pollution prevention focuses rather on ‘change of raw materials/process improvement’. 76% of companies committed at the CEO level carried out environmental management by applying pollution prevention measures (see Table VII-1). When a CEO and his employees were positive regarding environmental issues, it reflected in management performance as well as environmental performance. However, companies who were passive toward pollution prevention had comparatively poor performance.

### Table VII-1. Organizational Commitment and Environmental Management Performance

<table>
<thead>
<tr>
<th>Environmental Management Activity Types</th>
<th>Performance</th>
<th>Environmental Management Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>End-of-Pipe</strong></td>
<td><strong>Pollution Prevention</strong></td>
<td><strong>Environmental Performance</strong></td>
</tr>
<tr>
<td>CEO and All Employees</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>Environmental Department</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Note: The level of relationships

Companies which had environmental policies covering all work duties accounted for 92% of companies surveyed (see Figure VII-9). In the survey, 18% of the small companies with less than 100 employees had no environmental policies, however all companies with more than 100 employees had at least one or more environmental policy (see Figure VII-10).
3. Environmental Department

The titles and roles of departments in charge of environmental issues differ from one company to another. Of all firms surveyed, 90% of had departments dealing with environmental issues, while 31% of had independent, dedicated environmental departments (see Figure VII-11).

![Figure VII-11. Departments in Charge of Environmental Issues](image)

Regarding size, many of the large firms (>300 people) had independent environmental departments (see Figure VII-12), while many middle sized firms (100~300 people) placed the general management department in charge of environmental issues.

![Figure VII-12. Environmental Departments (by size)](image)
Environmental departments play multiple roles in simultaneously participating in facility management, production, purchase/sales, and research and development. The survey results showed that the two main tasks of environmental departments were facility control and production (see Figure VII-13). Environmental departments also carried out affairs related to certification or quality control.

Figure VII-13. The Role of Departments in Charge of Environment

With respect to business types, purchase/sales is considered more important in metal/machine and electric/electronic than in the food and chemical industries. Also in the case of the food industry, the fraction of departments that perform production and environmental management at the same time was comparatively smaller than other sectors (see Figure VII-14).

Figure VII-14. The Role of Departments in Charge of Environment (by business)
4. Environmental Management

There are several driving forces leading SMEs to implement environmental management (see Figure VII-15). The strongest among these forces was ‘environmental regulation’ followed by ‘corporate image’ and ‘competitive advantage’ respectively. Overall, these three elements are dominant, although there was some variation between business types. Corporate image is the most significant factor in the metal/machine and chemical industry, while competitive advantage tops the list in the electric/electronic industry and environmental regulation in the food industry (see Figure VII-16).

![Figure VII-15. The Drivers of Environmental Management](image)

![Figure VII-16. The Drivers of Environmental Management (by industry)](image)
With respect to supply chain, 71% of SMEs obtained environmental certifications (i.e. ISO14001), as they were required as a prerequisite for contracts from their customers (see Figure VII-17). Regarding industrial type, only 57% of companies in the food industry were influenced by the supply chain (see Figure VII-18).

![Figure VII-17. Environmental Certification Required by Customer Requirements](image-url)

**Figure VII-17. Environmental Certification Required by Customer Requirements**

The companies surveyed were currently approaching environmental management primarily by introduction of an environmental management system (i.e. acquiring ISO14001 certification) (see Figure VII-19). Companies were also working to improve their treatment facilities and/or change raw materials, promote environmental training programs, and establish environmental departments. Regarding industry, whereas ‘change of raw material/process improvement’ is used more in the electric/electronic industry than other industries, ‘environmental training programs’ were used more in the chemical industry. ‘Establishing an environmental department’ was less important for the food industry compared to other industries. (see Figure VII-20).
Environmental management initiatives can bring both environmental and economic benefits (see Figure VII-21). Many companies achieved reduced emissions, and cost saving or sales increases were also realized by about 30% of firms surveyed. These results not only serve as a model for learning about these companies' environmental management, but also serve as an
indicator for other enterprises regarding the effectiveness of environmental management. Regarding size, reduction in pollutant discharge was especially remarkable (79%) in companies with 100~300 employees. As seen below, there was a direct-positive correlation between a company’s size and sales increases realized from environmental management (see Figure VII-22).

![Figure VII-22. Results from Environmental Management (by size)](image)

Regarding industrial characteristics, 62% of food companies and 73% of chemical companies respectively were able to cut costs and reduce pollutant discharges (see Figure VII-23).

![Figure VII-23. Results from Environmental Management (by industry)](image)
There is also a correlation between the types of environmental management activities performed and overall performance (see Table VII-2). Companies practicing end-of-pipe treatments performed better in the environment compared to management performance.

<table>
<thead>
<tr>
<th>Environmental Management Activities and Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>End-of-Pipe</strong></td>
</tr>
<tr>
<td>Environmental Performance</td>
</tr>
<tr>
<td>Pollution Prevention</td>
</tr>
</tbody>
</table>

Note: The level of relationship

In carrying out environmental management, having an environmental champion inside the company played a more important role than other resources (see Figure VII-24). Facility/technology and consulting services were of great help in continuous implementation of environmental management. Unlike other industries, the most important resource for chemical industry is ‘introduction of facility and technology’, while ‘consulting service’ contributed comparatively less to environmental management in the chemical industry (see Figure VII-25).

![Figure VII-24. Resources for Environmental Management](image-url)
Companies encouraged to carry out environmental management through supply chain relationships were provided with information, management skills, technology, funds, and human resources by their customers (see Figure VII-26). However, only 3% of small companies were observed to have cooperative relationships involving technology (see Figure VII-27). Compared with other industries, the metal industry received greater amounts of information and less help with management skills through customer supply chain relationships (see Figure VII-28).

Figure VII-25. Resources for Environmental Management (by industry)

Figure VII-26. Cooperation with Customers on Environmental Management
Lack of human resources and time was the single largest environmental management barrier faced by the surveyed organizations (see Figure VII-29). It was also shown that access to information was scarce, with only a few, if any, information resources known to most companies. Organizational resistance against change was another documented barrier. Compared with other industries, lack of information and budget shortage were greater barriers in the food industry (see Figure VII-30).
5. Environmental Subsidies and Assistance Programs

In general, small firms suffer from budget shortages for environmental investment. While a wide variety of financial assistance programs are offered by the government and financial organizations to meet SME needs, nearly
69% of companies surveyed had no experience using these programs (see Figure VII-31). There are so few sources of information on such programs that many companies do not even realize they exist (see Figure VII-32). Even when an SME is applying for financial assistance, it is often not useful due to the administrative difficulties and excessive qualification requirements.

![Figure VII-32. Barriers to Utilizing Environmental Assistance Programs](image)

Main difficulties in using assistance programs lie in the ‘lack of information’ for companies with less than 100 employees and ‘administrative difficulty’ for ones with 100~300 employees (see Figure VII-33). In case of larger companies with more than 300 employees, ‘small-size of budget’ and ‘excessive qualification requirements’ were chosen as main barriers.

![Figure VII-33. Barriers to Utilizing Environmental Assistance Programs (by size)](image)
6. Quality Management and the Environment

Most firms surveyed had quality management systems, which mainly aim to improve productivity (see Figure VII-34). Improving the working environment, reducing energy/resources/water usage, and minimizing wastes were additional goals of their quality management programs that relate to environmental issues. Others include improving consumer awareness, cost saving, and increasing sales among others.

![Figure VII-34. The Environmental Objectives of Quality Management](image)

The size of companies seems to affect the environmental objectives of quality management. While large companies consider productivity improvement of primary importance, smaller companies put more emphasis on improving the working environment (see Figure VII-35).

![Figure VII-35. The Environmental Objectives of Quality Management (by size)](image)
While ‘Reduction in use of energy, resources, and water’ has relative significance to the electric/electronic industry, it is not so important for the metal/machine industry (see Figure VII-36). The metal/machine and food industries showed the most concern over ‘improvement of working environment’.

Figure VII-36. The Environmental Objectives of Quality Management (by industry)

67% of firms experienced noticeable environmental improvements by implementing quality management programs over the last three years (see Figure VII-37). Food and metal/machine industries that focused more heavily on improving the working environment experienced greater environmental improvements than other industries (see Figure VII-38).

Figure VII-38. Environmental Improvement Through Quality Management (by industry)
VIII. Best Practices: Case Studies

The case studies presented in Chapter VIII were chosen to demonstrate voluntary environmental management (VEM) best practices by exemplary, or "role model", SMEs. Results documented in the case studies are intended to motivate broader SME interest in VEM. Also, by covering a number of practical aspects regarding VEM adoption, the case studies serve as reference for SMEs seeking to improve their environmental management.

EMS assessment criteria used in the case studies are included in the appendix.

1. Changwoon Co. (Taegu Factory)

1.1 General

(1) Company Profile

Changwoon Co. is a polyester processing firm headquartered in Taegu. The company was established in 1980, first began trading in 1982 and launched a branch office in Seoul in 1985. Their Yongchun factory commenced operations in 1989. Dye processing was begun in the Taegu factory in 1993 when it was first completed.

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980. 12</td>
<td>Establishment : Taegu megalopolis (KRW 10 million capital)</td>
</tr>
<tr>
<td>1982. 5</td>
<td>Trade business registration</td>
</tr>
<tr>
<td>1985. 10</td>
<td>Launch of branch office in Seoul</td>
</tr>
<tr>
<td>1985. 11</td>
<td>Head office moved to Taegu megalopolis</td>
</tr>
<tr>
<td>1989. 9</td>
<td>Launch of Yongchun factory</td>
</tr>
<tr>
<td>1991. 3</td>
<td>Received the Honest Tax Payment award from Finance Minister (awarding agency : the Ministry of Finance)</td>
</tr>
<tr>
<td>1991. 11</td>
<td>The President award in Trading day</td>
</tr>
<tr>
<td>1992. 2</td>
<td>Export award (awarding agency : Korea Textile Export Association)</td>
</tr>
<tr>
<td>1993. 3</td>
<td>Q MARK acquirement (POLYESTER &amp; NYLON textile: Korea Yarn and Textile Test Inspection Office)</td>
</tr>
<tr>
<td>1999. 3</td>
<td>Launch of dye processing plant at head office: monthly production capacity 3,000,000 YDS</td>
</tr>
<tr>
<td>1995. 9</td>
<td>Increasing to KRW 1.7 billion capital</td>
</tr>
<tr>
<td>1997. 12</td>
<td>Increasing to KRW 1.7 billion capital</td>
</tr>
<tr>
<td>1999. 6</td>
<td>Prize of &quot;Promising SME for Export&quot; (awarding agency : SMIPC)</td>
</tr>
</tbody>
</table>
The company's total sales average 30 billion won per year, although sales have decreased slightly since 1997. Total number of staff has decreased over the last decade, with just over 300 employees at present. Figure VIII-1-1 shows annual trends for sales and number of employees.

![Figure VIII-1-1. Sales and Employees](image)

The company's overall organizational structure is as shown in figure VIII-1-2. As the chart shows, there is a large infrastructure used to manage each process. The Taegu factory has about 180 employees, which makes it large compared with other factories in the region.

![Figure VIII-1-2. Organization](image)

In the bleaching and dying industry, sales price depends closely on product quality. For this reason Changwoon Co. is concentrating on producing high quality goods to compete against other companies. Quality is a particularly important aspect of the
dyeing process, as dyeing a product to exactly match the color of a sample is difficult. 90% of their products are exported to countries in east Asia (including Hong Kong), North America and Europe.

Table VIII-1-1 lists Changwoon Co.’s main corporate customers and their delivery rates.

<table>
<thead>
<tr>
<th>Company</th>
<th>Delivery rates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itouchu Corp. (H.K.)</td>
<td>15</td>
</tr>
<tr>
<td>Mainywx Fabrics (H.K.)</td>
<td>20</td>
</tr>
<tr>
<td>Twins Istanbul (Turkey)</td>
<td>30</td>
</tr>
<tr>
<td>Trade Textice (U.S.A.)</td>
<td>10</td>
</tr>
<tr>
<td>Originac Ecegantinc (H.K.)</td>
<td>8</td>
</tr>
<tr>
<td>Classic Co. Ltd. (Canada)</td>
<td>6</td>
</tr>
<tr>
<td>Others : U.A.E., Singapore, Taiwan, China</td>
<td>11</td>
</tr>
</tbody>
</table>

(2) Industrial Setting

Constant demand for textiles, coupled with a wide variety of demands, means that the textile sector is continuously growing. The fashion industry has particular potential in that it makes high value-added products with a short life span. The textile sector is also a knowledge intensive industry that exerts great influence on related businesses, such as textile machinery and dye manufacturing.

The textile industry accounts for 8% of the total Korean manufacturing industry, and recorded production value of close to 31 trillion won in 1996. The recent decrease in production has been due to a drop in demand overseas. Since the late 1980s, rapid domestic wage increases that raised production costs and reduced competitiveness in the world market have caused Changwoon Co. to lose much of their clothing market to developing countries like China. The industry has also been affected by decreased domestic consumption. Domestic demand in 1997 equaled 18.5 trillion won, only 86.8% of that of 1996. Changwoon Co. attributes this trend to a domestic recession lowering consumption of clothing, textile and fiber.

Textile exports are also experiencing difficulty. The textile industry was the first to reach the single product export goal of 10 billion USD, and steadily increased to reach 18.3 billion USD in 1997. However, for the reasons noted above, Changwoon Co.’s competitiveness in the overseas market has weakened. Technology levels and value of the textile industry in Korea are at 70% and 40%, respectively that of Italy, the world
textile leader among industrialized countries. Changwoon Co. is falling behind particularly in the area of dye processing technology.

The structure of the Korean textile industry does not allow for active exchange of information across businesses. As a result it has been difficult to foster the development of dye processing technology, and the clothing business and the textile business have not been able to complement each other successfully. The communications gap is even larger between conglomerates and SMEs, leading to over competition and over production for the same markets. There is also no doubt that technology levels in Korea are slipping behind that of developed nations.

Figure VIII-1-3 shows the overall historical pattern of change in the bleaching and dye process industry. The dramatic swings in the 90s show the overall instability of the market.

![Figure VIII-1-3. Market Size of Bleaching and Dye Industry](image)

The figures show that at present the bleaching and dye industry seems to be in decline. To regain competitiveness Changwoon Co. will focus on developing high value-added products.

### 1.1 Environmental Situation

(1) Production Process and Major Environmental Aspects

Changwoon Co. (Taegu factory)'s dyeing process consists of material preparation, refining and washing, dehydrating, weight reduction, dyeing, washing, drying, and wrapping. The main pollutant generated from the whole process is wastewater. Figure VIII-1-4 shows the amount and concentration of the wastewater generated in each unit process. Wastewater concentration is highest in the weight reduction process: BOD
3500 mg/L and COD 2000mg/L. However, as the wastewater is gathered, the final concentration of the wastewater before flowing into the treatment system has an average BOD and COD of 1000 mg/L and 600 mg/L each. Total volume amounts to 1550 m³/day.

Expenses for wastewater treatment are, on average, 50 million won per month. In 2000 year Changwoon Co.’s goal is to reduce expenses by 15%.

(2) Management of Major Environmental Aspects

Raw wastewater undergoes primary treatment that chemically treats pollutants with sulfuric acid and Fe₂SO₄, an inorganic coagulant. Secondary treatment is through aerobic biological treatment. Figure VIII-1-5 is the wastewater treatment plant flow diagram. The treated water goes through the advanced wastewater treatment process at the Environmental Management Corporation, which is a central treatment agency in the industry park, and then to a

![Diagram of production process and wastewater generation](Figure VIII-1-4. Production Process and Wastewater Generation)

![Diagram of wastewater treatment](Figure VIII-1-5. Wastewater Treatment)
distribution system. The legal effluent standard for discharged wastewater is COD 130 mg/L, BOD 120 mg/L, and suspended solids 120 mg/L. Current effluent concentrations at Changwoon Co.’s treatment plant are COD 40 mg/L, BOD 20 mg/L, and suspended solids 40 mg/L.

Organic industrial wastewater generally has much higher BOD concentrations than municipal wastewater. Thus the conditions of microbes in the biological treatment plant are crucial to wastewater treatment capability. Microbes are very sensitive to their surroundings, which directly affects the system’s treatment capability. For instance, when temperatures are high during the summer, sludge bulking can disturb the treatment process. Maintaining constant microbe concentration is also important.

1.2 Environmental Management

(1) Overview of Environmental Programs

A wastewater treatment plant was constructed with the main factory building in 1993. Treatment quantity was 800 ton/day at first, but was doubled in 6 months with additional facilities. After accidentally discharging untreated wastewater in 1994, Changwoon Co. began a thorough environmental management campaign by establishing an environmental management bureau, investing in environmental facilities, and improving production processes. Unfortunately, the company experienced another environmental accident in 1996, although in this instance the problem was with air emissions. The following year, Changwoon Co. introduced air management facilities to change fuel from bunker C oil to gas. In 1998 Changwoon Co. repaired the treatment plant and in 1999 constructed a new treatment plant with treatment capacity of 600 tons per day at the Yongchun factory. During the year 2000, Changwoon Co. actively promoted an environmental improvement program. Table VIII-1-2 shows the history of the company's environmental management.
### Table VIII-1-2. History of Environmental Programs

<table>
<thead>
<tr>
<th>Year</th>
<th>Program</th>
<th>Year</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>93.2</td>
<td>Constructed wastewater treatment plant (800ton/day)</td>
<td>96.6</td>
<td>Environmental accident (air quality)</td>
</tr>
<tr>
<td>93.8</td>
<td>Additional wastewater treatment facilities (1600ton/day)</td>
<td>97.8</td>
<td>Introduced air management facilities (changed fuel from bunker C oil to gas)</td>
</tr>
<tr>
<td>94.2</td>
<td>Discharged untreated wastewater</td>
<td>97.9</td>
<td>Exemption of air environmental emission facility</td>
</tr>
<tr>
<td>94.3</td>
<td>Established environmental management bureau</td>
<td>98.8</td>
<td>Repairs to wastewater treatment plant</td>
</tr>
<tr>
<td>94.7</td>
<td>Investment in environmental facilities (filter press)</td>
<td>99.8</td>
<td>Construction of new wastewater treatment plant in Yongchun factory (600tong/day)</td>
</tr>
<tr>
<td>95.8</td>
<td>Improved production process (wastewater reduction)</td>
<td>2000.4</td>
<td>Promote environmental improvement program</td>
</tr>
</tbody>
</table>

(2) Pressures of Environmental Management

The water quality accident in 1994 made Changwoon Co. acknowledge the importance of an organized approach to environmental management. The accident was caused by an unexpected change in the microbes in the treatment process, which led to a decrease in sludge settling and microbial loss. Effluent concentrations shot up to 10 times average levels. After the accident, Changwoon Co. was placed under careful watch by the Ministry of the Environment. Due to this pressure Changwoon Co. planned a new environmental management project to stabilize treatment quality and systemize the biological treatment process.

(3) Activities and Performance of Environmental Management

Since their accident, Changwoon Co. has made it a practice to check microbe conditions 5 or 6 times a day. The check includes DO (Dissolved Oxygen) and SV (Setting Volume) of which concentrations must be maintained at 1.5~2.0mg/L (DO) and 40~50 (SV30). Further, Changwoon Co now operates an emergency system that is able
to handle any mishaps that may occur during the wastewater treatment process. As a consequence of these efforts Changwoon Co. has experienced no wastewater accidents since 1995.

![Figure VIII-1-6. Concentration of Treated Wastewater](image)

(4) Management Performance of Environmental Management

These above mentioned examples of environmental management are beneficial to the company and good for the environment, but also make economic sense. Sound management of wastewater treatment facilities reduces costs by avoiding the need for extra chemical compounds necessary to compensate for fluctuations in the condition of microbes in the biological treatment. Changwoon Co. was able to save 10~20 million won per year by reducing consumption of these compounds compared to other firms in the industry.

(5) Environmental Organization

Affairs related to environmental management in Changwoon Co. are the responsibility of 4 staff members in the environmental management division. Their main responsibility is water quality maintenance within the treatment plant from 8 a.m. to 7 p.m. Nightshift is in every three weeks so that they can be fully prepared for any possible situations.

Considering that the entire Taegu factory employs only a total of 180 staff members, the assignment of 4 employees to run environmental facilities occupies a significant proportion of total company staff. This size was maintained throughout all of the
company’s history, except in 1997 and 1998, when economic situations were difficult due to the recession. This shows that a minimum in human capital is necessary for systematic environmental management. Figure VIII-1-7 shows changes of staff size in the environmental management division.

The following paragraphs provide additional details about Changwoon Co.’s efforts to soundly manage environmental issues without a standardized EMS.

The operating system used in the environmental management division was an integral to Changwoon Co.’s success. A flexible ‘operation first, report later’ system made it convenient for personnel to respond to emergencies. Also the short decision making chain from assistant manager to director to executive officer made for more efficacious management.

The company atmosphere also encourages employees to secure their rights for self-development. For instance, Changwoon Co. provides liberal internet access or broadcasting services and a staff-only library to its employees. The result of these efforts can be seen in the employee transfer rate, shown in figure VIII-1-8.
Employee turnover rate has decreased over time and was only 3.2% in the year 2000. This is a relatively low quantity compared to the fact that the general transfer rate in the textile business is 4~5%. A low transfer rate enabled the company to accumulate highly skilled human capital, which ensures a source of information and know-how for addressing any environmental problems that may occur over the course of operations.

(6) Organizational Learning

From the cost reductions captured through maintaining control over microbe conditions, Changwoon Co. learned that environmental management is closely related to overall business management. Every staff member, including the CEO, came to acknowledge the importance of environmental management and actively supported enlarging investment in the environment.

1.3 Implications and Key Conclusions

(1) Environmental Management and Organizational Trends

Changwoon Co. does not have an outstanding or flashy environmental management system, but has produced excellent results through thorough internal management. One drawback though, is their lack of written documentation on the operation of environmental management processes.

Recording management processes in document form is a very important part of sound environmental management. Nevertheless, management procedures in Changwoon Co. are as sound as possible taking into account the organizational character of an SME.
Large discharges of wastewater with high pollution concentration make the bleaching and dyeing industry, to which Changwoon Co. belongs, one of the major industries impacting the environment. This fact has actually helped Changwoon Co. to implement thorough self-regulation on environmental matters without having a systematic environmental management program. This type of management style is only possible for businesses with a flexible atmosphere. Employees prefer Changwoon Co.'s flexible policies, as can be seen from lowering employee transfer rates over time. Such a low transfer rate has enabled the company to accumulate highly skilled human capital, which ensures a source of information and know-how for addressing any environmental problems that may occur over the course of operations.

2. Daeduck Global Digital Solution Co.

2.1 General

(1) Company History

Daeduck GDS Co., established in 1965 as Daeduck industry, has been producing PCB (Printed circuit board) for the last 35 years. The company changed their name to Daeduck GDS Co. as a symbol of the new millennium. Daeduck GDS Co.'s main products are electronics equipment and PCBs used as components for information technology equipment.

Daeduck GDS Co. has contributed to the development of the domestic electronics industry throughout its long history. It participated in 'New Village Activity' in the 1980s and received a 'best corporation' award for 'excellency' in 1988. Since 1990, Daeduck GDS Co. has concentrated on quality improvement by obtaining the quality certifications in 100 PPM in 1996 and QS 9002 in 1999.

Daeduck GDS Co. has made outstanding efforts in the environmental sector as well. The company has been active in responding to national environmental concerns, governmental regulations, and legal enforcement. As a result, Daeduck GDS Co. received awards for water quality (1998) and air quality (1999). A recent product of the company’s environmental management efforts is the introduction of ISO 14001 certification.

As stated above, Daeduck GDS Co. always considers product quality and environment within its management policy. In year 2000, they reorganized the company structure to facilitate better environmental management.
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>Establishment</td>
</tr>
<tr>
<td>1972</td>
<td>U.L certification</td>
</tr>
<tr>
<td>1979</td>
<td>Received government award for contributing to development of domestic electronics industry</td>
</tr>
<tr>
<td>1983</td>
<td>Received presidential award for 'sae ma ul' activity</td>
</tr>
<tr>
<td>1987</td>
<td>Establish institution of Daeduck Co.</td>
</tr>
<tr>
<td>1988</td>
<td>Listing on the Korea Stock Exchange</td>
</tr>
<tr>
<td>1988</td>
<td>Received 'best corporation' awards from the National Managers Association</td>
</tr>
<tr>
<td>1991</td>
<td>Achieved '1st rate quality corporate' certification</td>
</tr>
<tr>
<td>1996.03</td>
<td>Achieved '100 PPM quality certification'</td>
</tr>
<tr>
<td>1996.06</td>
<td>Established Daeduck Philippines</td>
</tr>
<tr>
<td>1997.06</td>
<td>Received clean Han river environment award</td>
</tr>
<tr>
<td>1998</td>
<td>Award from the Ministry of the Environment for air quality management</td>
</tr>
<tr>
<td>1999.04</td>
<td>Achieved &quot;QS9002 qualification certificate&quot; from KMA-QA</td>
</tr>
<tr>
<td>1999.08</td>
<td>Achieved 'Y2K certification' from Korea Information Technology Association</td>
</tr>
<tr>
<td>2000.01</td>
<td>Structural reorganization</td>
</tr>
<tr>
<td>2000.03</td>
<td>Maximum production rate (550 thousand m2/month)</td>
</tr>
<tr>
<td>2000.04</td>
<td>Changed company name from Daeduck Co. to Daeduck GDS Co.</td>
</tr>
<tr>
<td>2000.05</td>
<td>Procedures expected to reach full scale from June</td>
</tr>
</tbody>
</table>

Daeduck GDS Co. has as their ultimate goal to be one of world’s finest corporations. Their objectives to meet this goal, include: leading the Korean PCB market by building a company image of trustworthiness and responsibility; using product development and globalization to improve their standing as a PCB producer in the Asian market; and targeting the global PCB market with a sound information base and digital response system. These management policies are represented as the FINE MOVEMENT, which aims to achieve the goals of Global Digital Solution by improving staff spirit, production process, and company destination.

There are four domestic and two overseas affiliates in Daeduck GDS Co.. Daeduck
GDS Co. was established first in the Banwal industrial complex. Daeduck electronics followed in 1972, and Hirose in the Shihwa industrial complex in 1985. In 1994, the CAD business units from Daeduck electronics and Internex Korea merged to form Internex Ltd., concentrating on software businesses such as PCB and CAM. Daeduck Philippines, established in 1996, was the first affiliate to be operated overseas. It since became the leading PCB producer in the Philippines, manufacturing single sided, double sided, and multilayer boards. Another affiliate, Fine Tech, Inc. (FTI), was launched in 1996 and is located in the United States in San Jose, California. In the following year, FTI Ottawa, Canada and FTI RTP, USA were included as affiliates of Fine Tech, Inc. FTI operates in the areas of customer service and technical support.

(2) Organizational Characteristics

Daeduck GDS Co. has the largest PCB production scale in the Korean domestic market, with total sales of 166 billion won in 2000 (figure VIII-2-2). Annual sales growth rate remained at 115% even during the Korean financial crisis, and continues to increase. 84% of total sales come from exports. Total staff is approximately 650 at present and has increased steadily over the years.

![Figure VIII-2-2. Sales and Employees](image)

As company size grew, operations became harder to control as a whole. The company's solution was to divide the organization into departments allocated with
different management responsibilities. In 1996 the organizational structure was divided into four parts: the department of general management, department of marketing, department of production, and department of technology. In the year 2000, production, management and marketing departments were also created for a newly launched project. As a result the original factory became division 1, in charge of monolayer PCB production, and the new factory became division 2, in charge of producing multilayer PCBs. The new structure produced an overlap in function between departments in division 1 and 2, so eventually marketing, production, and technology were absorbed into the headquarters. Currently the organizational structure is divided into factory 1 (division 1), factory 2 (division 2), and the management, marketing, and technology departments.

![Organization Diagram](image)

**Figure VIII-2-3. Organization**

Daeduck GDS Co.’s products are classified as general PCBs and special PCBs. The former is a monolayered PCB used in general electronics equipment. Special PCBs fall into 5 categories, double layer PCB (DOUBLE), silver or copper double layer PCB used for conductivity (STH, CPTH), monolayer PCB with carbon paste (CARBON), and PCBs used as tuners for TV receivers or communication equipments (TUNER). Table VIII-2-1 shows characteristics of each product.
Table VIII-2-1. Products of Daeduck GDS

<table>
<thead>
<tr>
<th>Product type</th>
<th>Product features</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SINGLE</td>
<td>Printing and etching on plate → print with solder ink to prevent conduction → press punching</td>
<td>General electronic appliances</td>
</tr>
<tr>
<td>DOUBLE</td>
<td>Make circuit on only one side of the plate</td>
<td>Low-current high-frequency TV</td>
</tr>
<tr>
<td>STH</td>
<td>Circuit on both sides of plate → conduct by silver paste</td>
<td>CD-ROM, DVD-ROM</td>
</tr>
<tr>
<td>CARBON</td>
<td>Conductive carbon paste printed between single PCBs single PCB</td>
<td>Remote controller, organ</td>
</tr>
<tr>
<td>TUNER</td>
<td>Equivalent to single PCBs. Used for turners</td>
<td>TV receiver and communication device</td>
</tr>
<tr>
<td>CPTH</td>
<td>Similar to STH PCBs. Copper used instead of silver for conduction</td>
<td>CD-ROM, DVD-ROM</td>
</tr>
<tr>
<td>Special</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These classifications were due to rapid development in the electronic industries and multimedia industries in the 1990s. Daeduck GDS Co. is planning further classifications in PCB production such as the MULTI PCB which needs 4, 6, 8 layers. Figure VIII-2-4 shows the historical change of PCB production.

Figure VIII-2-4. Products of Daeduck GDS

Figure VIII-2-5 shows changes in production quantity resulting from industry trends. Total production decreased after 1995 due to the recession, but recovered quickly. The chart also shows that supply of general PCBs is greater than special PCBs.

Figure VIII-2-6 shows production trends for special PCBs. Demands on SILVER which is used for CD-ROM and DVD-ROM production, is growing rapidly. Production of COPPER, an alternative to SILVER, has been increasing for production cost reduction.
(3) Industry Setting

The standard of technology in the domestic Korean electronics industry does not fall far short from that of developed countries. Production is based on standardized parts and is cost competitive. In 1997, Korea was the 3rd leading PCB producing country after Japan and the United States. Particularly up until 1995, Korea had high a growth rate in PCB production due to increase in domestic demand and technology development.
Favorable overseas demand was another factor aiding growth. Although exports increased, total sales in 1998 decreased to 9.8 billion USD, a 22.6% fall, as a result of the economic recession and reduced demand in the domestic electronic and computer markets.

Nevertheless, demand for printed circuits parts is continuously increasing. The domestic PCB industry experienced rapid growth in support of a thriving electronics industry in the early 90s. Production costs began to increase in 1991, with the rate of increase accelerating after 1995. Figure VIII-2-7 shows trends in the production rate. Currently, industries related to information technology are flourishing due to digitalization, networking, and mobilization. Communication equipment, semiconductor, and LCD producers are requiring more complicated and sensitive PCBs. The domestic industry is reducing production of monolayer PCB in anticipation that demand will decrease by 2005 due to the coming digital TV era. For this reason, the production market has shifted to China or to the Philippines where the labor market is cheap enough to compensate production costs.
2.2 Environmental Situation

(1) Production Process and Environmental Aspects

Figure VIII-2-8 shows the PCB production procedure at factories in Daeduck GDS Co..

![PCB Production Process](image)

Figure VIII-2-8. PCB Production Process

Raw materials used in the process include water, ink, hydrogen peroxide, hydrochloric acid, sodium hydroxide, sulfuric acid, and UV ink. These materials are closely related to environmental issues such as water quality, air quality, solid wastes, hazardous wastes, and soil pollution. The single greatest environmental issue for Daeduck GDS Co. is water quality. Daeduck GDS Co. is located in the Banwal industrial complex in Ansan, and is surrounded by other similar factories. Water supply is a key issue in the region due to limited water resources. Sufficient water supply is critical in the washing process. Recent diversification of products and the enlargement of production lines have increased water consumption and wastewater generation. This makes recycling of wastewater indispensable to Daeduck GDS Co. operations (figure VIII-2-9). The importance of environmental effects caused by PCB can be seen through the relationship between PCB production quantities and wastewater discharge quantities. Over the last 5 years production increased by 27%, but wastewater discharge increased by 43%. Average water demand is 1050 ton/day, 24% of which is recycled water. The company is undertaking an R&D project to improve usage of recycled water.
Figure VIII-2-9. Water Consumption and Wastewater Generation

(2) Management of Environmental Aspects

Table VIII-2-2 is the classification of Daeduck GDS Co.’s business division and its facilities according to environmental sectors.

<table>
<thead>
<tr>
<th>Class</th>
<th>Generation/use</th>
<th>Treatment method</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Class II workplace</td>
<td>800ton/day</td>
<td>Physiochemical treatment</td>
</tr>
<tr>
<td>Air</td>
<td>Class IV workplace (workplace which emits specific toxic substance)</td>
<td>-</td>
<td>Absorption facility</td>
</tr>
<tr>
<td>Waste</td>
<td>Workplace which emits certain waste</td>
<td>Consignment treatment: 800ton/month</td>
<td>Consignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self treatment: 8ton/day</td>
<td>Dryness</td>
</tr>
</tbody>
</table>

Table VIII-2-2. Environmental Facilities
Table VIII-2-3 shows characteristics of wastewater inflow to the treatment plant.

**Table VIII-2-3. Characteristics of Wastewater**

<table>
<thead>
<tr>
<th>Cu</th>
<th>pH</th>
<th>SS</th>
<th>COD</th>
<th>N-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ppm</td>
<td>7.20</td>
<td>15 ppm</td>
<td>100 ppm</td>
<td>1.5 ppm</td>
</tr>
</tbody>
</table>

The wastewater undergoes the treatment process shown in figure VIII-2-10. A pH adjustment process regulates acids used, such as hydrogen peroxide or hydrochloric acid. The treatment includes both physical and chemical processes. Regulatory discharge limits for effluent are COD 130mg/L, and Cu 3ppm. Daeduck GDS Co. manages their COD concentrations at 45 mg/L and Cu 0.45 ppm, as can be seen in table VIII-2-4. Daeduck GDS Co. has implemented a strict set of internal regulations for environmental emissions, intended to keep them in full preparation for any changes in governmental regulation and retain some flexibility against concentration changes due to methods of measurement. The environmental harm caused by the electronics industries is notorious among the Korean public. The D electronics' phenol discharge incident in 1991, which caused severe municipal water pollution, led to the public apprehension and has become representative of the industry in general. Public sentiment is an important reason Daeduck GDS Co. has implemented strict self-regulation of environmental discharges.
Table VIII-2-4. Discharge Limits and Control of Emissions

<table>
<thead>
<tr>
<th></th>
<th>Emission limits</th>
<th>Self standard('99)</th>
<th>Self standard('00)</th>
<th>Self standard (present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>3ppm or less</td>
<td>0.8ppm or less</td>
<td>0.7ppm or less</td>
<td>0.45ppm</td>
</tr>
<tr>
<td>COD</td>
<td>130ppm or less</td>
<td>80ppm or less</td>
<td>75ppm or less</td>
<td>45ppm</td>
</tr>
<tr>
<td>PH</td>
<td>5.8~8.6</td>
<td>6.5~7.5</td>
<td>6.5~7.5</td>
<td>6.8~7.2</td>
</tr>
<tr>
<td>Air</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCl</td>
<td>5ppm or less</td>
<td>1.4ppm or less</td>
<td>1.3ppm or less</td>
<td>1.0ppm</td>
</tr>
<tr>
<td>stench</td>
<td>2degree or less</td>
<td>1degree or less</td>
<td>1degree or less</td>
<td>1degree or less</td>
</tr>
</tbody>
</table>

Figure VIII-2-11 shows concentration changes in COD and Cu in the effluent of Daeduck GDS Co.’s wastewater treatment plant since 1993. It is noteworthy that since 1996 concentrations were maintained at less than 50% of regulatory discharge limits. The regulatory discharge limit was been tightened once in 1996 from COD 150mg/L to 130mg/L.

In terms of solid wastes, the unit operation discharge amount has increased continuously since 1994 (figure VIII-2-12). The increase was due to changes in waste type and amount from product variation. Also, measurement methods used for solid waste have changed. However, since 1999 the company began to store wastes properly using tents and has decreased the unit operation discharge amount.
2.3 Environmental Management

(1) Initiation of Environmental Management

There were many reasons that led Daeduck GDS Co. to implement an EMS. The most important reasons were to build a sound company image and to make efficient use the limited municipal water supply of the region without affecting the local environment. In terms of the supply chain, it became important to emphasize the environmental benefits of their product, as well as quality, to buyers. Changing market circumstances also made environmental management crucial to the company’s management policy. Finally, an active response was necessary to meet continually tightening government environmental regulations.

However, what has been most important is the management philosophy of Daeduck GDS Co.’s board of directors. Daeduck GDS Co.’s success in introducing an environmental management system, despite an environmental accident which led to a 200 million won fine, is due to the chief executive’s ability to quickly accept and adapt to new trends in business management.

(2) Adoption and Implementation of Environmental Management System

Although the decision to introduce an EMS came from the chief executive a number of obstacles remained. In contrast with most other SMEs, financial issues were not a problem in the case of Daeduck GDS Co. due to its relative economic strength. Instead,
company culture or individuals' lack of awareness on environmental issues proved to be
the major barrier. At one point, EMS funding was delayed due to sentiment that
investment in the environment was unproductive.

There was no preparatory stage for introducing ISO 14001 certification, instead only
3 days of employee education were carried out with the help of Daeduck electronics. Table VIII-2-5 shows costs incurred for adopting ISO 14001 certification system. In order to achieve the certification a total expense of 263 million won was required.

**Table VIII-2-5. Costs for Adopting ISO 14001 Certification**

<table>
<thead>
<tr>
<th>Itemized account</th>
<th>Total</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training (1person x KRW500,000/day x 3days)</td>
<td>KRW 1,500,000</td>
<td>Training on impact assessment</td>
</tr>
<tr>
<td><strong>Inspection cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection cost of document (4 man-day):</td>
<td>KRW 6,400,000</td>
<td></td>
</tr>
<tr>
<td>KRW 2,560,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main inspection cost (6 man-day):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KRW 3,840,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Certificate agency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea Management Association Quality Assurance Co., Ltd</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Labor cost for TFT staff</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants (3persons) x average wage</td>
<td>KRW 54,937,500</td>
<td></td>
</tr>
<tr>
<td>(KRW36,625,000) x 50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of painting, gauge, repairing,</td>
<td>KRW 200,000,000</td>
<td></td>
</tr>
<tr>
<td>protective partition and writing materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>KRW 262,837,500</td>
<td></td>
</tr>
</tbody>
</table>

The company also experienced difficulty implementing the EMS mainly due to low
awareness among employees about the importance of environmental management. A
large organizational structure and complicated decision making process also contributed
to the difficulty. As a conglomerate, Daeduck GDS Co. enjoyed an advantage in that
tasks, duties and responsibilities are divided clearly. However, in the environmental
division, the widening range of tasks required by their EMS levied a large number of
responsibilities onto a few people.

In order to solve these difficulties, the board of directors has offered their full support
on environmental tasks. There was a further attempt to settle into the EMS by initiating
programs for employee education, emergency training, and internal auditing.
Table VIII-2-6 shows the economic and environmental costs and benefits from operating Daeduck GDS Co.’s EMS.

**Table VIII-2-6. Costs and Benefits of Environmental Management**

<table>
<thead>
<tr>
<th>Description</th>
<th>Investment cost</th>
<th>Effect (compared with 1998)</th>
</tr>
</thead>
</table>
| Electric energy savings                   | Improved efficiency through condenser equipment  
KRW 120,000,000                  | 22% electric energy saving  
(5.50 KW/m² → 4.29 KW/m²)  
cost saving  
KRW 422,663,261/year            |
| Reduced wastewater generation            | Continuous training and department’s goal system, flow meter by processing  
KRW 25,000,000                  | 16.3% reduction of Wastewater generation  
(74.93 L/m² → 62.73 L/m²)  
cost saving  
KRW 51,800,000/year            |
| Reduced water use                        | Continuous training and department’s goal system, flow meter by processing  
KRW 10,000,000                  | 21.2% reduction of water using  
(60.21 L/m² → 47.42 L/m²)  
cost saving  
KRW 20,027,421/year          |
| Sub-materials saving                     | Continuous training and department’s goal system, flow meter for a specific chemical  
KRW 20,000,000                  | 13.3% sub-materials saving  
(2.10 g/m² → 1.82 g/m²)  
cost saving  
KRW 1,753,586,352/year       |
| Tent for solid waste storage             | Tent equipment KRW 5,000,000            | Proper storage of solid waste                                                              |
| Dust collector installation              | Dust collector installation  
KRW 35,000,000                  | Improved workplace environment  
Reduced air pollution            |

In 1999, Daeduck GDS Co. was able to reduce 22% of their electricity consumption by installing electric condensers. The savings equaled 3.5 times the annual investment expense. Installing flow meters also resulted in reduction of production cost. Cost reduction from raw materials saved in the wastewater treatment process was 88 times the investment cost.

When Daeduck GDS Co. encounters difficulties that it is incapable of solving on its own, the company asks other conglomerates for assistance with information, technology, and managerial know-how. Daeduck GDS Co. also examines the environmental management of its suppliers. Most of the businesses, which are linked to Daeduck GDS
Co. through the supply chain, have already introduced the ISO 14001 certification system and are recommending it to other companies. Table VIII-2-7 shows the customers and suppliers of Daeduck GDS Co. that have received environmental management certification.

### Table VIII-2-7. Environmental Management of Customers and Suppliers

<table>
<thead>
<tr>
<th>Company</th>
<th>Certification</th>
<th>Company</th>
<th>Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung Electronics</td>
<td>ISO-14001</td>
<td>Doosan Electronics</td>
<td>ISO-14001</td>
</tr>
<tr>
<td>LG Electronics</td>
<td>ISO-14001</td>
<td>Shinsung Multiclad</td>
<td>ISO-14001</td>
</tr>
<tr>
<td>Daewoo Electronics</td>
<td>ISO-14001</td>
<td>Dio Ink Korea</td>
<td>ISO-14001</td>
</tr>
<tr>
<td>Sony Electronics Korea</td>
<td>ISO-14001</td>
<td>Unid</td>
<td>ISO-14001</td>
</tr>
<tr>
<td>Hyundai Electronics</td>
<td>ISO-14001</td>
<td>Taekyung Chemical</td>
<td>ISO-14001</td>
</tr>
<tr>
<td>Tae Kwang Industry</td>
<td>ISO-14001</td>
<td>Donghwa Damura</td>
<td></td>
</tr>
<tr>
<td>SONY</td>
<td>ISO-14001</td>
<td>Matsusida</td>
<td>ISO-14001</td>
</tr>
<tr>
<td>SIEMENS</td>
<td>ISO-14001</td>
<td>Comboard</td>
<td>ISO-14001</td>
</tr>
<tr>
<td>TOSHIBA</td>
<td>ISO-14001</td>
<td>Fujikura</td>
<td>ISO-14001</td>
</tr>
<tr>
<td>SMK</td>
<td>ISO-14001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALCATEC</td>
<td>ISO-14001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUJITSU</td>
<td>ISO-14001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KENWOOD</td>
<td>ISO-14001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHILIPS</td>
<td>ISO-14001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(3) Organizational Changes

The first environmental division in Daeduck GDS Co. was organized as an ‘environmental team’ in 1995 and was changed to an ‘environmental management department’ in 1996 and to an ‘environment and safety department’ in 1998. There are total of 6 staff working in the environment and safety department, one for each duty, as can be seen in figure VIII-2-13.
Table VIII-2-8 shows the historical change in roles of the environmental division. In contrast to other companies in the industry that reduced employment rates after the financial crisis, Daeduck GDS Co. hired more employees and enlarged management scope. In terms of environmental management, Daeduck GDS Co. expanded its range to include soil pollution in addition to water and air quality, hazardous waste and municipal water supply, safety and fire measures. ISO 14001 certification marked the introduction of the EMS.

### Table VIII-2-8. Roles of Environmental Department

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Water quality control</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Air pollution control</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Noise and vibration control</td>
<td>O</td>
<td>O</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Soil pollution control</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Toxic substance control</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Industrial water management</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Waste management</td>
<td>X</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Safety management</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Fire prevention</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>ISO14001 certification task</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

(4) Organizational Learning

Systematic environmental management reduced water demand by 21%, wastewater generation by 16%, electricity by 22% and minor material usage by 13%. As a result,
overall production costs were reduced by about 2.25 billion won.

Environmental and safety department reports are delivered to the board of directors on necessary investments and environmental regulations. Information on environmental management is collected from mass media, Internet, and public documents. Any valuable information gathered is reported to the CEO. Data analysis is used to compare investment values with actual return on investment. These activities help promote investment in environmental management and reaffirm to employees the importance of environmental management.

2.4 Implications and Key Conclusions

(1) Importance of Awareness to Environmental Management

There were several external pressures that led Daeduck GDS Co. to introduce an EMS. Industry characteristics, shortages in water supply, regulatory concerns, market competitiveness etc. all worked as external pressures on the company. What was more important is that the company was able to accurately assess their circumstances and build an active managerial response to the changing market environment.

The board’s awareness regarding environmental management was also an important driving force for the introduction of an EMS. Aside from current external pressures, indirect social pressures such as market changes were taken into consideration when drafting environmental management policy.

(2) Educational Effect of Operating an Environmental Management System

In Daeduck GDS Co. case study, environmental and economical benefits from introducing the EMS were so apparent that the entire staff recognized the importance of environment, reducing inter-management conflict and energizing managers to work together to make continuous environmental improvements. This in turn instills the necessity of environmental management on the employees. Important to this development was the existence of objective criteria that demonstrated the effectiveness of the environmental managerial system. The Daeduck GDS case study shows how important the sequence of events, introducing the right managerial system, operating it and analyzing the results, is in making it possible for an EMS to succeed.

3.1 General

(1) Company Profile

Located in Kumchun gu, Seoul, Korea Omyang Co. is a conglomerate with 5 affiliate companies including 2 in China with 500 employees. Korea Omyang Co. was launched as a fifty-to-fifty joint venture with ONKYO of Japan in 1973, but is totally independent at present. The office headquarters are now run by two professional executives. The company now engages in export with ONKYO.

<table>
<thead>
<tr>
<th>Company History</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1986</td>
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<tr>
<td>1994</td>
</tr>
<tr>
<td>1995</td>
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<td></td>
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<tr>
<td>1996</td>
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<td></td>
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<tr>
<td>1997</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1998</td>
</tr>
</tbody>
</table>

The main product of Korea Omyang Co. is speakers used in automobiles, audios, and telephones. Annual total sales was about 40 billion won in 2000. Sales rate and employment rates are shown in figure VIII-3-1.
(2) Industry Setting

The domestic acoustic equipment industry has been growing rapidly since its inception, but experienced a negative growth rate after 1995, as can be seen in figure VIII-3-2.

Among the same domestic industry, Korea Omyang Co. ranks second for sales base and first for net profit. Its domestic market share is 25%. Korea Omyang Co. has no liabilities and is refusing to take loans from financial organizations. Product cost is 30 to 50% higher than other companies, but Korea Omyang Co. believes that competitiveness lies in quality of the product.
Table VIII-3-1 is a list of major customers of Korea Omyang Co..

<table>
<thead>
<tr>
<th>Domestic</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyundai Motors</td>
<td>Toshiba</td>
</tr>
<tr>
<td>Daewoo Motors</td>
<td>Sharp</td>
</tr>
<tr>
<td>Haitai Electronics</td>
<td>Sony</td>
</tr>
<tr>
<td>Anam Electronics</td>
<td>Matsushida</td>
</tr>
<tr>
<td>Samick Musical Instruments</td>
<td>Philips</td>
</tr>
<tr>
<td>Young Chang</td>
<td>Genus</td>
</tr>
<tr>
<td>LG Industrial System</td>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Korea Electronics</td>
<td>Schneider</td>
</tr>
<tr>
<td></td>
<td>Fujitsuten</td>
</tr>
<tr>
<td></td>
<td>Isuzu</td>
</tr>
<tr>
<td></td>
<td>GM</td>
</tr>
</tbody>
</table>

Figure VIII-3-3 shows sales distribution. Exports account for 53% of total sales with domestic consumption coming from customers Kia, Dawoo, and Hyundai Motors along with general electronic equipment businesses as Haitai and Anam electronics. Among these companies, Hyundai Motors accounts for the greatest proportion of domestic sales at 23%.

Figure VIII-3-3. Distribution of Sales

Korea Omyang Co. is responsible for nearly 50% of Hyundai motors’ speaker consumption and supplies a significant proportion to other domestic conglomerates as well, and thus feels little competitive pressure at home (figure VIII-3-4). However, competitiveness in the overseas market is crucial due to their high dependence on exports.
3.2 Environmental Situation

(1) Production Process and Environmental Aspects

The main processes in producing speakers are the production of cone paper and assembly.

Figure VIII-3-5 shows the cone paper manufacturing process, which generates significant amounts of wastewater. All wastewater generated comes from the pulp beating and paper making processes and effluent from the wastewater treatment plant. Parts of the effluent is recycled and reused in the process while others are discharged.
The production process requires large amounts of glue, which is hazardous to the environment. Glue is dangerous to employees’ health due to toxic vapors given off while it dries, and is also a source of solid waste.

Present water demand for production is 1,830 m$^3$/month of municipal water and 3,964 m$^3$/month of recycled water. 62,689 kilograms of hazardous materials are used annually generating 34.97 m$^3$ of waste.

(2) Performance on Major Environmental Aspects

The major environmental issues Korea Omyang Co. faces are the quantity of hazardous and solid waste generated and the amount of water and recycled water demanded.

① Wastewater

Figure VIII-3-6 is annual shift of effluent concentrations such as pH, BOD, COD, SS, and $n$-Hexane. pH is maintained within the range of discharge limits pH5.6~8.6. Concentrations of BOD, COD, SS, and $n$-Hexane have gradually declined since 1995, the result of nonstop efforts to improve.
Figure VIII-3-6. Emissions to Water
② Hazardous Wastes

Figure VIII-3-7 shows annual hazardous waste generation. Since 1996, the amount generated decreased by 23% in 1998, but began to climb again in 1999. This is due to rising production quantity over the last 4 years. Overall though, waste generation decreased by 16% from 1996 while total sales rose by 53%, demonstrating a considerable increase in process efficiency.

![Graph showing percentage increase in toxic chemicals consumption and sales from 1996]

**Figure VIII-3-7. Toxic Chemicals Consumption and Sales**

③ Water Capacity

Figure VIII-3-8 shows monthly water consumption. The fluctuation seen in the last year is due to a jump in production in 2000, when sales shot up to over 40 billion won. Importantly, the proportion of recycled water consumption to municipal water consumption rose to 117%. This means that the amount of wastewater discharged is correspondingly less than that used in production. Increasing use of recycled water means that the production process is improving due to environmentally sound management. As of the present, water consumption has fallen by 22%.
4 Solid Wastes

Solid waste generation has decreased by 48% since 1996 (figure VIII-3-9). The small increase registered in 2000 is also a result of increased production.
3.3 Environmental Management

(1) Overview of Environmental Activities

Environmental management activities in Korea Omyang Co. began with installation of their wastewater treatment facility, however no organized programs were implemented until the energy savings program in 1996 and the achievement of ISO 14001 certification in the same year. In the following year, the company achieved QS 9000 certification and in 1998, installed additional tanks in the cone paper producing process to save on water consumption. Efforts were also made to improve the working environment and production rate by adding new facilities. As a result of these management activities, Korea Omyang Co. was awarded ‘Excellence’ in the environmental section of Hyundai Motors’ technical cooperation awards. In January 2000, the company renewed ISO 14001 certification and is in the process of promoting their environmental management system to subsidiary companies.

<table>
<thead>
<tr>
<th>Procedural History of Environmental Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>1984. 3</td>
</tr>
<tr>
<td>1996. ~</td>
</tr>
<tr>
<td>1996.4</td>
</tr>
<tr>
<td>1996.5</td>
</tr>
<tr>
<td>1996.7</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>1996.8~11</td>
</tr>
<tr>
<td>1996.12</td>
</tr>
<tr>
<td>1997.12</td>
</tr>
<tr>
<td>1998.1</td>
</tr>
<tr>
<td>1998.5~12</td>
</tr>
<tr>
<td>1999.8</td>
</tr>
<tr>
<td>1999.12</td>
</tr>
<tr>
<td>2000.1</td>
</tr>
<tr>
<td>2000.2</td>
</tr>
</tbody>
</table>
(2) Pressures of Environmental Management

Environmental management in the Korea Omyang Co. began as a movement to improve the quality of products. Company history has given them a Japanese management philosophy underlying their business management policies. The Japanese philosophy manifests itself as ‘managing a clean workplace’, which was the foundation for Korea Omyang Co.’s management policy even before adopting an environmental managerial system and gaining certification. At present, environmental management certification is especially critical to finding and developing overseas markets.

The box below shows internal and external driving forces in Korea Omyang Co.’s adoption of an EMS.

<table>
<thead>
<tr>
<th>The Drivers of EMS Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal drivers</strong></td>
</tr>
<tr>
<td>- Increased employee turnover rate by harsh working environment</td>
</tr>
<tr>
<td>- Noise problem in pressing process</td>
</tr>
<tr>
<td>- Wastewater treatment problem in cone paper process</td>
</tr>
<tr>
<td>- Reduced environmental cost</td>
</tr>
</tbody>
</table>

(3) Adoption of Environmental Management System

ISO 14001 certification was adopted in 1996 as an environmental requirement for QS 9000 certification. First a task force was formed to spearhead the certification effort. An initial environmental impact assessment was also carried out. System documentation was the final task to accomplish before achieving certification at the end of 1996.

The ISO 14001 certification system was first introduced to Korea in 1992, and was adopted mainly by conglomerates. The first small business adopted ISO in 1996, the same year Korea Omyang Co. was certified. At this time the certification system was still in its early stage and was inexperienced in its dealings with domestic industries. As a result, most information available was focused on conglomerates and much of the written documentation was unsuitable to domestic business structure.
The preparatory steps taken over 9 months (from April to December 1996) by Korea Omyang Co. to gain ISO 14001 certification are included in table VIII-3-2. The task force charged with pushing certification was composed mainly of members from the quality management team, a fact which had great bearing on the process. The quality management team is staffed out of the Korea Omyang Co. headquarters, and is charged with managing the overall system, and analyzing employee education, environment, quality, facility installation etc. Their role in the company greatly strengthened the task force in its efforts.

Table VIII-3-2. Schedule for ISO14001 Certification

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Detailed contents</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jun</td>
</tr>
<tr>
<td>1</td>
<td>TFT organizing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Pre-audit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>EMS training</td>
<td>3.1 For all members</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.2 For key men</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.3 Initial environmental review</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Workshop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Environmental impact assessment</td>
<td>5.1 Initial environmental review</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.2 Environmental impact assessment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.3 Identification of significant impact and goal setting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.4 Review</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Documentation</td>
<td>6.1 Listing up</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.2 Work in collaboration with every dept.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.3 Training</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.4 Draft</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.5 Review, workshop</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Management review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Internal audit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Management review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Application for certification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Audit for certification</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The task force team structure is shown below in figure VIII-3-10. Team meetings were held twice a month to discuss implementation of the EMS and measures to further its development.
Environmental impact assessment was executed after thorough preparation through employee education and workshops on company targets. The next step carried out was the drafting of environmental manuals. This was done by asking each division to reexamine their processes. After this the chief executive took charge of further preparations until the company was ready for examination by the certification examining.


Table VIII-3-3 shows expenses incurred in adopting ISO 14001 certification. There was no need for outside consulting. The total cost of certification amounted to over 26 million won.

**Table VIII-3-3. Costs for Adopting ISO 14001 Certification**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparatory assessment</td>
<td>Number of judges (3) × visiting time (1) × cost of evaluation (600,000won/time)</td>
<td>KRW 1,800,000</td>
</tr>
<tr>
<td>Certification</td>
<td>Certification agency: KMA-QA</td>
<td>KRW 6,600,000</td>
</tr>
<tr>
<td>Cost of TFT employees</td>
<td>Number of participants (3) × average wage (23,000,000 won/person) × annual participation rate (10%)</td>
<td>KRW 18,400,000</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td></td>
<td><strong>KRW 26,800,000</strong></td>
</tr>
</tbody>
</table>
(4) Implementation of Environmental Management System

③ Management by performance

Table VIII-3-4 is an example of environmental programs adopted by the various divisions in Korea Omyang Co..

<table>
<thead>
<tr>
<th>Division</th>
<th>Environmental goal-to minimize the pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>General management</td>
<td>1. Waste reduction in the working space-waste separation</td>
</tr>
<tr>
<td></td>
<td>2. Improve working environment-evaluate 2/year</td>
</tr>
<tr>
<td>Production/F A team</td>
<td>1. Reduce hazardous waste usage and waste reduction activities (monthly)</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>1. Invent environmentally sound products</td>
</tr>
<tr>
<td>Quality insurance</td>
<td>1. Waste reduction-claim reduction</td>
</tr>
<tr>
<td>Cone paper team</td>
<td>1. Recycle wastewater</td>
</tr>
</tbody>
</table>

Each month each division completes and submits written reports on rules and objectives for the programs, as shown in table VIII-3-5. Program management activities, results, and annual average rate of achievement are included in these documents to facilitate comparison with progress from previous years.

Divisions that have succeeded in achieving their annual objectives are rewarded according to a set of ‘goal achievement’ rules. The awards motivate employees to work towards more effective environmental management.
<table>
<thead>
<tr>
<th>Category</th>
<th>Objectives</th>
<th>Activities</th>
<th>Performance of the former year</th>
<th>Person in charge</th>
<th>Performance</th>
<th>Goal of the year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Month</td>
<td>1  2  …  11  12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
### Environmental Policy

Established a new philosophy on being a sustainable corporation by respecting the environment and preservation of it from the sound business management
- Every employee is in charge of environmental preservation
- Minimize pollution generation in overall process-from product development to after service
- Efforts in energy/resource savings and waste recycle
- Provide environmental education to every individual related to the company
- Maintain transparency in environmental management policy by opening to the public

### Environmental Objectives (1997~2000)

- **Waste reduction (50%)**
  - Solid waste, sludge, and etc.: save 40 million won/year
- **Noise and hazardous smell reduction in the working space**
  - Waste glue reduction (50%): save 17 million won/year
  - Smell rate: under 2
  - Noise: under 85 dB
- **Hazardous waste reduction (50%)**
  - Save 200 thousand won/year
- **Water recycling (50% of effluent reduced)**
  - Save 3.9 million won/year
- **Reduce electricity consumption**
  - 1.4 million won/year
- **Waste (waste wood) recycling**
  - Save 4.9 million won/year
- **Waste steel recycling**
  - Save 470 million won/year
2. Environmental Impact Analysis

Korea Omyang Co. performs an environmental impact analysis on glue use every month due to the great impact of the glue types used to on the work environment. Figure VIII-3-11 is an example of a glue impact analysis. First, it must be determined which specific processes use glue and then identify the type of glue, glue supply source, usage amount (kg/month), amount of impact, expenses (won/month), and the expense of losses (by evaporation, won/month) etc. All of this information must then be placed in document format. The amount of impact from glue on the working environment is indicated from a 0 to 5 evaluation made directly by the workers. The impact analysis enables the company to detect when excessive amounts of glue are used, and reduces overhead expenses by minimizing glue evaporation and waste generation.

### Figure VIII-3-11. Environmental Impact Analysis of Bond Using

#### 1. Processes using bond

- 1
- 2
- 3-1
- 3-2
- 4-1
- 4-2

#### 2. Identification of problems of bond use

<table>
<thead>
<tr>
<th>No.</th>
<th>Bond type</th>
<th>Supplier</th>
<th>Process #</th>
<th>Bond usage (kg/month)</th>
<th>Degree of impact</th>
<th>Cost (won/month)</th>
<th>Amount of loss (won/month)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>U</td>
<td>1</td>
<td>15.57</td>
<td>2</td>
<td>7,627.8</td>
<td>452.4</td>
<td>16,209</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>V</td>
<td>2</td>
<td>11.10</td>
<td>3</td>
<td>46,207</td>
<td>23,723</td>
<td>69,930</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>W</td>
<td>3-1</td>
<td>3.27</td>
<td>1</td>
<td>3,007</td>
<td>446.9</td>
<td>6,703.5</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>X</td>
<td>3-2</td>
<td>19.32</td>
<td>1</td>
<td>18,794.4</td>
<td>446.9</td>
<td>20,364.7</td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
</tbody>
</table>

- 3 Environment Management Practices

In 1998, Korea Omyang Co. reorganized the cone paper making process in 1998 in order to reduce wastewater generation and noise. They found that constructing an additional water reservoir next to the factory was useful in solving both problems. As a result, water consumption and chemical material usage both were reduced. Noise in the factory was also reduced and the water supply rate raised.
Process Innovation (wastewater recycling and pollution minimization)

<table>
<thead>
<tr>
<th>Problems</th>
<th>Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Lack of treatment facility by inflow increase</td>
<td>- Quality stabilization by differentiating water consumption</td>
</tr>
<tr>
<td>- Noise problem</td>
<td>- Recycle industrial water</td>
</tr>
<tr>
<td>- Cost increase by consumption raise of industrial water and chemical materials</td>
<td>- Noise reduction</td>
</tr>
<tr>
<td>- Process problem by water pressure</td>
<td>- Construct additional tank-increase convenience in water usage</td>
</tr>
<tr>
<td></td>
<td>- Reduce water and chemical material consumption</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Investment</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRW 23,550,000</td>
<td>10176192 won/year (Payback period: 27.7 months) →</td>
</tr>
<tr>
<td></td>
<td>- Reduction in water consumption: 294,996 won/month</td>
</tr>
<tr>
<td></td>
<td>- Reduction in chemical material usage: 519,100 won/month</td>
</tr>
<tr>
<td></td>
<td>- Reduction in electricity consumption: 33,920 won/month</td>
</tr>
</tbody>
</table>

| Before improvement                                                        | After improvement                                                          |
| (1) PH4.0 ± 0.15                                                          | (1) PH7.0 ± 1.0                                                            |
| (2) Irregular color                                                        | (2) Regular color                                                          |
| (3) Pollution by wastewater discharge                                      | (3) Minimize pollution                                                    |

④ Inventing Environmentally Friendly Products

Korea Omyang Co. invented a soluble glue alternative to rubber glue made from toluene. The soluble glue is 30% more expensive than the rubber glue, nevertheless because it is environmentally friendly the company insisted on development. Further, wooden parts have been used as a substitute for plastic, paper and metal components, although the process has not yet been commercialized.

(5) Benefits of the Environmental Management System

① Environmental Outcome and Managerial Outcome

Table VIII-3-6 shows the costs and benefits of adopting an ISO 14001-certificated system.

Reduced waste generation and increased recycling were successful environmental management measures in that they have lowered costs. Installation of new facilities that improved environmental performance also contributed to sales increases.
### Table VIII-3-6. Costs and Benefits of EMS Adoption

<table>
<thead>
<tr>
<th>Investment</th>
<th>Improvements</th>
<th>Environmental aspect</th>
<th>Cost reduction (won/year)</th>
<th>Sales increase (won/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Indirect</td>
<td>1. Established new equipments in cone paper facility</td>
<td>- Reduced 22% of water consumption</td>
<td>4,135</td>
<td></td>
</tr>
<tr>
<td>KRW1,848mil.</td>
<td>- Water recycling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 20% of productivity increase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Improved environmentally harmful process</td>
<td>- Reduced 38% of waste glue generation</td>
<td>4,318,018</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Reduced 30% of organic solvents consumption</td>
<td></td>
<td>77,964</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Reduced toxic smell</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KRW36.5mil.</td>
<td>3. Reduced 47% of solid waste</td>
<td></td>
<td>3,760,103</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Solid waste recycling</td>
<td>(Exported recycled palate to China)</td>
<td>4,938,048</td>
<td></td>
</tr>
<tr>
<td>KRW495,000</td>
<td>5. Procedural improvement by introducing new equipments and facilities</td>
<td>(Reduced minor production rate)</td>
<td>49,500,000 34billion</td>
<td></td>
</tr>
<tr>
<td>KRW475mil.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

② Turnover Rate

The employee turnover rate decreased after 1996 as shown in figure VIII-3-12. Although rates climbed again in 1999 and 2000, the number includes Chinese employees educated at Korea Omyang Co. who returned to China. The overall decrease in transfer rate may be due to improved working environment in company factories.
Effects on Marketing

ISO 14001 certificate has been most beneficial in marketing activities to overseas corporations. As part of their marketing strategy, business managers always carry the ISO certificate with them. There are a total of 70 companies that do business with the Korea Omyang Co. Among these only 3 have been ISO 14001 certified. The Korea Omyang Co. has made it a rule to evaluate the environmental managements of companies it is does business with, and has been fully supportive of customer companies interested in adopting EMS (table VIII-3-7).
Table VIII-3-7. Supplier/Customer and EMS

<table>
<thead>
<tr>
<th>Number of companies</th>
<th>Customers</th>
<th>Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Domestic</em>: Hyundai Motors, Kia Motors, Daewoo Motors, and etc.</td>
<td><em>Foreign</em>: ONKYO, SONY, ISUZU, GM, and etc.</td>
</tr>
<tr>
<td>Companies with EMS</td>
<td>Company</td>
<td>Certification</td>
</tr>
<tr>
<td></td>
<td>Hyundai Motors</td>
<td>ISO14001</td>
</tr>
<tr>
<td></td>
<td>Daewoo Motors</td>
<td>ISO14001</td>
</tr>
<tr>
<td>Companies contracted after environmental review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The frequency of environmental audit</td>
<td>once per year</td>
<td>once per year</td>
</tr>
<tr>
<td>Supporting activities</td>
<td></td>
<td>Education and consulting service free of charge</td>
</tr>
</tbody>
</table>

3.4 Implications and Key Conclusions

(1) Adopting a well organized Environmental Management System

The most noteworthy feature of the Korea Omyang Co. is the careful and organized way in which they implemented ISO 14001. Implementation was the result of 9 months of meticulously prepared steps, from forming the EMS task force to actually achieving certification.

ISO 14001 certification first became prevalent for conglomerates in Korea in 1996. However, at this time the certification system was still in its early stages and was not suited to SMEs. Under these circumstances, Korea Omyang Co.'s EMS success was the result of a well managed adaptation of the certification system.

(2) Environmental Management Performance

Korea Omyang Co. has succeeded in both adopting and operating an environmental managerial system. Korea Omyang Co. has a performance based approach to environmental management. Performance management at Korea Omyang Co. is
expressed through their 'policy management' strategy. This is a strategy that encourages each division to set up its own environmental policy to achieve the company's strategic goals. Their monthly performance rate is evaluated and compared to that of the previous year. Employees are rewarded based on their rate of performance as an incentive to improve ‘policy management’. Korea Omyang Co.’s performance based management system has led to better environmental performance as well as improved economic performance, such as cost reductions. This win-win combination helps the board of directors and other staff to concentrate on environmental issues and maintain environmental improvement activities.

(3) Improving Working Environment

Absorption of Japanese business culture during cooperation with ONKYO was one of the main reasons that Korea Omyang Co. was able to adopt EMS without serious internal resistance. The Japanese business policy of ‘managing clean workplace’ became the foundation of Korea Omyang Co.’s management policy, affecting both quality management and workplace management. This attitude has contributed in reducing employee transfer rates and improved labor efficiency.

4. Samjin Chemical Co.

4.1 General

Samjin Chemical Co. was established on June 25, 1962. The present Chonann factory was constructed in 1978 on a plot of 53,418m² with building area of 22,494m². With 186 staff members, Samjin Chemical Co.’s total sales reached 71.5 billion won in 1999. Its main products are assorted packing and paper materials, and synthetic resins. Exports account for over 30% of sales.
and domestic deliveries are supplied to corporations such as Pulmuwon and Bingrae. Figure VIII-4-1 shows annual total sales volume.

4.2 Production Processes and Environmental Aspects

The main production process starts with design printing, adhesion, waterproofing, polishing, pressing and coating and finishes with a cutting process shown in figure VIII-4-2. Products vary from high-end packing materials and hologram packages to confectionery or agricultural product packaging. Wastes generated from the process include used plastics and wastewater. Minute quantities of volatile organic chemicals are also generated during the process.

4.3 Environmental Management System

(1) General Situation

Samjin Chemical Co. was the first SME to achieve ISO 14001 certification in Korea. It was certified for ISO 14001 in 1996 and then successfully achieved ISO 9002 in 1999. Samjin Chemical Co. is widely known for their sound environmental management.

(2) The Background of EMS Adoption

By achieving ISO 14001 certification Samjin Chemical Co. hoped to raise the importance of environmental problems throughout the company and among the executive management. Through certification the company also hoped to reduce production costs, build credibility and transparency into management procedures, and be able to prepare organized responses to environmental regulations.
**Environmental Policy (July 8, 1996)**

Producing and supplying packing materials, Samjin chemical Co. determines management goal with the mind of responsibilities for human and nature. All employees respect the nature and preserve pure and clean global environment.

- We observe any laws and regulations related to the environment.
- We establish environmental goals and specific targets and implement them step by step.
- We try to minimize pollutants that impact to the environment in the process of production and sales.
- We conduct EMS and continuously improve it.
- We make all employees have awareness of EMS with training and enhance responsibilities for the environment.
- We open our environmental policy to the stakeholders.

(3) The Process of EMS Adoption

Samjin Chemical Co. introduced an EMS without the use of outside consultants. This enabled it to build a system appropriate to the present company situation and in compliance with ISO14001 and ISO9002 and the KS (Korean Standards) measure.

However, the adoption process did not proceed smoothly due to a lack of information on how to adapt ISO 14001 to the needs of an SME. A look at outside consulting found also a lack of information about SME application of EMS. The company found it particularly difficult to find guidance manuals appropriate for an SME.

However, Samjin Chemical Co. eventually succeeded in introducing an EMS and achieving ISO 14001 certification. This was possible first because Samjin was able to develop a management system appropriate to its business features. Active participation by employees in task force teams responsible for drawing up the EMS was also very important. Finally, the company was able to effectively make use of an individual with considerable knowledge about the environment, who proved to be critical to achieving ISO 14001 certification. Figure VIII-4-3 shows the structural relationship of the task force team to the company organization.
Table VIII-4-1 shows problems that occurred during the transition period for introducing the ISO 14001 system and Samjin Chemical Co.’s responses.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lack of capacity to push EMS due to multifunctional nature of staff in TFT</td>
<td>• Support from CEO</td>
</tr>
<tr>
<td>• New investment required for improvement activities</td>
<td>• Overtime work</td>
</tr>
<tr>
<td>• Antagonism between departments (responsibilities and authority)</td>
<td>• Financial review to assign priority to items with most improvement potential</td>
</tr>
<tr>
<td>• Lack of all employees’ awareness</td>
<td>• Agreement reached through conference</td>
</tr>
<tr>
<td>• Training to improve awareness</td>
<td></td>
</tr>
</tbody>
</table>

(4) Benefits of Environmental Management

Benefits of introducing the EMS include improvements to the hierarchical rule that formerly dominated the organization. The EMS was able to systemize, document and take precedence over the former system. At present, 50% of suggestions presented from the lower levels of the organization are accepted.
(5) Settling of the Environmental Management

A task force team dedicated to sound maintenance of the EMS was launched in August 1999. However, the team was created to prepare for the ISO 14001 post-certification examination, rather than for environmental improvement. The team had full support from the management team in the head office, but later was reduced to a small group of employees whose work was directly related to the certification process. The task force team remained active until May 2000.

Likewise, Samjin found it hard to maintain the EMS for want of human resources and time. The Korean economic crisis further worsened their situation. Although management is responsible for maintaining a sound EMS, at present the overall environmental awareness of Samjin's managers is worsening.

Figure VIII-4-4 shows Samjin Chemical Co.'s factory management principle. The 5 principles are steady implementation of the EMS, compliance with safety principles, pursuing customer satisfaction, laying out the rights and responsibilities of the individual within the company, and building credibility between the company and their labor union. However, the principles are not always easy to implement in practice. Every employee at Samjin is educated on his or her environmental duties, but actual awareness may still be low. In order to overcome these problems, Samjin Chemical Co. has realized the necessity of continuous education. The current EMS requires daily a record of environmental issues in written form to help steady implementation of the system.

(6) Environmental Programs

The "5S" program is an environmental program organized by Samjin Chemical Co.'s production team. The main purpose of this program lies in ‘arranging and ordering’, which means to reorganize the department and to reduce solid waste treatment costs (2000~3000 won per 200 ton of waste). The 5S program is linked with the ISO14001 and ISO9002 systems, but more innovative changes are required.

From 1996 to 1998 Samjin Chemical Co. invested a total of about 0.22 billion won in 33 environmental management programs, which led to cost reductions of 0.31 billion
won per year. Of the 33 environmental programs, 16 of them generate economic returns, such as cost reductions, without additional investment. Table VIII-4-2 provides more information about some of Samjin's environmental management programs.

### Table VIII-4-2. Costs and Benefits of Major Environmental Programs

<table>
<thead>
<tr>
<th>Main environmental programs</th>
<th>Real investment cost</th>
<th>Cost saving and Investment effect</th>
<th>Payback period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repairing separate disposal system and installing additional compressor</td>
<td>KRW 13.35 Mil.</td>
<td>- Cost saving: KRW 36.6 mil. - Waste reduction</td>
<td>5 months</td>
</tr>
<tr>
<td>Installing bath cover in each printer</td>
<td>KRW 1.43 Mil.</td>
<td>- Cost saving: KRW105mil/year - Workplace improvement</td>
<td>1 month</td>
</tr>
<tr>
<td>Using domestic K-Resin</td>
<td>-</td>
<td>- Cost saving: 25.206mil/year</td>
<td>-</td>
</tr>
<tr>
<td>Minimizing energy loss with automatic blower down facility</td>
<td>KRW 9.55 Mil.</td>
<td>-B-C oil reduction: KRW 22,860l/year - Cost saving: KRW3.359mil/year</td>
<td>36 months</td>
</tr>
<tr>
<td>Substitute refined petroleum for diesel oil as fuel for incinerator</td>
<td>KRW 4.82 Mil.</td>
<td>- Cost saving: 5.362mil/year</td>
<td>11 months</td>
</tr>
</tbody>
</table>

- **Product Recycling**

While Samjin Chemical Co. cannot say that their products are environmentally friendly, they are trying a sort of "environmentally friendly management" by recycling their products. Methods vary from give away or sales of recyclable items, or even payment for the product to be recycled. Recycling helps the company by lowering waste treatment costs. The cost of waste treatment decreased from 200,000 won/ton to less than 50,000 won/ton as a result of increased recycling. Also company image improved as waste no longer had to be stored somewhere inside the company. Figure VIII-4-5 shows the results of these activities.
However, what is more pressing for the company at the moment is finding recycling agencies capable of handling different waste types rather than having to develop the necessary techniques on its own.

(7) Environmental Assistance

At present, the government provides subsidies on safety and energy facilities, but not on environmental pollution prevention facilities. Exchanges on environmental information did take place through the Environmental Preservation Association. Samjin Chemical Co. was once subsidized by the Energy Management Corporation to introduce a new facility to enhance energy conservation rates.

4.4 Implications and Key Conclusions

Samjin Chemical Co. was a trailblazer for SMEs in obtaining the ISO 14001 certification.

However, Samjin Chemical Co. was able to overcome the difficulties faced by an SME at that time to build a new environmental management system appropriate to their business sector. The company required all departments to participate in forming the implementation task force team, including even the personnel management department. This broad base for participation greatly facilitated the introduction of their EMS.

To maintain continuous environmental improvement, it is important that every member of an organization actively participate in environmental procedures related to
he the EMS. In the case of Samjin Chemical Co., they have been able to obtain a very positive participation rate among their employees.

Continuous monitoring and performance management are integral parts of Samjin Chemical Co.’s environmental management program, and any environmental improvements are clearly shown in contrast with their costs. While there is no doubt that environmental improvement is more urgent than performance management, performance management makes it possible to demonstrate or quantify environmental improvement, and in a sense is necessary to catalyze environmental improvements.

At present in Korea, it is difficult to find information sources regarding EMS for SMEs. However, Samjin Chemical Co. was able to overcome hardships during the early stages of EMS adoption and change the disadvantages of an SME into environmental management advantages.

The 5S program one of Samjin Chemical Co.’s environmental programs, intended to promote ‘arranging and ordering’. The 5S program may lead to success in cleaner production, but it is still in being developed.

5. Tongyang Confectionery Co. (Iksan Factory)

5.1 General

(1) Company History

Tongyang Confectionery Co. was established in 1956 through the take-over of Pungkuk confectionery. The company produces various confectionery products such as biscuits, pies, candies, chewing gums, chocolates and other snacks. The company motto is, “fulfilling company responsibility by fostering new values and service to the society based on the company ideology of respecting human rights and improving human labor.” Tongyang Confectionery Co. has a morally driven management system that runs on the central philosophy of 'Fair, Forward-looking, Fun' management.

At the time Tongyang Confectionery Co. was established, the domestic confectionery industry was only at the status of a handicraft industry due to poor facilities and a small domestic market. However, its undeveloped potential caused the confectionery industry to be regarded as one of the top growth industries of the time, much like information technology today. Tongyang Confectionery Co. was one of the leading companies in the confectionery industry during that era, holding 60% the market share. In the 1960s, Tongyang Confectionery Co. systemized their merchandizing system, enlarged
production and began its own technology research. This allowed Tongyang Confectionery Co. to begin producing gum products in the 1970s. It also signaled the beginning of Tong Yang's export of confectionery products.

Tongyang Confectionery Co. also produces ‘Orion Choco-pie’, the first confectionary invented with their own technology, and which ranks top in domestic sales. Tongyang Confectionery Co. exports Choco-Pie and other goods to over 60 countries around the world. In the 1980s, Tongyang Confectionery Co. modernized its facilities and introduced new technologies to their newly constructed factories in Iksan. At this time the company also established it’s marketing department. In 1987 the beginning of the company's 'professional period' in the confectionery business, at which time they established OFL (Orion FritoLay) in cooperation with Pepsi Inc. Also, Tongyang Confectionery Co. launched OMP (Orion Merchandising Program), which revolutionized their retail marketing structure.

Since 1989 Tongyang Confectionery Co. has concentrated on high quality management in accordance with the rapid changes in management occurring around the country. Working under the vision of becoming ‘the world's best confectionery company’, Tongyang Confectionery Co. introduced the BPR (Business Process Reengineering) system for effective business management, restructured the organization, introduced a new personnel management system, and began using the Activity-Based Budgeting (ABB) system. Tongyang Confectionery Co. also improved their business management efficiency by being one of the first companies in the industry to introduce the Hand Held Computer (HHC). Efficiency increased by systemizing product categories using the Core-Brand strategy. Subsequently the number of product categories dropped by about 50% and management efficiency increased. This strategy became an industry benchmark for other companies during the Korean recession. From the mid 90s, Tongyang Confectionery Co.’s management policy started to reach into the overseas market. ‘Orion Choco-pie’ is the primary export product and is sold in a number of countries such as Russia, China and in East Asia.

(2) Organizational Characteristics

Tongyang Confectionery Co.’s factory No. 2 in Iksan was established in 1980. There are about 200 employees including 5 environmental managers. The No. 2 factory mainly produces chocolates, pies and snacks including the famous ‘Choco-pie’. Main ingredients used are flour and sugar. Total sales from the Iksan factory in 1999 were 119 billion won. Figure VIII-5-1 shows changes in sales amount and the number of employees over the last 5 years.
After the Korean financial crisis in 1998, Tongyang Confectionery Co. restructured the organization to strengthen competitiveness. After the adjustments, sales increased steadily but some departments were severely burdened by their new responsibilities.

Restructuring the organization entailed a shift to a horizontal team system from the former hierarchical structure in place under the MOB (Management by Objective) system. The main features of the new team system are a shorter decision making process and increased responsibilities. There are 4 team categories that Tongyang Confectionery Co. utilizes in the horizontal team system, as can be seen in the following table (Table VIII-5-1).

However, the organization is again in the process of organizational restructuring as a result of nationwide structural reform.
<table>
<thead>
<tr>
<th><strong>Table VIII-5-1. Types of Teams</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Types</td>
</tr>
<tr>
<td>Committee, Small task team</td>
</tr>
<tr>
<td>Project team</td>
</tr>
<tr>
<td>Routine task team</td>
</tr>
<tr>
<td>Network team</td>
</tr>
</tbody>
</table>

(3) Environment of the Company

The confectionery industry in Korea has grown continually since 1970, as has value added in the industry (figure VIII-5-3). This is because the confectionery industry is an incremental industry, in that a new brand can always lead the market while an existing brand declines.

![Figure VIII-5-3. Market of Confectionery Industry](image)

There is fierce competition in the current domestic confectionery industry between companies such as Lotte, Tongyang Confectionery Co., Haitai, Crown and Nongshim. Tongyang Confectionery Co. currently has the second highest market share behind Lotte. Tongyang Confectionery Co. became the second leading three years ago when Haitai, the former second ranking confectionery company, was on the brink of bankruptcy. Competitiveness among the confectionery industry mainly comes from production cost,
but also from company brand image and originality of the products. In the case of the Orion Choco-pie, the product has remained competitive although there are a number of imitation products on the market.

In the current market, 70% of Tongyang Confectionery Co.’s business comes from domestic supply and the other 30% from export. Exports began in the 1970s with the sales of chewing gums to the Middle East. Exports have since strengthened, reaching the highest point in the early 1990s with the ‘Choco-pie’. Since 1993 the companies export growth rate increased an average of 56% annually, until the Asian economic crisis hit the overall market.

5.2 Environmental Situation

(1) Production Process and Major Environmental Aspects

The production processes for confectionery goods differ slightly according to the type of the product, but in general the mixing, shaping, ovensning, cooling, and wrapping processes are the same. Figure VIII-5-4 shows the manufacturing process of the ‘Choco-pie’, Tongyang Confectionery Co.’s most representative product.

Environmental problems that occur during the process are hard to ignore because they are directly related to sanitary problems associated with the products and with inferior product yield. Main ingredients are flour, starch syrup, and sugar. The main wastes generated from these processes are wastewater and solid wastes. Small amounts of fine flour particles are also detected.

The actual amount of ‘Choco-pie’ produced per day is 53 tons, along with 28 tons of wastewater. Wastewater characteristics include BOD 1200~1500mg/L, COD 500~650mg/L, and SS 800~850mg/L. Also, an additional 60~70 ton per day of wastewater is generated from the washing process for the molding machines. COD of wastewater coming out of the wastewater treatment system is about

![Figure VIII-5-4. Production Process of the “Choco Pie”](image-url)
20~30 ppm. This number is much lower than the regulatory requirements. Tongyang Confectionery Co. treats the wastewater below the standard in order to lower their costs.

Left over packages from defect wrapping add up to 0.5 ton per day, and the left over products are used as assorted feedstock. Other solid waste generated includes small quantities of waste oil produced from machine maintenance. Worn out / replaced equipment is stored for recycling. Energy consumption levels are highest in the ovening process, which is indispensable in the production of confectionery. The process consumed up to an average of 2,000 TOE (tons oil equivalent) per year till 1999. Water consumption amounts to 83 ton per day.

(2) Performance of Major Environmental Aspects

The following figure shows the results achieved in reducing Tongyang Confectionery Co.’s various wastes generated from the overall production process.

① Solid Waste

In 1993 the Korean government introduced a waste treatment charge system and a waste deposit-refund system, raising solid waste treatment costs. This left industries looking for economical methods of treatment and recycling of solid wastes. In the case of Tongyang Confectionery Co., treatment efficiency has improved as can be seen by the annual decreases in solid wastes generated per unit operation. As can be seen from figure VIII-5-5, the amount of solid waste generated in 2000 was only one third that of 1996.

② Wastewater

The Ministry of the Environment began to impose a treatment charge system for wastewater in 1986 as a part of an environmental policy designed to trigger proactive wastewater treatment on the part of companies. In addition, beginning on first day of 1996 the MoE also tightened the wastewater effluent standard. The revised standard for COD of treated wastewater is 60~70ppm, however Tongyang Confectionery Co. maintain COD levels around 20~30ppm. This is a result of thorough management of water consumption, wastewater generation, and wastewater concentration data.
Figure VIII-5-5. Environmental Performance on Major Environmental Aspects

Energy and Water Consumption

As one of the countries with a water and energy deficit, the cost of energy and industrial water is critical to all businesses in Korea. The charge for industrial electricity jumped 35% from 49.51won/kWh in 1990 to 66.63won/kWh in 1998 (statistics on national electricity 1990~1999). The water charges for municipal water supply jumped even higher, 59%, from 220.0 won/ton in 1992 to 347.8 won/ton in 1998 (yearbook of environmental statistics 1990~1999). Due to these increases, Tongyang Confectionery Co. is in the process of lessening dependence on energy and water. The company has had particularly good results in lowering energy consumption by organizing a ‘Task Force Team’ for energy conservation.
5.3 Environmental Management

(1) Environmental Management Initiatives

Environmental management in Tongyang Confectionery Co. began in 1985 with the construction of a wastewater treatment facility, a year before the Ministry of Environment promulgated the natural environment conservation act in 1986. Tongyang Confectionery Co.’s efforts hit stride in 1993 with the establishment of a new environmental department that took charge of all environmental management, and introduced systemized organizational management. However, ‘management’ at this time tended to emphasize control rather than actual management.

The role of the environmental department shifted to a broader management of pollution control when the ‘Task Force Team’ for energy conservation was formed in 1997. In the same year, Tongyang Confectionery Co. supplemented the existing wastewater treatment facilities and introduced AIB (American Institute of Baking)\(^1\) certification. The national trend at that point for certifying an EMS was ISO14001, but rather than ISO14001, Tongyang Confectionery Co. pursued AIB certification which was more relevant to the market for them as a confectionery business. One year later, Tongyang Confectionery Co. received the ‘Excellent’ certification from AIB and in November 2000, received ‘Superior’, the highest level of achievement (figure VIII-5-6).

\(^1\) The American Institute of Baking (AIB) is a not-for-profit corporation, founded by the North American wholesale and retail baking industries in 1919 as a technology transfer center for bakers and food processors. The original mission of the organization was to "put science to work for the baker," and that basic theme is still central to all of the programs, products, and services provided by AIB to baking and general food production industries worldwide. Although AIB's history has been traditionally linked with North American wholesale and retail baking, the Institute currently serves many segments of the food processing, distribution, foodservice, and retail industries worldwide. AIB is headquartered in Manhattan, Kansas, home of Kansas State University and one of the major centers for wheat and related grain product research and development in the entire world. The Institute works closely with local grain science and trade organizations, and maintains links and working relationships with many other food production and equipment, food safety, trade development, and food legislation groups and university food science research programs both in the United States and abroad. The AIB association currently has more than 700 members in many countries, ranging from international food ingredient and foodservice companies to small single-unit traditional and artisan retail bakeries. Address : 1213 Bakers Way, PO Box 3999, Manhattan, Kansas 66505-3999, Phone 785-537-4750 or 800-633-5137, Fax 785-537-1493, http://www.aibonline.org
Tongyang Confectionery Co.’s business management environmental strategies are closely linked at present. The year 2000 is a year of environmental self-regulation. Each team has an area of environmental concern and is organizing appropriate plans and goals (written documents were not available when the case study was performed).

③ Pressure of Environmental Management

Tongyang Confectionery Co.’s environmental management efforts began in the middle 80s in response to the enforcement of domestic environmental laws. Government policy still plays a very direct role in the company's environmental management strategy. One example is the effluent charge system, which has become a critical factor in Tongyang Confectionery Co.'s environmental management system since it is directly related to the cost of wastewater treatment.

Full-scale environmental management began in 1993. This was a year when environmental management became prevalent nationwide and especially among the Korean conglomerates. Environmental management became a social issue after the D electronics incident in 1991, in which phenol discharges to the Nakdong river became public. As a result, good environmental management and certification have become very important to a company's public image.

Significant environmental management achievements were made in 1997 when the company formed the energy conservation TFT. At this time energy costs were increasing, so the company’s business management strategy shared a common objective with the environmental management strategy. Through this initiative, the company lowered production costs and saved energy.

Tongyang Confectionery Co.’s choice of AIB certification over ISO14001 certification was driven by perceived customer priorities. Tongyang Confectionery Co. believed that customers would be more concerned in sanitary problems rather than the
environmental problems, and therefore felt AIB certification to more relevant to their business needs.

② Activities for Environmental Management

Over time, Tongyang Confectionery Co.’s environmental management emphasis has changed from end-of-pipe treatment to pollution prevention measures. Implementation of the energy saving task force team (TFT) in 1997 and AIB certification are prime examples of this shift. The following is a brief outline of the energy saving task force team’s work as well as the AIB certification process.

- **Initiative for energy saving**

The energy saving task force team in Tongyang Confectionery Co. held monthly meetings to develop energy saving plans, deal with implementation problems, and review program results. The outcome of this initiative was very positive and led to expansion of the task force team. Team members increased from 6 in 1996 to 12 at present. Two of the team members concentrate on energy savings within the environmental sector. The team has used strategies such as detecting environmental faults during construction, alternative fuel substitution, and developing internal incentives.

<table>
<thead>
<tr>
<th>Year</th>
<th>Meeting</th>
<th>Member</th>
<th>Activities</th>
<th>Investment (TOE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>Every month</td>
<td>6</td>
<td>1) Foundation preparation of energy saving 2) Using steam (shutdown boiler)</td>
<td>130 million won</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>134</td>
</tr>
<tr>
<td>1997</td>
<td>Every month</td>
<td>10</td>
<td>1) Composing TFT 2) KEMCO's examination of heat 3) Substitute LNG for diesel 4) Managing in unit process (product / energy) 5) Award for slogan of energy saving</td>
<td>150 million won</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>881</td>
</tr>
<tr>
<td>1998</td>
<td>Every month</td>
<td>12</td>
<td>1) Making energy evaluation items for incentive system 2) Managing in unit process according to original plan, modified plan and conversion plan</td>
<td>70 million won</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>387</td>
</tr>
<tr>
<td>1999</td>
<td>Every month</td>
<td>12</td>
<td>1) Managing in energy saving by operational evaluating items and technical evaluating items 2) Training from advanced firms in monthly meeting (7 firms)</td>
<td>70 million won</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>281</td>
</tr>
<tr>
<td>2000</td>
<td>Every month</td>
<td>12</td>
<td>1) Saving target KRW 1.4bil establishment 2) Benchmarking</td>
<td>80 million won</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>200</td>
</tr>
</tbody>
</table>
The energy saving task force team was organized during the transitional period from a traditional institutional system to a team system. This was a period when business management was concentrated on dealing with the impact of the 1998 Asian financial crisis and recession. Given these circumstances the energy saving task force team has had impressive results. Concerns about a backlash from the former hierarchical organizational system faded away as the team system settled in. Although promotion to the upper management positions were limited compared with the old organizational structure, there were more promotion opportunities open for employees in lower positions. Results from energy conservation efforts continued to be positive under the new team system, and have remained strong up to the present.

The company found that the greatest difficulty in promoting energy saving activities came from the ease in losing momentum. Also, the actual amount of energy saved often turned out to be smaller than anticipated due to conflict between the task force team and workers in the factory. One example is the task force teams' plan to turn off unnecessary lights, which field workers initially struggled against. In order to overcome these difficulties, the company is seeking to prepare employees for greater participation by including personal energy saving activities into the management by objectives (MBO) system or by issuing rewards based on the amount of energy saved in each factory.

The main effort undertaken during the energy saving campaign has been changing the energy source of the factory oven by switching to steam boilers and substituting LNG (Liquefied Natural Gas) for diesel oil. The cost of using LNG is 2.5 times higher than using diesel oil (regarding energy efficiency, switching to LNG doubled the total cost of energy consumption), but the replacement was undertaken to decrease pollution such as oil spill and odors. Managing by unit process, implementation of an incentive system, and making energy evaluation items are also examples of measures taken to awaken interests in energy saving around the organization.

Through the team’s efforts, the total amount of energy saved from 1996 to 2000 equaled about 1,883 TOE.

- **AIB certification**

Introducing the AIB certification system was one of the efforts within Tongyang Confectionery Co. to bring their overall EMS up to international standards. As AIB certification is a certification for North American confectionery products, Tongyang Confectionery Co. also found symbolic value in showing that its products meet U.S. and Canadian standards. Tongyang Confectionery Co. began preparing for AIB certification in 1997. The preparatory team totaled 8 members who were responsible for preparing for the 5 checklist items included in the AIB assessment. The items are as follows.
Table VIII-5-3. Checklist of AIB

1. AP (Adequacy of the Food Safety Program)
2. PC (Pest Control)
3. OP (Operational Methods and Personnel Practices)
4. MS (Maintenance for Food Safety)
5. CP (Cleaning Practices)

To prepare facilities for the food safety program, manufacturing processes were changed to improve the mean time between failure (MTBF), which lowered production costs and decreased waste generation. The improved process outcomes and MTBF objectives had an influence on the management by objectives (MBO) of the production members (PM) of process improvement team. Table VIII-5-4 provides an example of the performance charts used by the facility.

Table VIII-5-4. Performance of Facility Rationalization

<table>
<thead>
<tr>
<th>Team</th>
<th>Line</th>
<th>Product</th>
<th>Facility</th>
<th>Efficiency (%)</th>
<th>MTBF (%)</th>
<th>Reasons</th>
<th>Counterplan</th>
<th>Person in charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Planned</td>
<td>Achieved</td>
<td>Planned</td>
<td>Achieved</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>A</td>
<td>X</td>
<td>77</td>
<td>80</td>
<td>25</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>B</td>
<td>Y</td>
<td>63</td>
<td>52</td>
<td>30</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>C</td>
<td>Z</td>
<td>53</td>
<td>53.5</td>
<td>46</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>J</td>
<td>V</td>
<td>38</td>
<td>39</td>
<td>28</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

As a part of a cleaning activity program, Tongyang Confectionery Co. launched an initiative to clarify which team was responsible for the various wastes discharges. As a result, waste quantities decreased and more effective treatment became possible due to greater separation of the discharged wastes.

The most difficult part of the AIB certification process for Tongyang Confectionery Co. came from conflicts between the preparatory team and the production team. Each team had differing opinions regarding the motivations for achieving certification, the benefits from certification, etc. Some members of team reportedly had no interest in the certification process insomuch as it did not interfere with their work.
To efficaciously overcome these difficulties, Tongyang Confectionery Co. put in place a practical incentive system to reward individual employees that met MBO goals. Also further incentives were given to the factory with best performance based on assessment by the management board.

As a result of these efforts, wastewater generation in 2000 was only half of that in 1998. Solid waste generation decreased and the waste separation rate increased. In addition, production costs for the year 2000 decreased by about 30% over 1998. As a result, Tongyang Confectionery Co. was able to achieve “Excellent” certification by AIB for 2 years running, and it achieved “Superior”, the highest level of certification, in 2000.

- **Initiative for box returning and piecework system**

Tongyang Confectionery Co. has applied a piecework system to increase the return rate of packing materials such as boxes. Boxes are recycled as a way to lower production costs. The amount of packing materials follow the legal minimum standard, and printing on the package is minimized for a better recycling. Printing piecemeal wrappings with organic chemicals is not allowed. In addition the wrapping department designs the packages taking into account the size of the product, packaging material, and printing material.

3. **Performance and Organizational Learning**

The results of Tongyang Confectionery Co.’s environmental management effort are reflected in aspects of wastewater and solid waste treatment and water usage. Environmental management plays a significant role within the overall management policy of the company as a strategy for reducing production costs. Members of the board of directors have directly experienced the reductions in treatment costs resulting from reduced waste discharge, and now choose to invest not only in waste treatment, but also in reducing energy and water usage. The energy saving task force team also hopes to secure high employee participation for further energy conservation efforts.

Tongyang Confectionery Co. is in a transitional period where the results from environmental improvements are beginning to be reflected in general management results in the form of cost reductions. Tongyang Confectionery Co. is driving their environmental management process in response to an internal drive to improve production costs, product quality, and market share, rather than due to external pressures.
(2) Organizational Change for Environmental Management

Tongyang Confectionery Co. first established an independent environmental department in February of 1993. The department was initially in charge of wastewater treatment facilities. However, as the company's agenda changed from environmental facility management to environmental management, the department’s responsibilities and duties began to expand.

The department’s responsibilities changed significantly with the company’s reorganization to the team system in 1997. Environmental responsibilities were included in every team, which had a synergistic effect on the company's environmental management. Both the energy saving task force team and the food sanitation task force team included environmental managers. The process of obtaining AIB certification began in 1997, which also helped to work out some of the details of overall environmental management structure. Tongyang Confectionery Co.’s EMS was enlarged by placing environmental managers not merely on the ABC (Activity Based Costing) and ABB (Activity Based Budgeting) teams, but also on the cost management, inventory management, facility management, and budgetary management teams. Figure VIII-5-7 shows the structure of the facility team as an example.

In 1993, there were five managers from the environmental bureau in the 2nd factory and three in the 3rd. The broadening responsibilities of these managers created a number of problems, such as lack of manpower. These problems were resolved using computers to take over a number of complicated tasks and to systemize large environmental databases.

![Figure VIII-5-7. Infrastructure of Facility Team](image-url)
5.4 Implication and Key Lessons

(1) Team System and Environmental Management

According to ISO14001, a typical environmental managerial system requires establishing a goal for systemized management of environmental aspects, setting up responsibilities and duties for each organization, and pursuing continuous improvement. This kind of managerial system usually places a heavy burden on environmental departments.

While the team system at Tongyang Confectionery Co. does not manage overall environmental issues, it is effective for concentrating on specific issues (such as energy conservation). Teams formed to deal with a special issue have an advantage in that they can gather all of the professionals related to a particular matter and help the participants to achieve the best results possible in the given area.

However, Tongyang Confectionery Co.’s system still leaves a number of unresolved issues. For example, what is the incentive for an organization or company to improve environmental performance if there are not sufficient economic rewards? For this reason a company run on the team system may not be able to achieve effective overall environmental management. Government efforts may hold a solution in the creation of incentives for companies that encourage them to adopt EMS due to economic motivations.

(2) Atypical Environmental Managerial System

Environmental management efforts began among Korean businesses in the early 1990s, typically following the ISO14001 method of certification by a third party organization. Criticisms have been leveled that this type of standardized management system is ineffective for SMEs. During the 30 interviews carried out with SMEs during the course of this project, most of the SMEs running an EMS based on ISO certification stated that the vast documentation and complex procedures required were a heavy burden.

In Tongyang Confectionery Co.’s case, while lack of ISO14001 certification means that some of aspects of a formal EMS may be lacking, the company is still in good shape in terms of finding the best solutions for environmental improvement.

Table VIII-5-5 is a comparison of the typically standardized EMS and Tongyang Confectionery Co.’s atypical environmental management system.

Both EMS are similar in that they establish environmental rules and objectives.
However, the standardized EMS operates across the entire organization whereas in Tongyang Confectionery Co., it is limited only to the environmental management bureau. Thus, the environmental improvement program is applied to overall environmental issues in the former case, but for the latter, it is applied only to several important issues. Tongyang Confectionery Co. does not necessarily document every managerial process, and the executive officer reviews only the important ones. Tongyang Confectionery Co.’s atypical management system makes decisions to proceed or not based on degrees of reaching a goal for a specific issue.

### Table VIII-5-5. Comparison of Formal EM and the EM of Tongyang Confectionery Co.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Formal EMS</th>
<th>Informal EMS (Tongyang Confectionery Co.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental policy and targets</strong></td>
<td>Indicator 1.</td>
<td>Indicator 2.</td>
</tr>
<tr>
<td>For all members</td>
<td>〇</td>
<td>〇</td>
</tr>
<tr>
<td><strong>Documentation of EMS procedures</strong></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Environmental programs</strong></td>
<td>Indicator 3.</td>
<td>〇</td>
</tr>
<tr>
<td>For all environmental aspects</td>
<td>〇</td>
<td>For specific environmental aspects</td>
</tr>
<tr>
<td><strong>Management review</strong></td>
<td></td>
<td>〇</td>
</tr>
<tr>
<td>For all environmental performance</td>
<td>〇</td>
<td>For specific environmental performance</td>
</tr>
<tr>
<td><strong>Continuous improvement</strong></td>
<td>〇</td>
<td>△</td>
</tr>
<tr>
<td>Systematic/document</td>
<td>Situation dependent</td>
<td></td>
</tr>
</tbody>
</table>

However, from an external point of view, this type of EMS is not always regarded as positive due to the difficulty in obtaining a third party certification. In fact, the International Standardization Organization which developed the ISO 14001 certification system has admitted that the certification system is biased towards conglomerates. For this reason it is urgent that preparation begin for developing appropriate EMS certification systems for SMEs.
(3) Organizational Education by Management Performance

Learning by experience is an important process for building organizational knowledge. Within Tongyang Confectionery Co. and its EMS, every individual of the organization learned that environmental improvements eventually lead to cost reductions. They also learned that investments in environment management would lead to significant environmental improvement and that the EMS should be run in a way that all the employees and executives could understand.

(4) Cost Management and Environmental Management

ABC and ABB are cost management programs that Tongyang Confectionery Co. had been using since the mid-1990s. These tools are used for establishing costs and budgets for company activities. These methods have not yet become widespread, and Tongyang Confectionery Co.’s management has been one of the few success stories.

Effective cost management occurred at Tongyang Confectionery Co. by viewing water and wastes as cost, therefore directly related to regular management issues. In this way, management tools can be used to improve environmental performance. The company’s EMS also helped to systemize complicated environmental data such as effluent quantity and concentrations, production cost, unit operation etc.

However, the goals of economic and environmental management do not always go together. For instance, the marketing division may demand production of short life-span products to raise revenues. In this case environmental impact can become proportionally large.
< Appendix > EMS Assessment Criteria

This appendix contains EMS assessment criteria that can be used for analyzing the practices of SMEs with a relatively mature EMS. The indicators presented below are suggestions on how to answer the questions, (i) What actions allowed these SMEs to successfully implement EMS, and (ii) How can these be documented / quantified successfully?

Indicator selection methodologies will be discussed first followed by selection criteria. The first section contains assessment criteria valuable to external parties to better understand SME behavior, but that would not be used by SMEs themselves. The second section covers assessment and quantification methods valuable to external parties that are also used internally by SMEs.

1. Indicator Selection and Methodology

There are wide ranges of environmental indicators in use today by industry, government, environmental groups, and other organizations who try to measure environmental performance. Each group chooses indicators based on their specific measurement goals. There is no “correct” set of indicators – a set can only be judged by how well it achieves a goal. As a simple example, EHS engineers at a paper factory may choose to measure pollutants per ton of paper and total emissions. The engineers will seek to continually improve efficiency and minimize discharges. These indicators are very useful for this purpose. However, nearby communities or environmental groups may instead choose to measure air quality at the factory perimeter. The community may only care about environmental quality. Even if the plant is efficient, they are not happy with dirty air. Again, the community is not “wrong” but simply has different goals.

Generally, indicators have two primary uses. The first use is to assess and/or compare the quality of a company’s environmental management. Assessment indicator sets will emphasize the hard data about the company’s performance such as trends in resource consumption and pollution generation. The second use is to document or track a company’s practices. Documentation indicator sets will emphasize specific aspects of behavior that result in either superior or inferior performance. A documentation indicator set might include measures of specific practices such as recycling, but may not include indicators to cover the full range of environmental aspects.
Choosing the exact indicators depends on:

- The environmental aspects of the industry sector of the companies chosen
- The specific goals of the EMS assessment

Understanding the industry sector’s environmental aspects is relevant for choosing pollutants and resources that will be the focus of the indicators. For example, water intensity is key for the paper industry, but not as important for the cement industry.

Not all environmental-performance information is important for illustrating the theme, so the indicators will only reflect behaviors or environmental aspects that are directly related.

1) Types of Indicators

Two types of indicators are used:

- Indicators that measure outcomes such as efficiency, emissions, money spent, etc. which are called “operational indicators”
- Indicators that quantify practices such as training, development of policy, auditing, etc. which are called “management indicators”

Operational indicators tend to be more useful for assessment while management indicators are more often used for documenting behaviors. However, indicator types and their uses do overlap. Based on project criteria, a framework of indicators has been developed. Some criteria use both types of indicators and others use only one type. A matrix has been prepared below.

<table>
<thead>
<tr>
<th></th>
<th>OPI</th>
<th>MPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barriers and drivers</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Corporate priority</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Process of improvement</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Employee education</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Products and services</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Examples of the different functions of indicators:

Assessment: total volume of solid waste
Measures company’s overall performance and useful for ranking, but does not give any insight into why volume is high or low.

Highlighting strategy: Annual reductions in waste volume
Demonstrates company strategy for managing waste, but does not give insight into the behavior that allows the company to reduce waste.

Documenting behavior: Amount of waste recycled per year
Highlights a specific behavior that is a key component of a company’s environmental performance. However, this indicator alone does not give insight as to the company’s overall performance. Recycling levels may be high, but total volume of solid waste may also be very high.
(2) Principles in Choosing Indicators

Indicators were chosen based on the following guidelines:

- Indicators represent information that should be available in an SME even if the company does not currently compile the information.
- It should be possible to generate historical data on the indicator.
- Indicators should measure application frequency or results rather than yes/no wherever possible.
- The indicator is related to behavior that is important for SME environmental management.
- Indicators represent concepts easily understood by SMEs.
- The SMEs being surveyed have at least rudimentary technical skills and are not micro-enterprises.

Once a company has been selected for assessment, the indicators proposed here may need to be modified or indicators added based on the specific industry sector. For example, any study of the paper industry would probably require measuring their chlorine usage habits while review by a metal finishing company would have to focus on nickel, chrome, and other heavy metal usage. So far, 42 indicators have been selected. This is still a big number for an SME considering many companies only track a dozen or so. Therefore, final choice depends on aspects of the specific assessment goals.

(3) Normalization

Whether to take absolute values or to normalize is determined when taking measures. Absolute values mean measuring simple totals such as total amount of solid waste or wastewater. Normalized indicators have numerators and denominators such as wastewater volume/unit product or wastewater volume/employee. Both approaches have their strengths and weaknesses. Here both are used.

Absolute values measure the total impact of a company, but they are difficult to compare. Total pollution output varies depending on the industry, product lines,
company size, and other factors. Absolute values are critical for evaluating the total impact of a company or factory on the environment, but are not generally useful for comparing different companies.

For comparison, most companies use normal indicators. Typical denominators are:

- Per unit product
- Per sale
- Per employee
- Per raw material

No normalizing factor is perfect and each can create distortions in indicator data. Though unit product and sales are the most common normalizing factors, both have problems. Normalizing by product is difficult for companies or industries that produce a wide variety of complex products such as electronics. Unit product normalizing works best with industries that produce large volumes of homogeneous products such as paper or cement. Normalizing by sale is preferable because it comes closer to comparing product value against environmental cost. However, short-term changes in market conditions and prices can significantly change environmental performance indicators. Final choice of normalizing denominator should depend on the specific industries.

(4) Qualitative Factors

Indicators are useful for quantifying behavior, but they cannot measure the most important factor in good environmental management: Conviction. If a company truly believes that environmental management is important, they will almost inevitably have good performance. Without conviction, EMS, regular audits, and technical solutions will likely turn in mediocre or poor results. Good performance is driven by attitude. However, there is no way to measure attitude with EPIs, but it is an important factor to assess in a qualitative manner.

2. Section I: EMS Adoption and Corporate Priority

Section I is devoted to issues concerning EMS adoption and measuring corporate priority. Assessments of these areas are useful to understand SME behaviors better. However, it should not be expected that SMEs assess themselves using the same criteria.
(1) EMS Adoption – Barriers and Drivers

① Barriers

Understanding the barriers or obstacles that SMEs face in implementing EMS is an important step in promoting wider adoption. Actions taken to overcome critical barriers by successful SMEs need to be identified. Cross-referenced with other performance data, identifying what type of assistance is most needed from government (such as financial or technical assistance) to help other SMEs take the same steps. It is crucial to understand that while SMEs face many adoption barriers, perceived or real, the type and degree of barriers faced vary depending on factors such as size, industry sector and profitability.

In general barriers (as well as drivers) can be divided into internal and external. Internal barriers describe conditions within the company, such as SME staff views about EMS or company resources available for EMS implementation. External barriers describe conditions outside the enterprise, such as government policy or customer attitudes that discourage EMS adoption.

• Internal

Three types of internal barriers have been identified: (i) Resources, (ii) Company environment, and (iii) Implementation (Hillary 1999)\(^2\).

Resources – It is a critical issue how companies determine the amount of resources necessary for effective EMS implementation.

Areas to document include the amount of time or number of personnel dedicated to EMS implementation, budget available for environment, and skill levels of personnel involved in EMS. It can be measured that important characteristics of SMEs in EMS implementation are the multifunctional nature of staff with environmental responsibilities (i.e. most SME environmental staff have additional duties such as production or quality management) and importance of an "environmental champion" to promote EMS initiatives. In this case, it should be

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\(^2\) Indicator frameworks for drivers, barriers and benefits are adopted from Ruth Hillary, "Evaluation of Study Reports on the Barriers, Opportunities and Drivers for Small and Medium Sized Enterprises in the Adoption of Environmental Management Systems". Copyright Crown 1999.
reviewed the successful traits of a good "environmental champion", such as. project management skills, previous ISO 9000 experience, understanding of the organization, sufficient authority, and others.

Company environment: A major challenge to governments is changing what SME think of EMS and overcoming an SME company culture that tends to belittle their environmental issues and the need for change. At present, most SMEs see environment as secondary to production or profitability, and see EMS as a cost with relatively few benefits. The indicators measure factors that may directly or indirectly influence SME perceptions of EMS to understand how they overcame the aforementioned misperceptions. By understanding how the SME acquires information about EMS, the government is in a better position to assess effective channels for reaching other SMEs.

Company culture is intangible and difficult to measure, but is a key to motivating SMEs to adopt a proactive stance on environmental issues. Many of these issues must be addressed qualitatively. When assessing SME company culture, it is important that the following positive internal conditions were created favorable to EMS adoption:

- Top management support for EMS
- Employee support for EMS
- Good overall management system
- Willingness to admit company has environmental impacts
- Environment seen as having business value
- Influential personnel in charge of EMS implementation
- Belief EMS will bring efficiency improvements (productivity and resource)

Some questions to ask include, what types of internal communication were used? Paycheck stuffers? Training classes? Frequent staff meetings? By understanding what created a company culture allowing a company to excel in the environment, i.e. attendance of government seminars and new management systems, government can design EMS outreach tools and find effective distribution channels. Two specific quantitative indicators are as follows:
Indicator 4. # of annual contacts regarding environmental issues by type

While most SMEs will probably keep no record of each contact regarding EMS, an estimated figure is sufficient to show which source is most successful at reaching SMEs (and which source SMEs perceive as most helpful.) This should differentiate between government; industry associations; consultants; NGOs, and other companies. A contact includes workshop attendance, publication subscriptions, visits, phone calls, letters, fax, or emails.

This indicator focuses on the value assigned by the SME to each information source, and which were important in the SME decision to adopt environmental practices.

Indicator 5. Existence of system to track legal obligations (Yes / No)

SMEs that understand their legal liabilities are more likely to take systematic steps (i.e. EMS) to control them. A system for tracking legal obligations should include (i) documentation of current legal requirements, (ii) identification of relevant environmental authorities and contact methods, (iii) regular review of company compliance, (iv) methods of obtaining information about regulatory changes (such as subscription to government publication, lawyers and outside consultants).

When investigating the companies legal tracking system, it is also important to know how it is tied to company auditing procedures, and how legal responsibility is identified and communicated within the company. For example, what procedure exists to identify personnel responsible for ensuring the company not to exceed its emissions limits? How are they held responsible?

Implementation – Managers holding multifunctional role in most SMEs make EMS implementation an easily disrupted process. Conflicting priorities for EMS managers in small companies are EMS implementation or optimization that is put aside for production requirements, which ultimately take precedence over environmental matters. Some common reasons for EMS failures seen after implementation include:

- Implementation disrupted
- Poor communications
- Faulty or missing procedures
- Lack of training
- Belief that EMS cannot deliver benefits
- Failure to enforce rules
- Cannot assess company environmental aspects
- Difficult to maintain continuous improvements
One indicator possible for this category is:

**Indicator 6. % of sites or departments included in EMS**

This is a general way of measuring the extent to which the EMS is implemented throughout the company. Inclusion means that the department or site is a specified part of the company EMS or has adopted specific environmental programs as a result of the company EMS. For example, if the company has ISO 14001, are all sites certified? Does the purchasing department have green procurement criteria? Does the human resources department have an environmental training program? Do all production departments practice waste minimization? For this indicator, it is up to the company’s specific situation.

Scope and frequency of environmental audits are another good way of assessing a company’s ability to follow through with EMS implementation.

**External**

External barriers can often prevent an otherwise willing SME from EMS adoption. By understanding how SMEs overcome external barriers, government will understand what extension programs are necessary to broaden EMS adoption. Types of external barriers and their manifestations are (i) external costs, (ii) lack of external support, and (iii) lack of external pressures. Costs can include the high cost of certification or verification, or the inability of an SME to afford EMS during an economic recession.

External support includes institutions that SMEs rely upon, such as consultants, certification bodies, and government institutions. Barriers include things such as lack of qualified consultants or sector specific EMS guidebooks. External pressures come from the public, government, and customer companies. Most SMEs will not consider EMS adoption without external pressure.

The following indicators help to understand the degree of assistance or pressure required allowing SMEs to implement effective EMS:

**Indicator 7. Company received government assistance to implement EMS (YES / NO)**

It is important to know if government assistance is necessary for companies to excel at EMS. This includes both central and local government grants for certification,
technical assistance, provision of instruction manuals, or training and seminars. If the company was certified to a formal EMS, the percentage of certification costs covered by the government can be calculated. If not, the percentage of EMS implementation budget supplied by the government may be calculated. Even an answer of "none" is useful and it should be noted.

Indicator 8. % of environmental budget spent on outside consultants

This is useful for understanding the degree of external help required for successful EMS implementation. High consultant costs may also point to ineffective consultants or lack of alternative sources of support. Alternative support can include both consultants hired by government to help with set up, design, or certification of EMS, provide training, or technical guidance such as for a waste minimization program.

Indicator 9. % of revenue from customers with environmental requirements for suppliers

This measures the degree to which an SME is susceptible to customer pressures. Environmental requirements include ISO 14001 certification, product requirements (i.e. recyclability or disuse of toxics), and environmental performance requirements for the product or manufacturer’s production site (i.e. compliance with effluent standards). If the company has lost business in the past for environmental reasons, this will also be mentioned.

Drivers

Drivers vary with industry sector as well as social, geographic, and market conditions. Drivers here are not inclusive of benefits, which will be covered in Section II. However, stakeholder drivers vary across industries. The only common driver to all sectors is government regulations and enforcement. Therefore qualitative descriptions combined with the following indicator to address these criteria are used:

Indicator 10. # of annual visits by local regulator

This indicator includes scheduled compliance or monitoring inspections with unscheduled audits or visits. Most SMEs should have records of regular compliance visits, if not available for random checks, this figure can be estimated.

(2) Corporate Priority

Companies assign priority to activities through two very direct approaches. First, they apply resources: manpower and budget. Calling an activity a priority is meaningless if nobody is assigned to the project. Second, they measure results and hold senior staff
accountable for the success of the project. Here, key issues in assessing corporate priority are:

- Has the company assigned adequate staff and budget to environmental activities?
- What is the level of top management involvement in the process?
- Is there a complete set of environmental policies and procedures?
- Are there measurable targets and objectives that are tracked regularly?
- Are there internal rewards or penalties related to environmental performance?
- To what extent does the company promote its environmental goals internally?

Given the above, following indicators are used:

**Indicator 11.** % of annual budget specifically assigned to environmental protection activities

Many companies may only work with ad hoc budgets for environmental expenditures. If the company’s budgeting process does not include a heading specifically for environment, calculating “% of annual expenditures devoted to environment” is an alternative. In calculating either figure, it is important to give clear guidelines on how to count investments with environmental benefits such as water recycling. Generally, if improving environmental performance was a key motivation in the decision, it can be counted as environmental. Information can be gathered from company financial records. Expenditures can be checked and then estimates added for amount of staff time devoted to EMS.

**Indicator 12.** Number of staff assigned with environmental responsibilities

Some companies may respond that everyone has responsibility. The key is to determine how many staff have environmental responsibilities included in their written (or oral) job description. If a staff member cannot clearly explain their responsibilities, then they will not be included. This information can be found through staff interviews, checking job descriptions, or asking senior managers.

**Indicator 13.** Highest management person with day-to-day environmental responsibilities and % of time assigned to environment

This identifies the most senior person who regularly reviews environmental activities in the company on a daily, weekly, or monthly basis. Senior managers who only review performance every six months or once a year do not count.

**Keys of an Environmental Policy**
- Continual Improvement
- Pollution Prevention
- Compliance with Laws & Regulations
The percentage of time spent on environmental issues is obviously based on an estimate by the individual. Also, the impact of the company's environmental performance on performance review of the manager should be noted.

Other issues such as existence of specific targets and policies are important in assessing corporate priority. However, these are usually best evaluated with yes/no questions. For larger SMEs, it can be also measured the number of departments with specific environmental targets/goals.

3. Section II: EMS Implementation

Section II focuses on areas that an SME implementing EMS would measure for internal management uses. Measurements in these areas help a company to assess its own progress in meeting environmental goals.

(1) Improvement Process

This indicator measures management practices and is often easier to measure using yes/no questions since it evaluates whether or not companies have a management system in place. The key issues are:

- Does the company ensure continual improvement in their environmental policies?
- Do they have access to information on recent developments in laws, technology, and other issues relevant to their environmental management?

Ranking well in this category depends on having a pre-existing system for managing environmental performance. The phrase “process” implies a regular and systematic approach to improving environmental performance. In general, three aspects of an EMS directly impact improvement process. This includes (i) Auditing, (ii) Corrective Actions and (iii) Setting Goals and Targets.

The following indicators are used:

**Indicator 14. Number of factory-wide environmental audits per year**

It is important that the scope of the environmental audit is clear. If key processes or areas are not included, then the audit is not very meaningful. If the answer is zero, the indicator should be modified to: Number of areas receiving environmental audits per year. If audits have been performed, the company should have a written record.
**Indicator 15. Number of corrective actions per year**

A corrective action is a plan or action taken in response to a failure by the EMS to perform properly. Corrective actions are not just simple solutions to general environmental problems. Instead, they are attempts to remove weaknesses in the system for managing environmental performance and improving performance. This indicator can be deceptive when used alone and must be interpreted in the context of performance data. Generally, if performance is worsening and the number of corrective actions is not increasing, the management system is probably not strong enough. SMEs with unsophisticated management systems may not measure “corrective actions”. Instead, they may simply react to problems and solve them without keeping formal records. If the company has good records, the average time required to make a corrective action should also be recorded.

**Indicator 16. Percentage of targets achieved**

This indicator is also best viewed in the context of annual trends. If a company has an effective process for improvement, the percentage of targets achieved should increase before stabilizing at a high level, so a company with a good process for improvement might not see a significant change in this indicator. This measure also depends partially on the company’s ability to set good targets. Companies should be able to demonstrate written targets and internal documentation to prove that targets have been achieved. SMEs that have no targets cannot use this indicator.

(2) Employee Education

Companies that wish to excel at EMS must build sufficient internal capacity. This can come partially through strict hiring criteria, but no matter what, they will rely heavily on internal training. Training will come in a number of forms including seminars/workshops, individual sessions, and awareness raising campaigns. When reviewing their training program, the degree to which the company consistently makes employees aware of environmental issues and provides training in techniques or strategies for improving environmental performance is measured. Key questions to ask are:

- Who receives training?
- What procedure does the company have for assessing training needs?
- How often and what kind of training is provided?
- Is training provided in-house or by consultants?
- How detailed is the training?
• Is there a system for continual training?

The company should have standard management practices in place to organize training sessions, document training, set training goals, review training results and make any improvements necessary. The level of training in a company can be assessed quickly by asking simple questions of line employees, such as "How would you do this job?". For quantifying the results of the companies training program, the following indicators are useful:

Indicator 17.  \% of employees who have received formal environmental training related to company's environmental aspects within the last year

This includes general awareness-raising, specific training workshops, or any organized initiative to improve a specific set of employees’ ability to understand and handle environmental issues. If the company believes that informal educational efforts are an important part of their strategy, however, it can be significant. Company should have written records, as well as left over handouts, schedules, notes, or other evidence of training sessions.

Indicator 18.  \# of environmental accidents or problems due to insufficient training per year

This indicator measures events such as spillage or improper operation of wastewater treatment facilities that lead to a fine for failing to meet standards. This does not include regular operation mistakes. SMEs that do not conduct systematic auditing or maintain a system for reviewing mistakes will not likely have this information.

Indicator 19.  \# of suggestions on environmental improvements from staff per year

If training is working, they should have the results in increased ideas from staff on ways to improve performance. Some companies will have a stifling corporate culture and may not perform well on this indicator. Companies may not have formal documentation for this indicator. However, supervisors can probably remember which programs staff suggested.

(3) Products and Services

An assessment should determine what part of the EMS accounts for product and service environmental impacts, how these impacts are identified, assessed, prioritized (which product aspects can the company influence?), and what types of goals and targets have been set. When reviewing a company product, aspects of material intensity, toxicity, reduced packaging, low resource usage in product consumption, and ease of
disposal are the key elements. While this category is extremely important, SMEs will often have limited data on product impact. The following indicators are recommended:

**Indicator 20. Percentage of products for which company has done qualitative LCA**

The first step towards developing environmentally-friendly products is to conduct an assessment of life cycle impacts. Most SMEs do not have the skills to conduct a full LCA, however, a qualitative LCA is much more feasible. It may be necessary to define “product” in terms of product lines rather than individual products.

**Indicator 21. Environmental impact:**

  i. **Kilograms of packaging per unit product**

      The key issue is not packaging weight, but the degree to which it is reduced year-to-year. Even packaging that is extremely light can add up to a significant environmental burden. Companies should seek to regularly reduce the amount of packaging required. An alternative indicator would be “% of packaging that is recyclable”.

  ii. **% of product that can be reused/recycled**

      Product disposal is often a significant burden, so many manufacturers of complex products such as electronics or automobiles seek to measure the percentage of recyclable/reusable. For manufacturers of simple, recyclable products such as paper, a more useful indicator may be the amount of product actually recycled.

  iii. **Resource consumption/pollution generation during use**

      Depending on the product and industry sector, it may also be important to make an indicator of the major resources used or pollution generated during product use. For example, fuel efficiency in a car or water use in a washing machine. However, many SMEs will not have this data. Ideally, the indicator would include information about amount of resources consumed per unit of service provided (e.g. amount of carbon monoxide released per mile driven). However, such calculations become complex and most companies will not have the information.

**Indicator 22. % reduction of hazardous materials in product**

The presence of hazardous or toxic materials in a product presents a health threat and makes final disposal more difficult. Depending on the industry, it may be useful to measure reductions of a specific, hazardous/toxic material in product composition. An example would be to measure the amount of lead used in soldering computer circuit
boards. However, it is important to note that company reductions in one toxic material can come at the cost of increases in another unmeasured toxic material.

(4) Facilities and Operations

Management policies regarding operations and facilities should be reviewed to analyze the process by which operating procedures are developed. Specifically, for what key processes do written procedures exist and how were these key procedures identified? How were the procedures written? Do they include (i) normal operating procedures, (ii) abnormal operating times (shutdown or startup), and (iii) emergency situations? Are employees trained or tested on operating procedures? Where are the procedures kept (being on an office shelf in the corporate headquarters doesn't help anyone)? Written procedures are not necessary for all operations, but in general the more complex or hazardous the more written procedures are necessary.

Quantified measurement of this theme covers the conventional area of environmental performance – resource input and pollution output. Key areas to review include:

- Energy and material efficiency (reducing amount of inputs required for manufacturing through process improvements or changing design to reduce need for inputs)
- Sustainable use of renewable resources (using either renewable or recyclable inputs)
- Minimization of waste (continuously reducing the total volume of wastes emitted, discharged, or disposed by developing less-polluting processes or increasing material recovery/reuse)
- Safe disposal (minimize environmental hazards from waste disposal)

The specific areas assessed or indicators chosen vary significantly between industry sectors because of differences in inputs, pollutants, and production process. The problems and technical options available to manufacturers of hydrochloric acid are very different from those of a precision machine shop. It is important to remember that many of the quantifiable measurements possible describe the results of a company’s actions and behavior, but do not describe how they achieve the results. For example, knowing that a company is energy efficient does not tell us why. Put in another way, many of these indicators allow us to judge whether or not a company has a good performance, but they do not reveal the process that the company uses to achieve good performance. Process must be determined by reviewing management practices, such as corporate policy, goal and target setting and written operational procedures.
When choosing indicators of pollution output or resource usage, there are two relevant measures: Total footprint of impact and efficiency. Total footprint refers to the total amount of pollution produced and is an absolute measure (see section on “normalizing”). This figure is always important since it determines the impact on the ecosystem. Efficiency is a measure of resource volumes consumed and pollution generated in the manufacture of a product. Ideally, a company will see decreases in both measurements. However, it doesn’t include external factors such as changes in production volume or product design temporarily changing one measurement. The following indicators are useful:

**Indicator 23. Energy use**

*Total energy and energy used per unit product:* Using the CEFIC guidelines, energy consumption is: “fossil fuel use + purchased electricity + self-produced electricity – electricity sold externally”. CEFIC recommends using tons of fuel oil equivalent. The Global Reporting Initiative recommends using joules as a measure.

**Indicator 24. Materials consumption**

1. *Kilograms/liters of material per unit product:*

   1~3 raw materials should be chosen that are central to manufacture of the product in question and have an impact on a significant environmental aspect of the product. For example, automobile products may track use of steel per unit product or a hazardous material used in the product. If the material is expensive or is purchased in large quantities, SMEs are likely to have good records on purchase amounts. Data can be drawn from purchasing and production records and reported in kilograms of material per unit product.

2. *Percentage of recyclable materials used in product*

   This measure is often used in industries such as the automotive that manufacture complex products. Definition of recyclable can be based on international standards, local regulations, or local market conditions.

**Indicator 25. Water use**

*Total use and use per unit product:* Water is a key resource and should be included in any performance indicator set. It may be necessary to make estimates from observing a shift since many SMEs do not have flow meters. Water bills may also provide useful information.

**Indicator 26. Non-Product Output (Wastes)**

Based on the company’s environmental aspects, major indicators could be selected for each pollution media to track. Waste minimization should be measured in terms of both
changes in total emissions and pollution per unit product. Both can change due to outside factors. For example, many companies find that pollution per product may decline as production volume goes up. Therefore a good year in sales can mean lower pollution intensity even though nothing in the factory has changed. Most companies do not keep records of emissions volumes, so it will be necessary to estimate based on the concentrations of company emissions/effluents and production volumes. Typically, pollutant indicators are chosen based on environmental regulations. Some standard measures are listed below:

<table>
<thead>
<tr>
<th>Water</th>
<th>Air</th>
<th>Waste</th>
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</thead>
<tbody>
<tr>
<td>COD (tons)</td>
<td>SOx (tons)</td>
<td>Hazardous (tons)</td>
</tr>
<tr>
<td>BOD (tons)</td>
<td>NOx (tons)</td>
<td>Non-hazardous (tons)</td>
</tr>
<tr>
<td>Metals (tons)</td>
<td>VOCs (tons)</td>
<td></td>
</tr>
</tbody>
</table>

**Indicator 27. Resource recovery**

For some industry sectors, recovery levels are a good measure of overall efficiency and resource stewardship. Frequently, these practices also appeal to SMEs because they lower production costs. If records are available, the following can be measured:

1. % of oil/solid/metal/other materials recovered from wastewater for reuse
2. % of solid waste recycled or reused

**Questions to ask:**

- Does SME check proper product handling, storage or usage by contractors or suppliers?
- Does SME provide technical support/ training for contractors or suppliers?
- Do they audit or check contractor/supplier facility operations?
- Check waste treatment and disposal?
- Do they work with supplier on hazardous/toxic materials substitution?
- Does SME have supplier/contractor environmental requirements?

**Indicator 28. Number of fines, penalties, community protests due to discharges or improper disposal**

Both companies and local government offices should have records of all fines and penalties for discharges or improper disposal procedures. Community protests are also important as an indicator of potential improper disposal or emissions. However, since many SMEs escape strict supervision, the measurement of fines is only useful in the context of other indicators.
(5) Contractors and Suppliers

Companies have great potential (and responsibility some might argue) to influence the environmental behavior of their contractors and suppliers, and SMEs working with contractors or suppliers should be an integral part of any EMS. Some areas to check include existence of green procurement criteria and written environmental procedures for contractors or suppliers.

Indicators available to review degree of SCEM implementation are perhaps more appropriate for large companies, but are presented here nonetheless:

**Indicator 29.** # of suppliers / contractors with EMS (ISO 14001 or comparable)

Another approximate indicator is the # of suppliers/contractors with environmental policies.

**Indicator 30.** # of supplier / contractor environmental assessments performed

If performed, each SME will have different assessment criteria. Assessments can range from the simple (checking for existence of EMS or environmental policy statement) to the complex (audits of supplier facilities), but in general, aim to gather environmental data about suppliers/contractors.

**Indicator 31.** proportion of suppliers / contractors environmentally assessed

Equals the number of suppliers/contractors environmentally assessed divided by the total number of suppliers/contractors.

**Indicator 32.** # of suppliers / contractors given training or technical assistance

This could include training on product usage, handling, or disposal, proper onsite working procedures (contractors), or technical assistance to improve supplier performance or select alternative materials. This can also be expressed as a proportion.

Environmental requirements imposed on contractors/suppliers are always more effective when procurement staff are involved as opposed to only environmental personnel. It may also be informative to ask whether or not the SME has ever disqualified a supplier or contractor for poor environmental performance.

(6) Emergency Preparation

Emergency preparation measures a company’s ability to minimize environmental damage from spills, leaks, or other accidents through both prevention and proper on-time response. Sufficient analysis, planning, and drilling of possible emergency scenarios are necessary to ensure a proper response.
These questions are important: How does the SME do this? Does a standardized procedure exist? How do they ensure that it is followed? Just as with corrective actions, all EHS incidents (such as spills or near misses) should be investigated to locate their root cause, potential for recurrence, and actions necessary to prevent their recurrence.

In designing an emergency response plan, key elements for consideration are:
- Handling of evacuation
- Community liaison
- Notification of authorities
- Offsite emergencies

What procedures does the SME have in place to ensure these aspects are handled properly? How were they developed? Emergency situations should also be included in operating procedures for key equipment. How does the company test employees’ knowledge of company emergency response plans? What disciplinary actions do they take to ensure this? How are firm plans communicated to key external agencies, such as fire, medical, rescue, and emergency response? In addition, management should review the emergency response plan periodically.

Indicators suggested for emergency response include:

**Indicator 33. Frequency of management review for emergency response plan**
This should be a critical review of the emergency response plan, assessing its appropriateness in accordance with changes or reassessment of personnel, processes, risks or environment (such as changes in neighboring facilities).

**Indicator 34. # of employees with specific emergency response training**

**Indicator 35. # of emergency response drills conducted each year**
Both simulations, factory wide drills, and drills performed in coordination with local authorities or neighboring facilities are measured.

**Indicator 36. # of facility tours for emergency service providers.**
Emergency service providers include local authorities such as fire, medical or police, or personnel from an emergency response or rescue center if one exists.
Indicator 37. # of SHE incidents investigated

This includes SME management investigation of actual safety-health-environment (SHE) incidents such as fires, leaks, spills and explosions. Also included is so-called “near misses” such as improper handling or storage of dangerous substances, poor housekeeping, or other conditions that could lead to an incident. Investigation is a review of the incidents with an attempt to identify both direct and indirect causes and determine proper preventative actions.

(7) Environmental Management Programs

Effective environmental management is built on specific programs that can be implemented. Environmental programs are means by which companies achieve goals.

If SMEs have assigned personnel, written procedures, and budget to achieve goals listed above, i.e. production process optimization to waste minimization, they can be said to have a "program". For example, a written procedure for pollution prevention cannot be called a program if there is no one to work on it and no budget to implement changes. In addition, it should be asked how the company communicates the programs to employees? Are environmental programs incorporated with overall business plans? For example, are environmental programs considered when production changes, procurement decisions, or quality issues are considered?

Indicators recommended here identify management actions that allow environmental programs to succeed:

Indicator 38. # of sites / departments that collect environmental performance data

Keeping data or tracking environmental performance is the only credible way to demonstrate environmental improvements. Collection should be on a regular basis using standard OPI methodologies. This also includes upper level departments with managers or supervisors that collect or aggregate data from line units.

Indicator 39. # of sites / departments with written environmental targets

Setting targets is tied closely to the collection of environmental performance data. This includes departments overseeing individual processes and departments that set plant or facility level goals. Degree of target implementation can also be measured. Targets are generally quantifiable, such as “XX reduction of SO_X per year”, but may also include statements such as "elimination of XX substances from production."

Indicator 40. # of waste audits per year

A waste audit is a systematic assessment of the waste characteristics and sources of a factory with the purpose of finding ways to prevent or reduce waste. Audits are typically
completed through a combination of factory “walk-through” and records research. A waste audit should include a review of waste and result in a specific set of recommendations. This indicator should measure the number of full facility audits undertaken per year.

In addition, the degree of system implementation can be assessed for SMEs choosing to adopt formal EMS, for example, the number of Responsible Care Codes of Management Practice for which the company has attained "practice in place", or certification in ISO. This will vary depending on the SME / EMS.

(8) Benefits

Benefits can be divided into internal and external ones. Internally, EMS benefits manifest as better overall company management (organizational), cost savings or improved financial performance, and staff improvements.

Indicators suggested to quantify internal benefits include:

**Indicator 41. Total dollar savings from efficiencies**

This calculation should include savings that result from process or materials changes that arise from EMS or related programs. This calculation should include savings from:

- Reductions in energy use
- Reductions in raw material consumption
- Reductions in waste treatment or disposal costs
- Reductions in packaging materials
- Reduced transportation costs
- Reduction in environmental fines

This indicator can also be normalized as dollar savings per unit product.

**Indicator 42. Dollar benefits from improved productivity**

Environmental initiatives often have positive effects on other parts of the company, particularly productivity. Productivity increase can stem from improved yields, decrease in the number of defective product, reduction in downtime from breakdowns or accidents, increased automation, and any other actions that may be direct or indirect components of an environmental improvement program. Often, gains in productivity bring greater financial benefits than other aspects of EMS.
implementation.

External benefits are grouped into economic benefits, environmental benefits, and improved stakeholder dialogue.

Suggested indicators for external benefits include:

**Indicator 43. % sales related to environmentally designed products**

This includes products designed to incorporate recycled materials, for post-consumer recycle ability, for lower toxicity, or to qualify for eco-labeling.

**Indicator 44. # of environmental awards received**

Without good communication, improved environmental performance will not be recognized. Awards include government, community, and industry awards for environmental performance. A less positive measure of external communication is the reduction in complaints by neighboring residents or factories lodged against the enterprise.

**Indicator 45. # of new customers or increased market share gained since EMS implementation**

The SME will need to pick a meaningful date to begin tracking this statistic. Examples could include CEO approval of new environmental policy, ISO 14000 certification, or introduction of an eco-friendly product.
IX. Environment Management Guidelines for SMEs

From the EM experiences of Korean SMEs investigated through survey and case studies, important factors in adopting and implementing EM(S) were gathered to form EM guidelines for SMEs.

The guidelines consist of information and implication collected from about 100 companies that responded to survey questionnaire. Among 100 companies, about 30 companies were analyzed by pre-case studies and 5 of them were thoroughly investigated. Most of the guidelines on adoption and implementation of EM(S) is contributed by successful EM practices of about 30 company case studies. Companies studied by case studies are from diverse industrial sectors with different market environment, which enables the guidelines to cover broad aspects of SMEs.

The guidelines may provide helpful information to SMEs of other Asian countries in the stage of developing economy as well as other Korean SMEs concerned about EM. The result of this study would be of special interest to Asian countries in the developing world in that it includes all the efforts made in EM activities of Korean SMEs through rapid Korean economic development of recent several decades, economic crisis in 1997, and the course of overcoming the crisis.

In order for the guidelines to be more practically useful, this chapter focuses on the barriers of adopting and implementing EM(S) and how to overcome such difficulties. Much has been extracted from the result of case studies to suggest solutions consistent with reality.

1. Incentives for Implementing EM

After the Rio Declaration in 1992 it has become increasingly clear that enterprises must take social responsibility for environmental pollution. At the present, the 'costs' related to an environmental accident are often manifested through permanent damage to a company's image. Increasingly, the concept of environmental investment is shifting from end-of-pipe treatment to pollution prevention. These phenomena demonstrate recent advances made in addressing environmental issues. A company's existence is closely bound both to the global environment as well as to the local community in which it is based. In carrying out their business activities each company must maintain respect for human dignity, and strive towards a future society where the global
Companies must contribute through their business activities to the establishment of a new socioeconomic system that enables a society to achieve sustainability.

- Pressure

Drivers vary with industry sector as well as social, geographic, and market conditions. Key stakeholders capable of creating drivers for adoption include customers, local government, local community, and employees, although lending or insurance institutions may also play a role. Stakeholder drivers vary across industries. The only common driver to all sectors is government regulation and enforcement. Companies have great potential (and responsibility some might argue) to influence the environmental behavior of their contractors and suppliers, and work with contractors or suppliers should be an integral part of any EMS. Oftentimes improvements in SME environmental performance can only come from work with customers. In general, work with suppliers or contractors can focus on reducing the environmental impacts generated by the contractor / supplier, or on reducing the environmental risks or costs passed on to the SME customer.

- Benefits

Benefits arising from EMS are often described as "win-win" scenarios for both the SME and the environment. Improved environmental performance leads to financial benefits and cost savings for companies. Although such benefits are widely documented for larger companies many SMEs do not believe they can capture these benefits. The case studies presented in this project made an attempt to document benefits accrued by SMEs and draw clear links between the benefits and the EMS practices of successful firms, such as frequent waste audits or extensive training, etc.

Benefits can be divided into internal and external benefits.

Internally EMS benefits manifest as better overall company management (organizational benefits), improved financial savings or performance, and employee improvements. Improvements to overall company management include:

- Better management of quality
- Improved training
- Workplace safety
- Better communications
- More innovation
- Legal compliance
- Improved work procedures
- Operational improvements
Some specific benefits accrued from the following categories would be greater customer satisfaction (management of quality), improved employee satisfaction (better communication), less product defects (operational improvements) or lowered overall costs (improved work procedures).

In most cases improved financial savings or performance come from greater efficiencies, such as savings from reduced energy, water, and materials usage. EMS may also lead to increased revenues indirectly by helping to improve product quality or gain new customers. Improved productivity as a result of implementation of environmental improvement strategies is another area where many SMEs reap major financial benefits.

Employee improvements include:

- Improved employee quality (knowledge, skills, qualifications)
- Improved employee moral
- Improved communications between management and staff

External benefits are grouped into marketplace benefits, environmental benefits, and communications improvements. Marketplace benefits can be defined as new customers, marketing opportunities, or marketing advantages ascribed to the EMS. Examples are environmentally friendly or eco-label products, or new customers due to ISO 14001 certification. Environmental benefits include OPI areas such as reduced emissions or environmental fines. Improvements in communications can come between the firm and the public, customers, regulators, and other stakeholders.

SMEs in Korea usually adapt passively to environmental change rather than take a strategic approach to environmental issues.

Although the market, regulation, and a company’s internal factors can be thought of as separate factors motivating the SMEs to incorporate environment management (EM),
all these factors actually work in conjunction.

While recognizing various environment factors as important, the method, degree and level of EM attained depend upon the company’s ability to acknowledge the problem and develop its problem-solving skills.

1.1 Market

(1) Market Pressure and Supply Chain

As EM certification systems such as ISO 14001 have become accepted as objective measures of an environment management system (EMS), companies in countries that lack advanced environment regulations have felt increasing pressure to adopt EMS acknowledged by the certification system.

In the global market, more and more industries with environmental responsibilities feel pressure to get EM certification. Such pressure motivates Korean SMEs running businesses in a global market to adopt EM.

Among the thirty companies chosen for the case studies in this research (only 5 are included in the Final Report itself), Global & Yuasa Battery Co., KISWEL, and Dongwoo Fine-Chem Co. adopted EMS at their clients’ demand.

In the case of Global & Yuasa Battery Co. and KISWEL, their export firm asked for environmental certification. Dongwoo Fine-Chem Co. adopted an EMS because its major business partner, Samsung, had an environmental clause requiring inspection of the company's environmental situation.

Companies that do not feel direct pressure from the market yet still respond aggressively to environmental issues most likely feel that indirect pressure from the global market is a ‘tacit’ market signal to take concrete action. The presence of such tacit signals in the marketplace suggests that EM can be used as a strategic tool to improve competitiveness.

(2) Proactive Response

Daeduck GDS Co., Samjin Chemical Co., Korea Storage Battery, Tongyang Confectionery Co. have dominated their competitors by systematically applying EM into their business strategy, even in the absence of tangible market pressure.
Daeduck GDS Co. imposed a stringent pollution emission standard on its operations as a safeguard against tightening of environmental regulations. The company also aims to recapture a good public image after negative publicity about the electronics industry due to one manufacturer's discharge of phenol into a river near the Kumi industrial complex.

In the case of Samjin Chemical Co.’s, there was no clear pressure for EM adoption, but the company pushed forward with EM to raise their credibility and prepare for stricter regulations.

All of these companies were in a better position to pick-up market signals due to their supply chain relationships with large or multinational companies that had already implemented EM. They strategically approached environmental issues as a way of gaining the upper hand over their competitors.

(3) External Recognition

Companies that incorporate EM to gain strategic advantage seek as a way to receive ‘external recognition’. Daeduck GDS Co. and Samjin Chemical Co. both received ISO 14001, an international environment standard that covers all industry sectors, in order to obtain ‘external recognition.’ Other management systems that have acknowledged importance within a specific industry may also give companies external recognition. One example is Tongyang Confectionery Co.’s drive to obtain AIB certification as a way to address hygiene problems particular to the food industry. In this case, Tongyang Confectionery Co. obtained AIB as a counter to market pressure in the food industry. Receiving certification for a standardized EMS gives companies an advantage over their competitors.

(4) Creating New Markets

At the other end of the spectrum, instead of moving aggressively to counter market pressure, some companies have recognized the trend towards environmentally friendly products as an opportunity to develop a new market.

The Korea Omyang Co. has tried to enlarge their overseas market share by introducing environmentally friendly products to an audience that is not yet environmentally conscious. ECO Co., another case study, successfully won a niche market through creation of environmentally friendly products, and the Kyungdong Boiler and SindoRicoh are also well recognized for their superiority over competitors through aggressively tackling of environmental markets.
1.2 Regulation

As environment regulations are tightened directly and indirectly around the world, SMEs that formerly used a passive environmental pollution control strategy have changed their EM tactics to an aggressive strategy encompassing both prevention and post-handling of pollution.

Changwoon Co. and Korean Microsystems, both of which had violated environmental regulations in the past have taken steps to account for their past mistakes by building a thorough EMS.

Changwoon Co. which received an improvement order from the environmental authority after accidentally discharging polluted water that exceeded COD and SS standards, has equipped itself with a pollution control system and has implemented procedural safeguards to prevent any future reoccurrences.

In the case of Korean Microsystems, an independent contractor with a poor management system discharged polluted water in excess of the permissible standard. In response, Korean Microsystems set up an environment and safety management department to push forward a large scale EMS.

Although there is a lack of outside pressure, Daeduck GDS Co. and Tongyang Confectionery Co. are building EMS to gain an upper hand in the market and to prepare for upcoming regulatory changes.

Many companies that have established EMS are maintaining pollution emissions that are lower than the prescribed standard. By incorporating both preventative and post treatment measures into an EMS, companies can effectively comply with environment regulations and also prepare for reinforcement. For this reason, industries with high pollution levels or high risk of environmental hazard have a greater need to build an EMS in order to effectively handle environment regulations.

1.3 Internal Factors

Tongyang Confectionery Co. and Korea Omyang Co. both promoted EMS as a way to improve the workplace environment.

Implementation of EMS for internal reasons brings satisfaction to the employees and this in turn increases productivity. Better communication between departments is another advantage that was recorded by some of the case studies. By solving in-house problems, EM has the positive effect of increasing productivity.
2. Overcoming Difficulties when Implementing EM(S)

Understanding the barriers or obstacles that a company faces in adopting EMS was an important goal of the case studies. In general the barriers experienced by case study companies can be divided into internal and external. Internal barriers describe conditions within the company, such as SME staff views about EMS or company resources available for implementation of the EMS. External barriers describe conditions outside the enterprise, such as government policy or customer attitudes, that discourage EMS adoption.

2.1 Internal

In some instances, the case studies showed that overcoming internal barriers is crucial if the government is to be effective in convincing firms to adopt EMS.

(1) Resources

In these and other case studies, human resources are one of the most often cited reasons by SMEs as reasons for non-adoption or non-maintenance of an EMS. For an environmental initiative to succeed within a company, responsible personnel must be assigned, means to accomplish the task provided, and ample time available to perform work.

In addressing resources, it should be noted that an important characteristic of SMEs when trying to implement EMS is the multifunctional nature of the staff that are assigned environmental responsibilities (i.e. most SME environmental staff have additional duties, such as production or quality management). Finding an "environmental champion" to promote EMS initiatives is important.

Because significant paperwork and inter-departmental participation is necessary in implementing an EMS, the person put in charge of the EMS process generally tends to be overburdened. Therefore, in order to effectively implement an EMS with limited manpower, companies should organize a TFT (task force team) to maximize efficiency in terms of time and labor. Inter-departmental cooperation is also necessary, as well as finding a person responsible for the environment to "take charge" of the EMS initiative.

- Organizing TFT

In order to prepare for adoption of an EMS such as ISO 14001, it is necessary to organize a TFT through the recruitment of various department personnel, and arrange for regular meetings between TFT members.
KISWEL, Daeduck GDS Co., Samjin Chemical Co., Korea Storage Battery, and Korea Omyang Co. all organized TFT to prepare for their ISO 14001 certification. The efforts of the TFT were all found to be important to the companies’ successful bid in obtaining certification.

- Taking Initiative

Although cooperation is needed from members of staff in a number of departments to implement an EMS, it is often difficult to convince them to participate in the process. The case studies showed that in such instances, the person in charge of environmental related operations should take initiative in coordinating the EMS adoption process and find ways overcome inter-departmental problems.

Daeduck GDS Co. provides a good example of this. Although Daeduck GDS Co.’s organization lacked flexibility, a characteristic often seen in large companies, the company was able to systematically implement an EMS due to the aggressive cross-departmental efforts of their environmental staffs.

(2) Perception and Company Culture

SMEs perceive EMS (especially formal systems such as ISO or EMAS) to be complicated documentation systems unsuitable for the informal management styles of most SMEs, and are not aware of the organizational advantages SMEs enjoy in EMS implementation.

Company culture is key to motivating SMEs to adopt a proactive stance on environmental issues. An effective EMS must be dynamic to allow an organization to adapt to a quickly changing business environment. For this reason, EMS should be kept flexible and simple. This also helps make EMS understandable for the people who must implement it.

As an EMS is built and implemented, some roadblocks may be encountered. Some people in the organization may view an EMS as bureaucracy or extra expense-an ‘add-on’ to what they do now. There may be resistance to change or fear of new responsibilities. To overcome these potential roadblocks, it is important that everyone understands why the organization needs an effective EMS and how an EMS will help everyone control environmental impacts in a cost-effective manner. Getting people involved in designing and implementing the EMS will demonstrate the organization’s commitment to the environment and help to ensure that the EMS is realistic, practical and adds value.
Top Management Support for EMS

The CEO’s interest in EM plays a vital role in EMS adoption and initiation. Because the adoption process of EMS is difficult and complex, the CEO’s attitude affects the process more than the employee’s enthusiasm. Moreover, the CEO has greater decision-making powers due to the vertical line of command inherent in many Korean companies.

EMS adoption is no exception. Many companies with EMS have initiated the implementation simply at the command top management.

The management team of Daeduck GDS Co. decided to adopt EMS as way of actively preparing for changing market situations. The task force team in the environmental department was then charged with pushing forward the adoption process. Circumstances were similar at Korean Microsystems and Korea Telecom.

Bottom-up EMS Structures

While the role of the CEO is important, especially in Korea, actual implementation of an EMS require active employee participation in the process.

Through the case studies it was seen that employees often express interest in EM by offering suggestions on how to make improvements in areas such as working environment. The case studies show it is important to encourage employees’ enthusiasm for submitting comments and proposals regarding the environment. It is important that the management team show their interest in such proposals by carefully reviewing them and implementing when possible.

Korea Storage Battery’s EMS adoption proceeded particularly smoothly due to their bottom-up structure that encouraged active participation by the employees and active reaction to employee suggestions by the management team. Siemens Automotive Systems Co.’s ‘My Suggestion’ system is a good example of a way to facilitate the EMS adoption process through acceptance and implementation of employee suggestions.

Awareness of Company Environmental Impacts

For environmental improvements to occur, it is essential that both the management team and employees realize the importance of EMS. Industries such as the chemical and food industry that have serious environmental impacts must take active steps to help employees recognize the necessity of EM. However, it should be noted that attention to environmental issues is possible without adoption of a formal EMS such as ISO 14001, as was seen in a number of the case study companies.

The potential of their operations to impact the environment led companies such as Dongwoo Fine-Chem Co., Hannong Chemicals Co., Daeduck GDS Co. (a PCB
manufacturer), Tongyang Confectionery Co. (food products), and Changwoon Co. (textile dying and bleaching) to invest a major company effort in improving EM without seeking international EMS certification.

- Influential Position of Person in Charge of EMS Implementation

The nature of the staff or department in charge of building an EMS, and their position within the company hierarchy is very important to the final outcome. It follows logically, as seen in some of Korean case studies, that EMS is successfully implemented when this person or division has greater power to influence the organizations decision making process.

In the example of Korea Omyang Co., the department that took control of ISO 14001 implementation was also in charge of important operations within the company such as overall system management, quality control, and equipment purchase. Their influential role in the company power structure gave them important leverage necessary to accomplish all the necessary steps in the implementation process.

- Adopting Foreign Business Cultures

Developed countries often have well-established EMS or quality management systems. By understanding the cultural background of foreign companies with successful EMS and imitating it, Korean companies in developing countries can raise their chances of effectively adopting an EMS.

Siemens Automotive Systems Co., a German company, requires all of their factories to follow a code of operations developed by Siemens in Germany. The code covers all stages of operation, from factory planning to construction.

Germany’s systematic quality management system was applied at one of their Korean factories from the outset of factory operation, allowing for smooth adoption of a German-style operating system for the Korean workers and management.

Additionally, the Korea Omyang Co. which began as a joint venture with ONKYO of Japan, incorporated a Japanese style 'clean environment' credo from their beginning of their company history. The drive to continuously maintain a clean environment has lead Korea Omyang Co. to actively adopt an EMS.

2.2 External Barriers and Help

In Korea, as elsewhere, external barriers can often prevent an otherwise willing SME from adopting EMS. Some types of commonly cited external barriers include: 1) the cost of adoption, 2) the lack of SME appropriate information and technology, and 3)
complex formal procedures required for certification that are not suited to SME management style.

Because building an EMS entails a great deal of paperwork and assessment of environment influences, information gathering, expertise and funding, the limited internal resources of an SME often require them to look for outside help. However, as was seen in the review of Korean regulatory programs, the lack of appropriate external sources of SME support, either from consultants or government, can become a serious limiting factor. This was especially true during the early stages of ISO promotion which mainly targeted large conglomerates.

At present, SMEs in need of help can rely on outside consultants to help simplify paperwork and environmental assessment. Such outside support helps overworked environmental departments compensate for the limited human resources and generates a positive effect by providing more information to educate employees.

(1) Cost of EMS Adoption

Some of the major costs of EMS adoption certification or verification, or as was seen in the Korean economic crisis, the inability of an SME to afford environmental measures such as EMS during a recession are barriers.

The case studies showed approximately 25 million to 30 million won is spent by an 'average' SME on outside consultants, inspection, certification, and TFT labor in general. The high costs associated with certification makes funding a difficult problem for SMEs that want to implement EMS.

The results from the survey conducted in this study (see chapter 6) show that government support programs are not well publicized and that government funding from these program is difficult to obtain due to the strict qualification procedures.

Companies with adequate funds, like Dongwoo Fine-Chem Co., will not apply for government support programs to avoid the possibility that sensitive information could be placed at risk of leaking.

(2) Information and Technology

- Support through the Supply Chain

Small and medium-sized enterprises (SMEs) are often pressured by large downstream companies, but also receive educational and technological support from large companies when adopting EMS. Information and technology transfer through the supply chain enables easy and low cost EMS construction for SMEs.
In the Korean case studies, Daeduck GDS Co. and Korea Omyang Co. have encouraged their suppliers to obtain ISO 14001. The companies themselves also receive technical support from larger companies that they work with when needed. This example demonstrates the EMS corporate "food-chain" responsible for distributing large quantities of information and know-how from larger companies down to SMEs. A number of similar cases of SMEs adoption and promoting ISO 14001 due to supply chain pressures have been noted in Korea.

- Support from Industry Associations

Due to the similarity between operational processes and environmental issues encountered, informational exchange between companies within the same industry is extremely useful in promoting EMS.

One of the companies in the project case studies, the Dongwoo Fine-Chem Co., participates in monthly meetings held by the North Cholla Province Environment Association and the Iksan Industrial Complex Environment Association to obtain environmental information. Participation in such regional environment associations with active programs can be an effective way of fostering valuable information exchanges.

- Consultants

Consultants provide help in evaluating EMS and suggesting approaches used successfully elsewhere. There are ways to hold consulting costs down. Joining forces with other small businesses in related area to hire a consultant may be one of good examples.

Global & Yuasa Battery Co. and Dongwoo Fine-Chem Co. minimized trial and error incurred by limited human resource and lack of experience by bringing in outside consultants.

(3) Complex Procedures

Existing EMS may not be suitable for SMEs because the system is planned and built to fit the needs of large corporations. This inappropriateness of formal EMS for SMEs was noted several times by companies involved in the project. Furthermore, even basic tasks such as environmental impact assessment and paperwork are difficult for SMEs to perform due to a lack of funding.

Under these circumstances, it can be better for SMEs developing their own EMS to incorporate a company's actual work flow, rather than simply following a given process and structure from a pre-packaged EMS system.

Korea Omyang Co. successfully adopted ISO 14001 by going through each procedure,
Development of EMS for SMEs step by step, without bringing in an outside consultant. The company has made a serious effort to maintain the ISO 14001 framework while adapting it to meet their work needs.

Unlike Korea Omyang Co., the company KISWEL hired outside consultants to help them achieve ISO 14001 certification. However, the employees’ lack of understanding and enthusiasm towards the required paperwork compounded by a lack of interdepartmental cooperation, has made KISWEL’s EM efforts successful a lesser degree.

3. Overcoming Difficulties during EM(S) Adoption and Entering a Routine

3.1 Goals and Targets

Goals and targets provide important direction for any EMS by defining both the desired end result and the steps needed to get there. Goals can be defined as the final result, for example, elimination of hazardous wastes from a specific process. The targets would include incremental steps for achieving the goal, such as 25% reduction by 2000, 50% reduction by 2001, and total elimination of the substance by 2002. It is important to understand the process by which goals / targets were set. Were operational / line personnel involved? What targets are not reached? How are goals modified over time? How are goals and targets integrated with other aspects of the EMS, i.e. environmental policy, and performance monitoring system.

The process the company uses to ensure continual performance is the key here. Companies without any kind of system can improve their performance, but they cannot claim to have a process.

- Goals and Performance Management

It is important to set up a goal and detailed objectives which can be executed systematically when implementing EMS. Goals set up in the initial stage are compared to the result at a later date. This will let one know where improvements and new goals should be made.

In the Korean case studies an effective goal achievement system was demonstrated by Korea Omyang Co.’s ‘guideline management’. ‘Guideline management’ is a system for organizing management of separate goals and implementation of various environment programs across different company divisions. Performance management is carried out on a monthly basis by strictly comparing the performance of each month with that of the
same time from the previous year. This system ensures that continuous progress is made against benchmarks set using past company performance.

Another example of goal oriented environmental management is Tongyang Confectionery Co.’s energy saving TFT, which holds monthly meetings to examine and discuss energy saving ideas. They compare investments made on energy efficient projects and the actual cost savings, and share the results with management and employees. Again, the ability to produce measurable goals, results, and benefits from achieving these results helps the company make continuous improvements.

3.2 Management Systems

Standardized environmental management is generally recognized through EMS such as ISO 14001, however actual environmental management activities appear in a wide variety of forms depending on the companies’ particular conditions and circumstances.

Three general methods of implementing EM were observed in the are project case studies: (i) implementation of EM through traditional EMS certification, such as ISO 14001; (ii) implementation of EM through quality management, an alternate system certification; and (iii) 'homegrown' implementation of EM by companies that lack funding or the need for a certified system. Depending on internal and external factors, the case studies also found type three companies able to implement environment improvement programs and achieve performance on par with certified systems.

(1) EM through EMS Certification

ISO 14001 is the standard example of a standardized certified EMS. Based on the case studies, it seems that SMEs have a particularly hard time both adopting ISO 14001 certification and maintaining continuous improvements. However, in cases where ISO 14001 was successfully implemented and maintained, both environmental performance and business performance improved.

A typical certified EMS includes environment guidelines, assessment of environmental aspects, a system to enforce regulatory compliance, goals, monitoring of performance, specific environmental programs, education, documentation, auditing and a correction process.

Korea Omyang Co. is an excellent example of a company that has a systematically implemented EMS. The company has been successful in generating progress after adopting their EMS due to the systematic promotion and continued maintenance inherent in the ISO 14001 structure.
In a number of companies observed through the project, neglecting the maintenance of an EMS placed a greater burden on the company, and created the notion that EMS is completely unrelated to their actual work. The Korea Omyang Co., however, was successful in adopting a workable EMS that helped improve business performance.

(2) EM through Alternate System Certification

Environmental and business performance can also be improved when a system other than a standardized EMS (such as ISO 14001) is implemented. However, much like ISO 14001, success of the program depends on clear documentation of objectives, performance, analysis, countermeasure, and a person with sufficient authority in charge of the process. From an environmental perspective, it is important also that the goals of the management system are not in conflict with environmental objectives.

- Certified Quality Management Systems

QS 9000 and ISO 9001 are examples of certifiable quality management systems. Manufacturers generally profit from producing better quality products. Oftentimes manufactures put greater effort into quality management as compared with EM because of the perceived market benefits. This project study observed a number of companies that were successful in enhancing EM performance by implementing a quality management system. Such companies include, Siemens Automotive Systems Co., Korea Omyang Co., and Daeduck GDS Co.. In particular, Korea Omyang Co. adopted ISO 14001 before QS 9000 to fulfill requirements of the environmental provision in QS 9000.

Quality management is helpful to EM because goals, progress, result analysis, alternative plan and scheme are constantly documented. This keeps every aspect of the business' management transparent and systematic.

- Other Certifiable Management Systems

Aside from quality management, there are other certifiable management systems that can achieve EM improvement without the adoption of a traditional EMS.

The Tongyang Confectionery Co. was the prime example of this in the project case studies. Tongyang Confectionery Co.’s decision to adopt AIB (American Institute of Baking), a certification used in the North American food industry, out of consideration of product hygiene. AIB certification propelled Tongyang Confectionery Co. to initiate a number of programs which complemented or directly improved EM.
(3) Alternative Environmental Management

Sometimes acquiring EM or quality management certification does not greatly disrupt company management. In such cases, an environment improvement program can bring about both environmental progress and improved business performance without requiring a formal system.

Some SMEs lack a system adequate to their needs or are too small to adopt a system. From the case studies it has been shown that such companies can effectively implement EM by setting up an improvement program utilizing available internal resources.

Neither Hannong Chemicals Co. nor Changwoon Co. (textile dying and bleaching) have standardized management systems for handling environmental issues. However, because both companies work in industries with severe environmental impacts, and where any environmental accident could have grave repercussion on company image, it was necessary for the two to find a way to strictly control environmental aspects.

Hannong Chemicals Co. does not have written environmental management guidelines, but uses an SOP (Standard Operating Procedure) manual. Changwoon Co. also does not have specific environmental management procedures, but makes consistent efforts to create a company atmosphere enabling environmental staffs to work effectively. As the case studies showed, their EM self-improvement efforts, have allowed both companies to cut costs and improve environmental performance.

3.3 Organization

SME organizations often have some advantages over larger organizations in ensuring effective environmental management. In smaller organizations, lines of communication are generally shorter, organizational structures are less complex, people often perform multiple functions, and access to management is simpler. All of these can be real advantages for effective environmental management.

A team with representation from key management functions and production or service areas can identify and assess issues, opportunities, and existing processes. It would be helpful if contractors, suppliers and other external parties are considered to be part of the project team where appropriate. This team will need to meet frequently, especially in the early stages of the project. The cross-functional team can help to ensure that procedures are reasonable and will build commitment to the EMS.
(1) Position of EM Administrator within the Organization

The position of the EMS administrator within the organization is important when adopting and maintaining EMS. When an environmental department performs another important task within the company, such as strategic planning, incorporating environment management into overall company strategy and guideline can greatly facilitate effective implementation of an EMS.

The Korea Omyang Co. (speaker manufacturer) adopted an EMS in order to raise product quality. The company placed the quality management team on the ISO 14001 promotion team. Because the quality management team was in charge of important tasks such as company system maintenance, education, quality control, and equipment selection, the team was able to exert considerable influence in getting other company departments to go along with the EMS adoption process.

(2) EM in Small Organizations

- Free Spirited Atmosphere

In most cases, by definition SMEs have a small number of employees and a small organizational structure. The small number of employees often indicates a shortage of human resources, which as has been noted is a barrier to EMS adoption.

However, other traditional characteristics of small organization can sometimes be beneficial in implementing a more effective EMS. With a small number of employees, lines of communication are shortened and a free spirited working atmosphere is created that increases employee productivity.

Changwoon Co. never formed an EMS task force team, because the company did not adopt a formal EMS. One of the notable characteristics of Changwoon Co. is its free spirited working atmosphere. At Changwoon Co., the opportunity to learn and enjoy free time (for example, the company provides internet access and a staff lounge) induces employees to work harder. Changwoon Co.'s lowered employee turnover rate also increased the number of experienced workers leading to an accumulation of EM know-how.

(3) EM in Large Organization

- Management Team’s Perception of and Interest in EM

As the size of SMEs grows, the company begins to show some characteristics of a large-scale organization. The advantage of larger organizations tends to be a clear division of labor and responsibility. However, as an organization grows and
environmental responsibilities expand, pressure grows on the person in charge of the environmental department.

Negative aspects in the business culture of large organizations are a lack of inter-department cooperation due to communications difficulties and rigidity of the organization. To overcome such problems as an SME organization grows in size, the management team should show interest and support for environmental tasks. Growing SME companies can also facilitate inter-departmental cooperation through staff education programs.

In one case study, Daeduck GDS Co., the most important factor in their adoption of EMS was the management team’s positive attitude and support. However, the increased responsibilities for Daeduck GDS Co.’s environmental staff brought by the EMS created an obvious burden. Daeduck GDS Co. organized educational programs, emergency drills, inspection, and internal audits to improve employee understanding of their EMS. The company is also using corporate email to improve communications and cooperation between departments.

(4) EM through the Task Force Teams

While the task force team (TFT) proved to be important to EMS implementation in some companies included in the case studies, not all companies required an internal task force to lead EM. Using a TFT to operate a specific program (as opposed to a systems based approach) is also an alternative for implementing EM.

The biggest characteristic of a ‘team’ is that it is horizontally structured. No one person assumes full leadership on a team, and ample opportunity and authority are given to employees from lower positions in order to bring out maximum participation. When organizing a TFT, a wide range of departments should be mobilized to participate. This ensures that EM is implemented in conjunction with the company’s business management and strategic planning.

Samjin Chemical Co., the first company to acquire ISO 14001 certification in Korea, involved their human resource department in the adoption TFT in order to build EMS that would naturally blend into the company’s overall production system. Thanks to such efforts, Samjin Chemical Co. was able to integrate all procedure and responsibility of EMS into company standards.

Tongyang Confectionery Co. maintains energy efficiency TFT to save on energy costs. The energy efficiency TFT is horizontally structured to provide opportunities and authority for employees to increase work efficiency.
4. Environmental Management Programs

Effective environmental management is built on specific implementation programs. Environmental programs are means by which company goals are achieved. When designed, environmental programs should be flexible so that they are both easy to implement and revise. Environmental management systems (such as ISO 14001) should be the framework holding together individual environmental programs, such as pollution prevention (P2) and waste minimization.

The list of EM programs possible includes environment friendly product development, performance management, suggestion systems, and so forth. The list is summarized in the table to the right.

4.1 Pollution Prevention

Pollution prevention is the reduction of pollution at the source through manipulation of materials, production processes, or practices. This includes reductions in materials or energy use as well as reduction of pollutant emissions.

(1) Process Improvement

Process improvements can bring results such as decreases in pollutants, conservation of natural resources, improvement in workplace environment, and increases in productivity.

As their EM proficiency increased, Korea Omyang Co. was able to raise productivity by reforming the cone paper production process used in speaker manufacturing to reduce chemical use, wastewater emissions and noise pollution.

They accomplished this by installing a substitute tank outside the factory to recycle factory water. As a result, chemical and water usage decreased, along with discharge of wastewater. Noise was reduced which improved the workplace environment.

The company is currently making efforts to increase the amount of recycled water. This is a good example of positive EM and business performance through simple process improvement.
(2) Alternative Energy Source

In Korea the number of companies switching energy sources as a way to counter air pollution is increasing. Samjin Chemical Co. is representative of this growing trend. The company replaced gasoline used in their incinerator with recycled refined oil. The move improved environment performance and cut costs by 3%.

Global & Yuasa Battery Co. (industrial battery manufacturer) used LNG to replace BC oil, decreasing air pollution and cutting costs.

4.2 Waste Minimization

Generally, waste minimization is defined as the optimization of production processes with the goal of reducing to the extent possible the volume or toxicity of hazardous or other wastes to be disposed.

Korea Omyang Co. evaluated the effects of adhesive usage in their production process, and its contribution to odor and deterioration of the workplace environment. The company thoroughly documented the quantity of adhesive used and its effects on the environment. From this process, Korea Omyang Co. was able to identify ways to cut back on adhesive use (and waste). This program improved the workplace environment by cutting odors and toxic chemicals in the air and improved business performance by capturing the cost reductions from reduced adhesive use.

4.3 Recycling

Recycling is the processing of non-product outputs to recapture their resource value and prevent the need for disposal. Recycling includes reintroduction of wastes into the production process as well as onsite and offsite recycling and reuse. Best practices from the case studies include Global & Yuasa Battery Co., which recycles lead dust and scraps used in the battery manufacturing process. The PVC manufacturer KCC also recycles PVC film.

4.4 Pollution Control

Pollution control includes end-of-pipe measures to reduce environmental emissions within compliance of environmental standards, such as installation of de-NOx equipment or biological treatment systems for wastewater.
Due to the nature of transistor and IC manufacturing process, Korean Microsystems uses large quantities of water and chemicals and discharges large amount of wastewater. It is difficult for the company to maintain a safe pollution treatment process due to inconsistent pollution discharge rate. To solve this problem, Korean Microsystems installed new equipment and a new treatment process to decrease chemical use and wastewater pollution. The measures were effective in reducing costs from both chemical use and pollution treatment.

Changwoon Co. implemented a monitoring system to maintain proper levels of microorganisms necessary to ensure adequate treatment of polluted water generated from their textile dying and bleaching process. The monitoring system helped cut down on chemical usage, cut chemical use costs and maintained stable pollution levels in their wastewater discharges.

### 4.5 Waste Disposal Programs

Waste disposal programs are necessary to manage all wastes generated and ensure proper handling, treatment, and disposal.

Samjin Chemical Co., which manufactures wrapping materials, cut costs and pollution by separately treating pollutants generated during the production process.

By identifying the processes and departments from which pollutants originated, Tongyang Confectionery Co. was able to run a successful waste disposal program. The program was run by separating wastes and identifying them by placing a nametag on the bag containing pollutants. Besides ensuring that all wastes received proper treatment, the program also resulted in a reduction in waste and waste treatment costs.

### 4.6 Auditing

In a small organization, audits are particularly relevant since managers are often so close to the work that they may not see problems or bad habits that have developed. Periodic EMS audits will establish whether or not all of the requirements of the EMS are being carried out in the specified manner.

Project case studies revealed that Daeduck GDS Co., Siemens Automotive Systems Co., and Korea Omyang Co. perform internal and external audits every year to improve system management.
4.7 Performance Management

An effective performance management system is helpful in systematic implementation of EMS. Cooperation from employees is very important since EM is impossible without the participation of all employees. In this sense, performance management is not only important in systematically implementing an environment management system, but also helpful in generating employee participation. A number of the case studies reported that rewarding people was an effective means of securing participation from their employees.

Korea Omyang Co.’s ‘guideline management’ monitors goals, objectives, activities and performance to enable continuous maintenance of the EMS. By giving monthly or yearly bonus according to accomplishments, Korea Omyang Co. elicits active participation from employees.

Tongyang Confectionery Co. has developed a system to document process improvement and rate of operation. The system is designed also to measure individual performance in order to raise the level of environment awareness and motivate employees to strive for continued environmental improvements. Based on this case study, cost management methods such as ABC (Activity Based Costing) or ABB (Activity Based Budgeting) were also helpful in running their EMS. Tongyang Confectionery Co. calculates energy, industrial water, and industrial waste as environmental costs so that EM is implemented using cost management methods. In particular, dollar (or won) based analysis are important in expressing EM performance in a way that motivates upper management.

4.8 Suggestion Programs

In order to implement a successful EMS, it is vital to have employee cooperation. However, channels must be established to communicate comments from lower level employees in order to achieve any sort of real meaningful employee cooperation. Such communication channels are usually established through a program which allows employees to freely and openly offer suggestions.

One example of this in the case studies previously mentioned is Siemens Automotive Systems Co.’s ‘My Suggestion’ program to let employees freely express their ideas to management. Managers then make a decision on whether to implement employees suggestions. Interestingly, rejected proposals get a second chance when the vice president and president reexamine all proposals. Almost all proposals are incorporated
into the working process. In order to facilitate the program, individuals establish yearly goals that are rewarded with a year-end bonus according to the number of ideas that are adopted.

In Korea Storage Battery, which has a bottom-up organizational structure, 70% of employee suggestions are accepted after a management review.

4.9 Product Development

(1) Niche Product Development

Korea has recently seen a number of attempts to create new markets by developing environmentally friendly products. Unfortunately, the lack of publicity and consumer environmental awareness often mean that products struggle to capture a new customer base in a niche market.

One company, ECO Co. received an environmental mark by inventing a semi-permanent rechargeable butane gas can. The item is meant to reduce the environmental damage that comes from disposal of spent butane gas cans. Unfortunately the product is still struggling to gain a solid customer base.

(2) Product Differentiation

In some cases aggressive EM is pursued to gain the market advantages brought by having environmental characteristics differentiate a product.

Environmental certification or obtaining an environment mark is one way of showing that a product is environmentally friendly when compared with a competitor’s product, and helps raise credibility of that product in the market.

Global & Yuasa Battery Co. developed a long lasting sealed VGS battery that received an environmental mark. The product prevents electrolytic solution, made mostly of sulfuric acid, from leaking and allows it to be recycled. As testament to the success of EM product strategies, one of their competitors Korea Storage Battery, is putting effort into manufacturing an environmentally friendly and cost effective product by decreasing the weight of the pole plate and replacing Styrofoam wrapping material with paper.

Kyungdong Boiler has invented an energy efficient gas stove that emits only small amounts of air pollutants and actively promotes these characteristics in their marketing.

The printer manufacturer, SindoRicoh, developed a copying machine with reusable toner, for which it received a Green Marketing Award and cut costs for consumers.

5. Maintaining Performance, Feedback and Learning
IX. Environment Management Guidelines for SMEs

The concept of continual improvement recognizes that problems will occur. But a committed organization learns from its mistakes and prevents similar problems from occurring in the future.

To build and sustain an effective EMS, management must communicate to all employees the importance of; 1) making the environment an organizational priority (thinking of effective environmental management as fundamental to the organization’s survival), 2) building environmental management in everywhere (thinking about the environment as part of product and process development, among other activities), 3) looking at problems as opportunities (identifying problems, determining root causes and preventing their recurrence).

- **Priority**

At ECO Co., environment improvement has been ongoing for several years. These efforts reduced costs and were helpful in educating the management team about EM. As a result, the position of the environment department was elevated, and environment issues became a top priority in corporate decision-making.

- **Learning through Facilities Investment**

After a violation of environmental regulations, Korean Microsystems invested in a pollution prevention facility to minimize pollution. The company reduced legal costs and recovered their investment in almost no time. This success encouraged the management team to further invest on other environment related issues.

- **Learning through Cost Management**

Tongyang Confectionery Co. is clearly saving through environmental management based on cost management systems such as ABC and ABB. Saving energy, reducing waste, and saving water have taught the company that environment affects the competency of the organization. As a result, continued investment on environment was possible.

- **Learning through Performance Management**

Korea Omyang Co. set up separate environment objectives for each department and made them report the results on a monetary (won) basis. Korea Omyang Co. provided rewards to departments based on the amount of savings. By making the performance visible, continuous effort was put into environmental activities.

- **Learning through Monitoring**
Samjin Chemical Co. continuously monitors their EM programs through performance management. By translating performance records into dollars and cents, a clear relationship between investment and effect on the environment is identified. This system has also changed management team and employees’ perceptions on environment.

- Learning through Investment Analysis
  In order to facilitate investment on the environment, Daeduck GDS Co.’s environment and safety team is analyzes the effects of environment investment and reports it to the management team. The analysis shows that environment investment brings cost reductions, and which leads to greater willingness on the part of management to approve other forms of environmental investments.

6. Information/Consultancy/Source of Government Support and Its Application

6.1 Information /Government Support

Making the most of information is important in adopting and implementing EMS. Without a continuous supply of information, SMEs often have difficulty analyzing and getting information on environmental processing technology, product manufacturing technology, environment regulations and so forth.

Korea Storage Battery a manufacture of car batteries, received ISO 14001 certification, and on the whole has not had difficulty investing in the environment. However, Korea Storage Battery has had problems due to lack of understanding / information about government operations, regulations and technology. This indicates that sometimes lack of information can be a greater barrier to EM than financial resources.

Information in Korea is generally obtained through mass media, government, industry associations and large corporations. However, when SMEs over rely on mass media as their primary information source, they put themselves at risk of getting information that is too broad and superficial.

SMEs need alternate information networks. According to the project survey conducted, the information channels used most by SMEs were mass media and industry association, following these were government and consumers.
IX. Environment Management Guidelines for SMEs

(1) Obtaining Information through Industry Association

SMEs favor industry association and industry complex councils due to the ease in accessing information.

One of the project companies, Dongwoo Fine-Chem Co. makes full use of the local industrial complex council to collect information on the environment. The company also obtains valuable information regarding environmental improvement through monthly meetings held by the Northern Cholla Province environment council and the Iksan industrial complex environmental council.

Hannong Chemicals Co. also uses the local pollution prevention council as an information source.

(2) Information Access within Supply Chain

Another source for SMEs to obtain information is through their supply chain connections. Large companies, especially multinational companies, demand that environmental programs be implemented by business partners in their supply chain. While Korean companies have not yet actively implemented supply chain environment management (SCEM), a number of multinational companies are inducing SMEs they work with to adopt some form of EM. Some multinational companies have plans to include supplier EM into their own environment programs.

SMEs can also obtain information from their buyers. Getting information and technical support through the supply chain is recommended because it is easily accessible and the SMEs' needs can be accurately understood and satisfied.

Korea Omyang Co. and Siemens Automotive Systems Co. have both received environmental awards from Hyundai Motor Company. Occasionally Hyundai staff is dispatched to help these companies with environmental problems.

Daeduck GDS Co. is one of the case studies that make use of the help offered by larger corporations. As these examples show, large corporations are willing to support SMEs if the situation permits. SMEs can expand into new markets through implementation of EMS, and can also improve their position to obtain high quality information by gaining a good reputation.

(3) Using Internal Resource

Companies feel pressure to obtain information on a number of issues. In addition to information on environmental assistance and environmental technology, companies also worry about improving business management, manufacturing processes and the
workplace environment. Most companies encountered in the case studies worked hard to obtain outside information, however a number of companies were also successful making use of internally available information.

One example of this is KCC. The company obtains information regarding environment improvement through use of internal resources by collecting consumer opinions sent to their franchise.

(4) Using Government Support System

Not many Korean SMEs received support from the Korean government due to scarce information and the complex application process. There were a few exceptions recorded, however, of companies that made full use of available government support.

Samjin Chemical Co., for instance, received funds to purchase equipment from the Korea Energy Management Corporation. Samjin Chemical Co. is also getting information and education from the Korea Environmental Preservation Association in the form of environmental law classes, demonstrations, and environment assessments.

6.2 Training Support

Companies that adopted EMS in the past when there was no precedent should act as a role model to those companies planning to adopt EMS in the future.

(1) Consultancy

Generally companies bring in outside consultants to overcome difficulties caused by lack of information and manpower. Companies like Daeduck GDS Co., Global & Yuasa Battery Co., Dongwoo Fine-Chem Co. and KISWEL received help concerning documentation and the certification process by hiring outside consultants.

However, when the hired consultant does not understand the internal situation or the company hires a consultant from another industry, the attempt will be a waste of money and disrupt company efforts.

(2) Education, Instruction and Audit

One way to facilitate the spread of EMS is to encourage companies that have successfully adopted EMS to help educate and lead other companies in EMS adoption.

As a company which has successfully implemented an EMS, Korea Omyang Co. has begun evaluating the environmental impact of companies in their supply chain before
signing a contract with them.

Korea Omyang Co. helps SMEs by educating them on the necessity of EMS, sharing their experience as a well established company, and teaching them how to build their environmental management system step by step.
< Appendix > List of Company Case Studies

<table>
<thead>
<tr>
<th>Name of company</th>
<th>Industry</th>
<th>Number of Employees</th>
<th>ISO 14001 certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changwoon Co.</td>
<td>Textile dying and bleaching</td>
<td>180</td>
<td>X</td>
</tr>
<tr>
<td>Daeduck GDS Co.</td>
<td>Printed circuit board manufacture</td>
<td>650</td>
<td>O</td>
</tr>
<tr>
<td>Dongwoo Fine-Chem Co.</td>
<td>Chemical</td>
<td>100</td>
<td>O</td>
</tr>
<tr>
<td>ECO Co.</td>
<td>Butane gas manufacture</td>
<td>65</td>
<td>X</td>
</tr>
<tr>
<td>Global &amp; Yuasa Battery Co.</td>
<td>Battery manufacture</td>
<td>700</td>
<td>X</td>
</tr>
<tr>
<td>Hannong Chemicals Co.</td>
<td>Chemical</td>
<td>80</td>
<td>X</td>
</tr>
<tr>
<td>Keumkang Chemical Co.</td>
<td>PVC, ceramic</td>
<td>300</td>
<td>X</td>
</tr>
<tr>
<td>KISWEL</td>
<td>Metal</td>
<td>300</td>
<td>O</td>
</tr>
<tr>
<td>Korean Microsystems</td>
<td>Electronics</td>
<td>650</td>
<td>O</td>
</tr>
<tr>
<td>Korea Omyang Co.</td>
<td>Speaker manufacture</td>
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<td>O</td>
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<tr>
<td>Korea Storage Battery</td>
<td>Battery manufacture</td>
<td>500</td>
<td>O</td>
</tr>
<tr>
<td>Kyungdong Boiler</td>
<td>Boiler manufacture</td>
<td>450</td>
<td>O</td>
</tr>
<tr>
<td>Samjin Chemical Co.</td>
<td>Plastic film</td>
<td>186</td>
<td>O</td>
</tr>
<tr>
<td>Siemens Automotive Systems Co.</td>
<td>Automotive parts</td>
<td>300</td>
<td>X</td>
</tr>
<tr>
<td>SindoRicoh</td>
<td>Photocopying machine</td>
<td>1000</td>
<td>O</td>
</tr>
<tr>
<td>Tongyang Confectionery Co.</td>
<td>Confectionery</td>
<td>200</td>
<td>X</td>
</tr>
</tbody>
</table>
X. Policy Recommendations for Government

This Chapter provides the policy recommendations for government to facilitate environmental management of SMEs.

To facilitate voluntary environmental management, it is important to set reasonable regulations that will serve as a drivers for corporate environmental management applied to companies. In first section, we assess the present regulatory policy, and based on this, provide the direction of regulatory reform and recommendations for regulatory policy.

Second section discusses the government initiated environmental management promotion program including environmental labeling scheme and certification scheme for environment-friendly corporation. It also assesses the present schemes and provides recommendations for vitalizing those schemes.

Third section deals with the government’s supporting policies to facilitate SMEs’ environmental management. Firstly, the policies for supply chain environmental management are discussed. Korean situation of SCEM is reviewed and the roles and tips of government to encourage SCEM are suggested. And finally, government’s supporting systems including financial, technological, informational supporting systems are assessed and improvement plans are provided.

1. Regulatory Policies

1.1 Regulatory Policies and Corporate Environmental Management

At their most fundamental level, environmental regulations in Korea are intended to prevent the diseases or disaster that might arise as a result of environmental pollution, and to maintain a comfortable standard of living for local residents by placing controls on facilities (or actions) that discharge pollutants into the environment. Companies are drawn to implement environmental management systems in order to comply with these regulations. In other words, regulatory policies are an important driver in pushing corporate environmental management.

According to the survey conducted in this study, 88% of companies believed that strengthening environmental regulations would bring about corporate environmental improvements. This is a good indicator of the function that regulations has on corporate environmental management.

In broader a sense, environmental regulation refers to the means by which the
environmental behavior of business is controlled. At one end of the spectrum is state regulation (such as law and other forms of market intervention) and at the other end is self-regulation (such as voluntary codes of practice). State regulation and self-regulation should not be viewed as mutually exclusive, as it is possible to argue from an ethical standpoint that there is a value and a need for both forms (Schokkaert and Eyckmans, 1994).

At present in Korea, most environmental policies adopt a post-generation management approach to environmental pollution. For this reason, utilizing regulatory means or economic incentives in state regulation have resulted in limited improvement on the overall environment. This being the case, it is important to emphasize the necessity of using an active management approach to promoting pollution prevention measures. The active management approach looks at the environmental impact of the whole production process, thus encouraging preventative measures to minimize environmental hazards through comprehensive evaluation and management of all sources of pollution emission. However, using environmental management to foster adoption of pollution prevention measures is also limited in that it only addresses pollutant discharged, so it is still necessary to promote other activities outside of the scope of pollution prevention, such as the design of environmentally friendly production processes or products. This is not possible, however, without voluntary effort by companies that are responsible for production activities. In this sense, the ultimate meaning of voluntary environmental management is simply self-regulation.

Moreover, cost-effective and cost-efficient environmental management (including the necessary methodology and technology) should be found and adopted also as a way to increase economic efficiency. The information necessary to implement efficient industrial environmental management is more likely to be found in industry itself than with the regulatory authorities. Furthermore, the necessity for environment-friendly production-process innovation or production development skills is understood more clearly by industry than government authorities. Thus environmental management of industry should be carried out by encouraging companies to take action rather than enforcing external regulations or incentives. The outcome of this approach is a simultaneous increase in environmental improvements and economic efficiency.

The narrow definition of corporate environmental management is a way of systematically managing environmental pollution in order to comply with regulations. However, a more fundamental definition of this concept is the systematic and proactive management of the environment to achieve management benefits such as regulatory cost reductions, cost saving investments, sales increases, and improved corporate
reputation. The following sections contain suggestions on ways to improve current Korean regulatory policies in order to better enable proactive environmental management.

1.2 Implication and Direction of Regulatory Policies

(1) Regulation Policy Evaluations

Command and Control Regulation

In general, direct regulation, such as conventional command and control, sets standards and creates a strong obligation for compliance. The results of the regulation are determined by the appropriateness of the standards and the effectiveness of enforcement. However, setting appropriate environmental standards under circumstances when information leads to high administrative cost incurred to comply with environmental regulations. Moreover, the rigidity of a command and control system does not promote technical innovation and actually causes economic inefficiency.

The following section summarizes the direct regulatory system of the current industry environment in Korea:

First, most regulatory approaches are rigid and aimed at post-generation management of pollutants. Environmental regulations in Korea so far have focused more on post-management of pollutants than on preventative measures. In terms of methodology, emissions regulations were set based on concentration-based discharge standards that do not address the increasing environmental load caused by economic growth.

Second, regulations lack integration because they are set in individual media. As in most places, environmental regulations in Korea were developed along the lines of media such as air, water and waste. This being the case, regulations do not take into account the changes and mutations of pollutants. Furthermore, there is not yet a reliable environmental management model to use for establishing policy based on comprehensive evaluation of environmental factors which take into account the condition of local ecosystems. In short, government environmental management taking into account local characteristics is still not viable.

Third, the absence of environmental regulations based on industry characteristics is excessively burdensome on industry. Effective, economical environmental management can be implemented if policies and regulations take into account the specific processes of various industry and the pollutants they discharge. However, no such policies have been developed yet.
Fourth, under the current regulatory management system based on 'emissions facilities', the agencies handling approval (or registration) work and supervision work are operated separately, preventing the most efficient management. Approval or registration is required when installing or modifying an emissions facility to ensure the facility meets discharge standards and decide whether or not to allow installation in that region. Supervision work refers to the monitoring of emissions facilities to see if they are abiding by approved conditions or discharge levels. In theory both of these functions should be operated with a high degree of cooperation. Other issues include the lack of expert human resources for supervision and monitor work, and maintaining the transparency of supervision and monitoring.

Fifth, land use regulations for environmental protection are managed under a separate statute making systematic management difficult. In addition, various regulations related to land use only target efficient use of land and lack any integration with environmental protection.

In regards to conventional command and control regulation, not only are the specific standards set questioned, but also their overall validity due to their high application cost and inflexibility.

Regulatory policies suggested as alternatives to this are a marketable (tradable) permit and incentive-based regulation, both of which utilize market functions and incentive structures. However, for actual application of such alternative policies, issues such as creating the proper setting and acquiring adequate information remain to be solved.

For a regulatory system to maintain its validity, it is important to maintain flexibility in considering different industry characteristics, local environmental status and differing economic situations.

2 Economic Incentives

The various economic incentives available so far in Korea simultaneously have the characteristics of administrative regulations and economic incentives, so it is difficult call them pure economic incentives. These incentives stipulate environmental polluting activities and also include articles on punishments in case of violation.

In theory, an economic approach to incentives is possible by utilizing market functions to achieve the results with greatest economic efficiency. This approach would provide incentives for innovation, however in order to set and implement economic incentives, expert knowledge on the field of application is required.

Economic incentives can be targeted directly at pollutants themselves, however as there is as yet not a market for trading pollution rights. For this reason using either
other economic variables related to pollutants (utilizing market function) or creating a market for environmental pollution (emission trading system) is necessary. When pollutants are targeted directly, economic incentives are exchanged for easy monitoring and implementation. The high information costs spent on design and implementation of command and control systems is one the reasons that pollution exchange systems and other alternatives are used.

When targets and variables for policies are linked, the quality of the linkage will play an important factor in the environmental effectiveness of the initiative. Assessing current economic incentive under this aspect will be as seen in the following tablet.

### Table X-1. Assessment on Current Economic Incentives Related to Environment

<table>
<thead>
<tr>
<th>Target</th>
<th>Linkage</th>
<th>Information Cost</th>
<th>Variables</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions Charge</td>
<td>Good</td>
<td>Average</td>
<td>Discharging amount and emission standard</td>
<td>Partially volume-based system</td>
</tr>
<tr>
<td>Environmental Improvement Charge</td>
<td>Bad</td>
<td>Average</td>
<td>Group representative variable</td>
<td>Double charge of sewerage and emission charge</td>
</tr>
<tr>
<td>Water quality Improvement Charge</td>
<td>Bad</td>
<td>Low</td>
<td>Market variable (Sales volume)</td>
<td>Wrong selection of items</td>
</tr>
<tr>
<td>Deposit-Refund</td>
<td>Bad</td>
<td>Low</td>
<td></td>
<td>Wrong selection of items</td>
</tr>
<tr>
<td>Waste Production Charge</td>
<td>Average</td>
<td>Low</td>
<td>Pollution problem by solid waste</td>
<td></td>
</tr>
</tbody>
</table>

Note: As the emissions charge is calculated, proportion for volume-based system and number of items levies are increased, information cost went up, too.
Source: Hong-Gyuk Kim and others, Improving Tax and related System for Increase/Decrease of Environmental Pollution, Korean Environmental Technology Research Institute, 1996

Many economic incentives introduced in the 1990s to alleviate the rigidity of direct
regulations did not work out well due to problems originating in the design stage. Whereas these incentives contributed a lot towards obtaining greater environmental resources needed by regulators, they only contributed slightly to increasing the overall effectiveness of environmental policies.

Although other incentive systems, including the government’s financial and tax support for industrial environmental management, were also available they were relatively unpublicized. Furthermore, the small degree of support and complicated application process meant the programs never caught on.¹

(2) Directions for Improvement

Flexibility is Required in Application of Regulations

The rigidity and inefficiency of the regulatory system (whether it is command and control or economic incentives) is caused by the following factors:

- Information Issues
  
  First of all, there is an issue of information related to asymmetry of information in setting regulations, uncertainty existed by characteristics and changes over the passage of time.

  The information asymmetry when regulations are set makes it difficult to optimize regulations, resulting in rather low social efficiency. The risk increases when the regulation system is totally fixed and its success depends on certain types information.

  Uncertainty existed by characteristics and the changes in over the passage of time mean that eventually the regulation will face issues it is unable to adapt to, even when regulations were set right in the initial stage.

  This problem is not due merely to a lack of information, but also due to lack of flexibility in adjusting the regulation system and of its inability to 'learn' to acquire new information.

- Structural Issues of Regulation Systems

  Decreasing efficiency is brought about by the structural rigidity of the regulatory system. The regulatory system fails to accommodate the diversity of those that are to be regulated. For example, an emissions standard that is levied equally against all pollutants will lead to a loss of social efficiency by failing to differentiate between the different reduction cost between pollutants.

Some regulatory structures may try coming up with a regulation system that is flexible by incorporating the characteristics and diversity of the regulatory subjects, but even such a system will face limitations in being designed appropriately due to the information issues mentioned above.

- **Rigidity of Regulatory Compliance Method**

  Linking regulations with technology or facilities (e.g. BAT and facility installation approval). This is inefficient because the methods for obtaining regulatory compliance are set in too rigid a manner.

  In this case, even when more efficient methods of regulatory compliance are available, they cannot be used, resulting in a drop in economic efficiency because companies have no incentive for beyond compliance improvements such as technology innovation.

  Regulations set using a structure based on alternative variables of pollutants (e.g. products) also lack flexibility in allowing polluters to comply, as well as lack regulatory efficiency.

  To facilitate voluntary environmental management (including environmental management of SMEs), it is important to set reasonable regulations that will serve as drivers for corporate environmental management.

  However, these regulations must avoid becoming barriers to companies carrying out environmental management in a reasonable and efficient manner. To resolve this, flexibility is required in regulatory enforcement.

  One issue frequently raised in the project surveys and case studies during discussions on possible voluntary approaches to corporate environmental management, was that flexibility was required in consistently enforced regulations. Flexibility encourages companies to set their own plans and methods for environmental management. One way to do this is to waive regulatory enforcement until the environmental management plan established by a company is carried out. By doing this, when companies design an optimal way of environmental improvement based on superior information, technology and experience, they will not be blocked by enforcement of rigid regulations that do not conform with the optimal path. Even if regulations are not rigidly enforced, regulators will still be able to follow up on company improvements to environmental performance based on the companies’ plans. In this scenario the government's role would be to promote optimum environmental management by companies.

  ② **Voluntary Approach to Facilitate Corporate Environmental Management**

  A voluntary approach to facilitate corporate environmental management, expansion of
economic incentives and reform of direct regulations are needed to resolve issues that government's industrial environmental management system faces at present.

Voluntary approaches cannot be used as an alternative for regulatory measures or economic incentives. Rather, a voluntary approach should be used together with the conventional system to maximize its efficiency.

As noted previously, corporate environmental management in the narrow sense is aimed at regulatory compliance, however, at a deeper level, voluntary environmental management is an attempt to capture benefits such as cost savings, sales increases, and corporate reputation enhancement through a systematic and proactive response to environmental issues. Corporate environmental management programs such as the ISO 14000 Series and EMAS are recognized as types of voluntary approach.

While such voluntary approaches do not completely replace the need for regulations, it can become an alternative to a complex regulatory process and remove the need for certain regulations. In such an scenario, environmental protection measures are suggested by government, but most of the implementation and monitoring costs are transferred to industry, helping conserve government resources.

SMEs and the Voluntary Approach

Voluntary approach or self-regulation ought to appeal to the business community because it allows autonomy to interpret and regulate acceptable standards of environmental behavior. The use of voluntary schemes to green business practices and cut pollution damage is also attractive at a political level because they are popular among business, has successfully saved companies money and lead to great resource efficiencies (Cairncross, 1995).

Nevertheless, as a means of controlling small firms' environmental practice, sometimes self-regulation is not well supported. In the case of small enterprises, they are not best placed to identify what actions they need to take in order to manage their environmental responsibilities in an acceptable manner due to lack of manpower and expertise. Even if they knew ways to deal with, they lack capital to carry out proactive environment management and make investment voluntarily. This being the case, for small firms, external regulation, as opposed to self-regulation, could be preferable as a means of controlling the environmental behavior of business.

Due to the nature of environmental issues, it could be considered the government's responsibility to act as a legitimate and unequivocal source of guidance and support, the reasons being that government can take a longer-term view than business and represent wider ethical interests of all members of society. It can be viewed that legislation
provides a level playing field, establishes a minimum acceptable standard of behavior and provides a source of external pressure that has been lacking to date.

1.3 Policy Recommendations

(1) Flexible Regulation Policy

Appropriately framed regulations will serve as drivers to facilitate efficient corporate environmental management. For the regulatory system to remain valid and reduce inefficiencies caused by over-rigidity, flexibility considering different industry characteristics, local environmental conditions and differing economic conditions should be coupled with an incentive structure that encourages the most efficient regulatory compliance possible.

i) A flexible industrial environmental regulation system can be divided as follows:

Regulatory structure should not be flatly applied to companies subject to regulation and across industries, i.e. a differentiated regulatory system should be used.

ii) Regulation levels (e.g. standards and tax) should be determined with the companies that are subject to regulation or through an optimal industry decision making process. This is an incentive regulation that eases negotiations among companies that are subject to the regulations. One example would be creating a marketable permit system.

iii) Optimal regulation provides a variety of regulations and allows subject companies and industries to choose the most efficient way of compliance. This is considered another approach to incentive regulation, combining both differentiated regulation and incentive regulation.

iv) Negotiation: During the regulatory process, companies that are subject to regulations participate in exchanges of useful information. This system induces corporate compliance through negotiations between regulators and non-regulators but also negotiations among non-regulators.

(2) Applying Different Policies in Accordance with Environmental Management Company Implementation

Implementing a standardized environmental management system to industries or companies that face implementation difficulties, such as lack of capital and expertise, will burden them without much positive effect. For these industries or companies, rather than implementing a standardized environmental management system, regulatory
compliance should be induced through reasonable regulations and technical support enabling companies to adopt EMS. However, for those industries or companies that are working hard to voluntarily implement environmental management, regulatory waivers or flexible regulatory enforcement are required to allow them to achieve maximum EMS efficiency and effectiveness.

2. Market based Environmental Management Promotion Policy

2.1 Promotional Policy

Environmental management is based on the premises that corporations participate voluntarily, thus policies to facilitate environmental management can be effective when they are based on the market and government intervention. However, rather than directly involving itself, it is more effective if the government helps in establishment of a transparent system which allows large interest groups (i.e. consumers, shareholders and environmental organizations) to supervise and monitor corporate activities.

Some well known Korean polices to facilitate environmental management include an environmental labeling scheme and a certification scheme for environmentally friendly corporations. These certifications are granted to environmentally friendly products and companies by institutions with public trust, so that corporate quality and reputation are raised with consumers and other interested parties. These two certification schemes encourage companies to produce environmentally friendly products and adopt voluntary environmental management systems.

The environmental labeling scheme was first introduced to Korea in 1992 but was revised to suit international standardization in 1997. At the end of 2000, the environmental labeling scheme has been opened to 49 product categories and certified 134 products. The scheme is in the growing stage and is helping consumers and young people to change their ways of thinking about the environment. The government contributes to this system by making extra credit available to products receiving environmental labels so that it can nurture this system.

The certification scheme for environmentally friendly corporations was first introduced in 1995 and has continued up until the present. The main purpose of establishing this scheme lies in making companies evaluate their environmental aspects and set up improvement plans via a voluntary environmental management system. At the end of 2000, about 110 companies were certified. Those companies that wish to be
certified as environmentally friendly corporations need to properly handle all wastes, take preventative measures to protect the environment, and continuously implement environmental improvement measures. All employees in the company that wishes to be environmentally friendly should be a party to these efforts.

2.2 Current Issues and Improvement Directions

Currently, both the environmental labeling scheme and certification scheme for environmentally friendly corporations are operated by the government. However, some companies have offered alternative suggestions on how the schemes should be run. Companies have pointed out a number of flaws, including lack of transparency, weakening public trust or that standards are too quantified and subjective. Although they are based on market principles, in reality, the environmental labeling and environmentally friendly corporation schemes have had severely limited impact.

(1) Environmental Labeling Scheme

Transparent operation and a selective certification standard are key elements of the environmental labeling scheme. Since the scheme requires the participation of consumers, it should be operated in a transparent and objective manner. Moreover, environmental labeling certification standards should be set selectively and in a scientific manner.

The biggest problem at hand is that environmental labeling is not well understood in the market. Consumers are conscious of the environmental aspects of certain products, for example paper, electronic appliances and home appliances, and will consider a green label when making purchasing decisions. However, for other products, the market is not mature enough and environmental information does not affect consumers’ purchasing decisions. In regards to setting scientific product standards, at present quantitative assessment of environmental impacts is not feasible. The environmental labeling standard was established based upon quantitative assessment of the total production process, but for this to work a national environmental database and appropriate methodology must be established. Other issues that must be dealt with include a lack of recognition demonstrated by low participation rates by both consumers and suppliers. Furthermore, the scheme failed to motivate suppliers to produce environment-friendly products because the purchasing of environmentally friendly products is not organized or encouraged.

To resolve these issues, the Korea Ministry of Environment carried out studies on
promoting environmental labeling in 1998. The studies concluded that greater operational, social and technical infrastructure was required to further develop the environmental labeling scheme. On the operations side, it was suggested that adequate feasibility tests be carried out in consideration of environmental and market characteristics to select product-categories open for environmental labeling, and maintenance of a transparent certification process. On the social side, it was suggested systematic training and PR activities targeted at consumers. Organizing consumer buying power was also suggested by establishing green purchasing network. Issues such as selecting product category through an expert research institute and building trust by developing scientific certification standards were also selected as important issues. On the technology side, suggestions such as establishing a national environmental database to scientifically set product standards through an assessment of major environmental economic aspects. In response, in the mid 1990s the Ministry of Environment began preparing environmental assessment methodology and building an environmental database, which should provide a resolution to most issues in the near future.

(2) Certification Scheme for Environment-Friendly Corporation

This is a type of award scheme that designates companies meeting certain requirements as environmentally friendly corporations. The most successful element of this scheme is that it makes it possible for companies that receive certification to help improve their appeal to stakeholders. For this reason, beneficiaries must be selected transparently and objectively if the certification is to be recognized with trust and respected by the market.

The biggest issue facing this scheme is obtaining a set degree of reliability. As the current standard is qualitative, corporate environmental management performance is not well evaluated. This is because most environmental criteria are determined on a qualitative and not quantitative base. Next, since the benefits given to companies certified as environmentally friendly corporations are relatively small, there is not a great deal of motivation to be certified. Moreover, because the requirements that must be fulfilled are quite strict, it is mostly larger companies that have received certification so far. Current benefits from participation include reduction or exemption from governmental monitoring, but have failed to motivate companies. Most potential participants hope for improved public image. However, since it is not possible to measure the degree of “environmental-friendliness” scientifically, Korean consumer protection group have bans against that exact usage. For this reason, company participation is dropping.
To succeed, the environmentally friendly corporation scheme must be improved to increase appeal to all stakeholders and maintain transparent, objective standards. For the certification standards, the transparency of the screening process must be increased in consideration of the conventional qualitative characteristics of environmental management. This can be done in accordance with PR activities for announcing a company's certification. Companies should be allowed to announce the fact that they have been certified as an environmentally friendly corporation without any misunderstandings. However, companies should also be asked to submit environmental reports. By continuously disclosing their environmental performance and risks, they will accumulate credit with interested parties, and better appeal to consumers, financial institutes and environmental organization groups.

2.3 Recommendations

(1) Factors to Consider for Revitalizing Schemes

Whether or not schemes to encourage environmentally friendly goods or management will succeed is decided completely by good market utilization.

First, instruments that can convey the environmental aspects of a corporation and its goods in a transparent manner must be developed. These instruments will make it possible for stakeholders including consumers, banks, insurance companies and environmental organizations to monitor environmental performance of a corporation and its goods. In regards to products, in addition to environmental labels, Product Environmental Declaration (Type III labels) have received much attention recently. Product Environmental Declaration will officially be enacted into law in February 2001. This scheme accumulates environmental information about products in a quantitative manner, using life cycle assessment, and conveys this information to consumers. At the moment standardization is being handled by the International Standardization organization (ISO). In the 1990’s, systems such as Corporate Environmental Reports and Environmental Credibility Assessment helped to facilitate corporate environmental management by serving as references to determine risk factors of corporate environmental performance to major interest parties. Recently, some attempts were made to extend and link these systems to the financial sector.

Second, when operating these systems, transparency should be obtained to gain trust from stakeholders as they are the main targets and without their trust the systems are unlikely to succeed. To gain the trust of interested parties, the evaluation process (e.g. certification and awards) should be transparent and enable broad participation in the
Development of EMS for SMEs

process. Evaluation of standards and evaluation of results require an open process of consultation using public hearings.

Third, it should be first be clarified which target groups will receive environmental information gained from scheme implementation. Then, drivers that would motivate specific target groups should be found and preparation made to implement them. For example, because environmental labels target consumers, they should be easily recognized and accessible to consumers. Incentives should be given to those consumers that actually purchase products with these environmental labels on them. When electricity consumption efficiency for electronic appliances is adopted as an environmental label, consumers who buy these products should receive incentives for contributing to environmental protection and saving electric power cost.

Fourth, organizing consumer purchasing power motivates corporations to develop products and build management system that are environmentally friendly. Building networks to purchase green products will not only help consumers to purchase environmentally friendly products, but also organize their purchasing power enabling institutional procurement of products with good environmental aspects. This type of purchasing behavior will encourage companies towards proactive environmental management strategies and facilitate voluntary environmental management.

(2) Facilitating Measures and SMEs

Most SMEs face difficulties in carrying out environmental management and developing environmentally friendly products because they lack capital, manpower and marketing skills required for these activities. To overcome these difficulties, they should make use of government promotional instruments well. When the instrument is used well, competitiveness is strengthened, corporate credibility enhanced and marketing effect gained by improving corporate image. Government should proactively develop instruments that can help to identify model large conglomerates and good SMEs.

3. Government’s Support to Facilitate SMEs’ Environmental Management

It is important to build the infrastructure required for carrying out corporate EMS activities. Without the necessary infrastructure, corporate EMS activities are not developed or maintained, even by large conglomerates. In the case of SMEs, government support measures could play an important role in activating their corporate
EMS activities. In the past, the Korean government supported large conglomerates by introducing export-oriented help measures. While this brought economic growth, at the same time it caused many contradictions. Although SMEs have many weaknesses, their strength lies in coping with the rapid changes of modern society. With this in mind, the government should introduce suitable measures to nurture SME growth. When government designs measures to support SMEs, it should carefully consider their business setting (lack of and difficulty in implementing EMS) and focus on coming up with practical measures.

The government’s role in facilitating SME environmental management can be summarized as the following: (i) Carry out government-industry synergy program to utilize industry's organizational advantages in reaching SMEs (i.e. industry associations, supply chain environmental management), (ii) Create a market environment that encourages corporate environmental management, (iii) Provide information, experience and training to help form the basis for corporate environmental management, (iv) Provide practical financial and technical support to carry out corporate environmental management.

3.1 Policies for Supply Chain Environmental Management

(1) Issues related to SCEM

While not many regulators would argue against the benefits of EMS for SMEs, there is still no clear consensus on how to get SMEs voluntarily onboard. Most experts agree that business incentives are necessary for SMEs to seriously consider EMS. Using the supply-chain to drive environmental management creates such a business incentive.

Supply chain management (SCM) is a system of managing a corporation's cooperative relationships, including customers, suppliers and other corporate external relationships (such as contractors). Companies manage supply chain as a way to optimize overall management. As the corporate market becomes internationalized, the proportion of trade given to a company's various suppliers has triggered fierce inter-supplier competition. Competition gives customer companies a degree of leverage to influence supplier behavior. Supply chain management became important for companies because it increases productivity and management efficiency and reduces cost and risk.

Supply chain environmental management (SCEM), an extension of corporate environmental management policies through the supply chain, was another of the reactions to the growing prominence of environmental issues on the international stage.

Drivers motivating companies interested in SCEM can be divided into two types:
external drivers and internal drivers. Domestic and international environmental regulations are important external drivers. Companies hope to design products that are not in conflict with environmental regulations that may limit product use or sale. A second external driver is particular environmental features of a product that are demanded by a downstream customer. In this sense the potential of SCEM programs for improving SME performance is enormous. Most large companies have several thousand SME suppliers. Suppliers operate in a highly competitive environment and normally would not invest scarce resources in environmental improvements. They see environment as a “cost” with no benefit. By including environmental criteria in procurement decisions, large companies create a business driver for the supplier to improve performance. Large companies also have the potential to provide technical assistance or partner with external agencies to obtain support for suppliers. Last in terms of external drivers, it is important to note that efforts at SCEM by companies are strengthened as interest on environmental aspects increases by investors.

In terms of internal drivers, companies looking to minimize their own risk will expect suppliers to meet certain performance standards. Further, there are advantages gained from SCEM in terms of internal environmental performance (the ability to eliminate unwanted substances from production) and corporate image management. Another internal driver is companies’ desire to expand market share by developing environmentally friendly products. These developments reflect the increasingly important role that purchasing activities play in improving environmental performance and in SCEM.

Though SCEM is still only in its beginning phases, it will continue to grow and is expected to hold greater opportunity in areas such as value added and cost optimization. Some ways in which companies have implemented SCEM include composing cross-functional procurement teams and including environmental specialists on design and purchasing teams. The growing design for environment (DfE) trend, is fundamentally changing relationships between suppliers and customers. One example is of this is joint efforts by suppliers and customers at the production design stage to create cleaner production processes. A company that demonstrates skills and research ability in the environmental field is more likely to receive greater customer loyalty and therefore devote less time and energy on maintaining its supply contracts. SCEM also works in complement to Just-In-Time (JIT) management. In short, greater strategic environmental management is made possible through management of the supply chain.
(2) Korean Situation

Environmental management via the supply chain faces difficulties in a number of areas. First, it is not easy for SMEs to bear the costs required to carry out the environmental management activities demanded by large corporations. This is so because when large corporations think about sales volume and production cost they believe they have no reason to consider the suppliers’ environment. They maybe doing SCEM but not much real action is taken. Second, gaining access to environmental information is not always easy. Cooperative relationships between large corporations and SMEs have yet to be established and it is difficult for SMEs to improve environmental performance based only on demands made from large corporations that, in many cases, are not models of environment management. Moreover, SMEs cannot get information from large corporations at the product design stage, which becomes a barrier preventing completion of their competitive structure. Resistance from SMEs with vested rights may make supply chain management difficult. Thirdly, government has taken a relatively indifferent attitude toward SCEM. Although government has suggested cooperation between large corporations and SMEs, sufficient support has not been made available.

Despite these barriers, there are many reasons that interest in SCEM is increasing. Perhaps the most important reason is risk management. As society globalizes and the market expands, the reach of supply chain is extended. However, liabilities carried through the supply chain are also increasing. Large corporations must now think about the environmental credential of their suppliers to protect their own reputation and credibility. The chemical industry has developed the Responsible Care system to help prevent environmental accidents and dangerous material leakages, as well as raise the public image of the industry as a whole. It is obvious that the aims of the movement have struck a chord, and interest and participation in Responsible Care is growing worldwide. Many companies show interest in environmental improvements as a way to capture greater cost reductions. The desire to realize such cost reductions is shared alike by both large corporations and SMEs as a way to improve competitiveness. Long-term relationship between large corporations and SMEs creates enough trust to allow productive exchange of information and cooperation on environmental management, even without direct profits to be earned right away. Some SMEs may run their own EMS to maintain competitiveness during bids with large corporations with strict environmental management criteria. However, other SMEs that work for multiple large corporations often express difficulties in carrying out the environmental management
requirement of just a single client.

Multinational companies in Korea have their own policies to carry out SCEM, but they have not shown vivid activities. Within their own environmental management policies, multinational companies generally promised to undertake some consideration of environmental aspect in purchasing activities. However, at present most efforts have been restricted to paper work rather than real action.

Large conglomerates in Korea are making efforts to set up their own environmental management systems, and instruct and distribute guidelines to their subcontractors. Many have also received ISO 14001 certification. However, some companies are still not active about SCEM, although they do give some priority to companies holding environment labels during bidding (when choosing purchasing partners). Nonetheless, companies are making voluntary efforts to carry out environmental management in Korea, making increases in active supplier-customer partnerships aimed at increasing competitiveness more likely as regulations are strengthened.

For reference, a short series of interviews with multinational corporations with operations in Korea during the course of the project showed that their SCEM practices were not well advanced. SCEM for most MNCs was motivated based mainly on economic theory and in accordance with the need to be flexible to conditions in the country they are located in.

Nonetheless, companies are making voluntary effort to carry out environmental management in Korea thus active partnership with clients are likely to be formed as regulations are strengthened and to gain competitive edge.

(3) Roles and Tips of Government

As seen so far, Korean SCEM has not yet reached a satisfactory level. Facilitating environmental management via the supply chain will require government policy efforts. However, the potential of the government to directly intervene to improve corporate environmental management is limited. One limiting factor is the issue of trust between companies and the government. Companies that consider the government as a regulator thus have a tendency to stay away from government programs for fear of exposure to additional regulatory scrutiny. SMEs are even more likely to avoid the government because they lack resources to comply with regulations. To encourage greater company participation in government programs, steps must be taken to reduce fear of regulatory repercussions – for example guaranteed probation periods allowing improvement of regulatory violations discovered during program visits. However, such an approach may
be limited to more external aspects of pollution control, thus promotion of SME environmental management should be supported through cooperative relationships within industry. Namely, government’s EMS strategy should focus on the use of business networks such as supply chains or business organizations including industry associations as the primary pathway to engage SMEs. Industry networks and supply chains create a business incentive or “push” for SMEs to develop EMS. At the same time, they also resolve the fear that SMEs have of the government.

The emerging SCEM practices being adopted by large industrial firms present an opportunity for the government. Such industry practices have a potential synergy with the government’s environmental goals and support economic efforts to improve competitiveness by increasing efficiency of the supply-chain. At the moment, both government and industry have mutual benefits to gain from working together on this issue. The following suggest steps the government could consider in developing an integrated SCEM strategy.

1. Preliminary study: A short feasibility study is needed before any concrete programs are implemented to determine which industry sectors and what companies have greatest access to and influence on Korean SMEs. Large Korean companies may be more effective than multinational companies at promoting SCEM. Many multinationals used suppliers from abroad or were supplied locally by large Korean firms and thus had relatively little leverage to change supplier performance. Further research is needed in this area. Another possible area of study is the ability of large suppliers to influence customer environmental performance.

In conducting this study the government should look for industries where supply is dominated by either a small group of buyers or suppliers. If buying power is not concentrated, individual companies have little influence on supplier behavior. Review key buying criteria. Also, such a study should look at how environmental initiatives might relate to quality or cost reductions. Industry players will be more willing to get involved if they perceive potential benefits in conventional areas as well.

2. SCEM questionnaire / standards: Following results of a preliminary study, government could select target industries to develop sector-based standard supplier review questionnaires or SCEM standards. These could be developed through a joint government – industry effort. Many companies would like to perform supplier review, but lack the resources to develop appropriate procedures incorporating EHS & procurement departments. Having unified industry-sector standards resolves this
problem and reduces the strain on SMEs that must fill them out. Government can also consider reward / certification programs to encourage large companies to use the standards.

Such an effort could begin by developing a standard set of environmental criteria, in cooperation with relevant industry sectors, that all purchasers could use in reviewing products. The next step would be to produce guidance materials on how to use them. However, some incentive must be provided because many companies still lack motivation to use such guidance materials. One approach would be to prepare case studies of the cost benefits, marketing benefits, and liability benefits of greener supply chains. It is also worth pointing out that Japanese companies have decided that Design for the Environment (DfE) is the key to their future competitiveness, and are pushing environmental concerns down their supply chain.

Also, the government can consider developing more public benchmarking data on SMEs to provide a context for corporations to assess performance. Any kind of information tool to make SME performance more visible or interpretable will help drive performance. Similarly, anything to make the environmental dimensions of major corporate purchasing transparent will also help.

Lastly, the government should consider incentives to major corporations for such efforts. Tax incentives, awards, and regulatory relief for satellite systems (suppliers and major corporations) might be awarded for demonstrated improvements.

③ Supply-chain assistance program: the government could initiate a program to give SMEs technical assistance on EMS working through the supply-chains of large companies.²

④ Information and communication: Communication channels should be pioneered among companies. When SMEs are able to understand the environmental aspects of products from large corporations, they will be able to assess the impact of products during the design stage and apply the results to improving the parts and raw materials that they provide to large corporations.

Information exchange should take place between SMEs and large conglomerates. Since large conglomerates are sensitive to international surroundings and regulations, they are prompt in acquiring and analyzing newest information on environmental management. However, even if large conglomerates are interested in cooperating with

² The Guadalajara Environmental Management Pilot is one such model. Another good working model is Taiwan's Corporate Synergy System (see Chapter 5 on International EMS Precedents for more about
SMEs in regard to facing environmental issues, many difficulties lie ahead due to lack of capital by SMEs. One resolution to this problem is for government to support SMEs in establishing a database on environmental issues, update it and build a website to make access to information easier.

⑤ Build an industrial environment-support center that is clearly separate from government regulatory functions. Because the environmental problems created by each industry are different, specific industry sectors have different support needs.³

⑥ Review liability laws to assess the degree to which they encourage or discourage supplier stewardship.

⑦ Leverage Life Cycle Assessment (LCA) programs to promote SCEM. The more companies are encouraged (or forced) to quantify the life cycle impact of their products, the more they will be given an incentive to look at supplier performance. Increasing the reliability and availability of LCA information would start this process; promoting Design for Environment (DfE) and green market competitiveness would provide a business incentive to apply LCA.

3.2 Government Supporting System

(1) Current Government Supporting System and Related Issues

Government agencies in Korea such as the Small and Medium Business Administration, Ministry of Science and Technology, Ministry of Culture and Tourism, Ministry of Agriculture and Forestry, Ministry of Maritime Affairs and Fisheries, Ministry of Commerce, Industry and Energy, Ministry of Information and Communication, Ministry of Environment, Ministry of Labor, Ministry of Health and Welfare and Ministry of Construction and Transportation and local governments provide support for SMEs. Major support consists of low interest loans, tax benefits, technology supports, human resources and credit guarantees.

However, activities such as selecting prospective SMEs for receiving benefits, providing management consulting, and conducting research studies are carried out by multiple agencies, often with overlapping jurisdiction and managed inefficiently.

Based on the survey and case studies conducted during this project, the issues which

³ According to a survey conducted by the Korea Chamber of Commerce and Industry in 1995, 63.8 percent responded that when assistance is required, joint-support would be made to subcontractors.
must be resolved in regard to the current Korean government support system are summarized as follows:

① Loan-oriented Support System

It is important for SMEs that financial, technological and human resource support available are continuously increased. However, the current support provided by most agencies is finance related, and is approached in a non-practical manner.

Based on the results of the survey conducted during this project, SMEs chose the following as most in need for environmental management: Human resource, information, organizational compliance, and budget. In short, what SMEs want are expert human resources with know-how (information) to carry out environmental management. There is no doubt that sufficient capital would help SMEs increase human resources and gather more information, but in effect this only helps SMEs move a step closer to becoming large companies. Though most support systems focus on providing financial aids, the total amount provided is not large neither in total nor in amount received by individual SMEs. Thus financial assistance alone cannot bring up SMEs as a whole.

According to another question in the survey, SMEs answered that the resources they needed most for environmental management were facility, technology, information and capital. Here again, funds/capital ranked below other factors in importance.

② Problems in Support Method and Support System PR

Though support systems have been newly established by many government agencies, not many SMEs are able to use them, according to the survey. Of all respondents, only 31% had experience actually using the government support system. Reasons for not using the system were lack of information and complexity of procedures (respectively 27%), and small amount of support available. The smaller the company, the less information they possessed. This is a sign to the government to better publicize support programs. SMEs with a reasonable amount of information and size considered the amount provided too small justify investment in environmental management.

SME use of various tax benefit programs offered by the government for corporate environmental facility investments were also hampered by a lack of sufficient information and complexity of procedure, resulting in a low usage rate.

③ Problems in Technology Support Program

Most SMEs in Korea deliver goods to large companies. Though more than 50% of
companies in the survey delivered goods to large companies directly or indirectly, only a few were provided with technology know-how by their large partners. As seen in the case studies, even for companies that were established jointly with foreign companies it was not easy to obtain technology transfers. In the case of large companies, most limit the provision of technology to affiliate companies or subsidiaries, leaving SMEs to develop their own technology. This is not easy due to SME lack of government finance and required information.

Direct funding (reserve payment) support programs for technology are almost nonexistent compared to indirect support programs, such as tax benefits and financing. Lack of a credit guarantee system for technology development funds and human resources to screen technology hinder support of large-scale, high risk technology development. For this, strengthening direct support measures on SMEs technology development, complementing the credit guarantee program and establishing comprehensive technology development support programs are required.

4 Insufficient Information

Only a few channels are used by SMEs to learn about environmental management. Of all survey respondents, more than 30% learned about environmental management via the media, about 27% from industry associations and only 5% from the government. Not a single small company with less than 100 employees learned about environmental management through the government. The smaller the size of the company, the more likely they were to obtain information about environmental management from an industry association. Aside from insufficient publicity of government support programs, publicity programs failed to enlighten companies about environmental management. According to a survey conducted on the 182 member companies of the Small and Medium Business Administration, not only was the information gap among industries widening, but also overall promotion through the government information infrastructure was very low. This showed that SMEs are not aware of information and they had difficulty in directly obtaining information from the government’s broad methods of information distribution. Information on domestic and international regulatory systems, changes in social status, and information technology were lacking as well. Lack of information makes it difficult for SMEs to make use of government support systems.
(2) Government Assisted Improvement Plans

① Improvement of Support System

  • Diversifying Support System
  
The government support system should be diversified from its focus on provision of low interest loans.

  • Supporting System Differentiated by Industry and Corporation
  
Since resources required by industries differ according to corporate size, credit and methods of acquiring information, a differentiated support system should be developed.

  • Simplifying Support Procedures
  
Many SMEs responded in the project survey that the administrative process required to receive support was too complicated. Small companies found it difficult to understand the system or all the information provided. To resolve this, the government should consider modifying complicated procedures that hinder SMEs from getting the help they need. Small companies require relatively small loan amounts, so it should not be difficult for the government to simplify the relevant processes to work flexibly on a case-by-case basis. For example, standardized procedures should be taken for the provision of large loan amounts.

  • Monitoring
  
After support is provided to SMEs, strengthening efficiency of the program via monitoring and post-monitoring activities is important to determine need for additional support.

② Supporting Basis for Corporate Environmental Management

  • Publicity and Information Provision on Environmental Management
  
One of the most important resources that SMEs require is information. As shown in the surveys, insufficient information was considered one of the largest EM barriers by SMEs. However, SMEs lack capability to digest large volumes of information and human resources. The government should analyze and provide prescreened EM information to SMEs.

  • Guideline Provision
  
The government should also provide SMEs guideline booklets especially designed for SMEs (possibly by modifying existing guidelines used by large companies) when
carrying out environmental management. It is essential to include SME best practices so that companies can benchmark their performance and gain practical help based on first hand experience.

③ Create Market Environment Conducive to Corporate Environmental Management

  • Enabling Environment-friendly Production and Consumption

  Corporate environmental management is promoted not only to ensure regulatory compliance but also as a response to market demand. Even if companies voluntarily wish to carry out environmental management, produce goods using cleaner production process, or design environmentally friendly products, incentives for corporate environmental management will be reduced if no market demand or benefits exist.

  Thus enabling environmentally friendly production and creating a market for consumption of environmentally friendly goods are equally important elements in promoting corporate environmental management. Through the Korean government's active implementation of the certification scheme for environmentally friendly corporations and environmental labeling, consumers should be made aware corporate environmental performance, rewarding good corporations with improved public image. Moreover, providing consumers with more environmental performance information will improve the marketability of environment-friendly products. Furthermore, consumer oriented publicity and training about government environmental programs should be carried out continuously.

④ Support Technology, Expert Human Resource and Information via Cooperation with Industry

  As seen in the above, direct support by the government poses limitations. The smaller the company, the greater their reliance on industry associations for information and support. Because there are no as yet no direct incentives for large companies in providing technology and human resources to their smaller counterparts, the government should establish plans to provide support to SMEs through increased cooperation with industry.
XI. Summary and Conclusion

This study aimed to identify good examples of environmental management as practiced by Korean SMEs. The study is valuable because of persistent and successful efforts at environmental management by leading companies in the face of the Asian economic crisis in the late 1990s. In this sense, it would be also a valuable reference to other countries—especially developing countries—that must balance their environmental needs with those of economic survival.

This paper is intended for two audiences, SMEs interested in better understanding about VEM and government regulators looking for innovative ways to encourage SMEs to adopt VEM.

- **Korean Industrial Environmental Laws and Regulations**

Reviewing industrial environmental laws and regulations that promote corporate environmental management in Korea, it first addressed command and control regulatory system, followed by an analysis of different types of charge systems that create an economic incentive for companies to reduce discharge of pollutants. Next, supporting systems that encourage corporate environmental management (in terms of investment and operations of environmental facilities, and development and application of environmental technology), are reviewed.

The limitation of the Korean regulation system was indicated in general that (i) more importance is placed on end-of-pipe regulations than on precautionary regulations, (ii) regulations have been established and updated separately from one another, making integration of overlapping regulations difficult. Furthermore, assessment models of environmental policy that take into account unique regional conditions have not yet been established, (iii) because environmental regulations do not take into account industry characteristics, they may place a heavy burden on industry, (iv) the management of licensing separate from emission control is not efficient.

The command and control regulations and the economic incentives apply to all enterprises, including SMEs. Pollution control costs for SMEs are typically large, resulting in a situation in which many SMEs cannot afford to invest in pollution control systems.

Support for environmental technology has not been effective. Such support is not actively utilized due to insufficient publicity campaigns, small loan amounts, and overly complicated procedures. SMEs are burdened by high compliance costs incurred to meet
environmental regulations, thus such economic and technical support for investment in environmental facilities plays a very important role in corporate environmental management. Though, lack of information and the existence of inappropriate requirements or conditions to obtain such support make it difficult for SMEs to make use of government support systems to improve environmental management.

- **Environmental Management Precedents in Korea**

  Reviewing voluntary pollution control approaches that can be used to leverage win-win opportunities in corporate environmental management, it includes many kinds of voluntary approach currently used in Korea those are largely divided into government-driven (e.g. central and regional) programs and private sector initiatives (categorized by industries and regions). Other relevant initiatives include regional environmental agreements and energy-related voluntary environmental management.

  Although it is an emerging approach for environmental management in Korea, voluntary environmental management systems are not used widely enough in Korea because administrative mechanisms of government are mainly based on regulatory environmental management. Industry declarations of self-regulated environmental management lack consistency and tend to be used for external show. Another problem is that the governmental support system has not been sufficient to prompt industries to adopt voluntary environmental management programs. In general, there is also a lack of available programs developed to assist industry or business sectors. It is also important to note that voluntary support systems designed to help SMEs adopt environmental management are insufficient. Although voluntary environmental management by Korean conglomerates began promisingly, a lack of voluntary evaluation or reporting systems allowed such efforts to disappear conspicuously after the advent of the Asian financial crisis. The intentions of environmental programs driven by local governments are good, but still suffered from a shortage of funding, resources and a primary implementation body.

- **SMEs in Korea and Environmental Management**

  In order to understand environmental management potential of Korean SMEs, we review that the importance, history, industrial structure, and influence of SMEs within Korean industry in general. Further, the domestic and international environment in which SMEs operate, and the issues of capacity (in terms of financial and human resources) are discussed.

  There are more than 79,000 small and medium sized manufacturing enterprises in
Korea with a number of employees ranging from 5 to 300 persons. They represent 99.2% of total manufacturing companies. Of total 1.64 million employees, they account for 75.3% in the manufacturing sector. The value of their production and value-added activities amounts to KRW 197 trillion and KRW 85 trillion or 46.3% and 48.0% of the totals in these areas respectively.

Until now, Korean SMEs have been playing a vital role in creating jobs, increasing income, contributing to rapid economic growth. The importance of SMEs is stressed in the national economy as well because they are contributing to endless corporate activities taking place in the economic aspect and absorbing new labor power to create basis for production and workplaces. Currently, Korean SMEs are increasing their influence to the industry and deepening their mutual relationships through well-balanced development and systemizing of various industries and regional distribution.

Growth ratio recorded by SMEs is not only high, but also they are continuing to increase their portion accounted for export among total exports. SMEs consisted of 34.1% of total exports in 1999 showing how many portions they accounted for. SMEs achieved rapid quantitative growth after 1980 and reached a high position in the Korean economy. But economic structure is still large conglomerates-oriented, and SMEs are included in structured supply chain of larger companies. So, SMEs are somewhat affected by the supply chain thus demanders require SMEs to provide environment-friendly products or resources.

Korea has 22 laws and 643 regulations relating to environment as of the end of March 1999. The regulations are directly relevant to detail business activities amount for 475, representing 75 percent of total regulations. And also, as the government signed them, obligations to reduce discharging pollutants and limit use of certain substances in the domestic environmental surrounding was enforced bringing changes in management activities of SMEs and requiring them to cope with these changes.

Due to measures taken by foreign governments, SMEs who are exporting goods and services overseas were required to rethink about environmental issues during their production process. Furthermore, as international standards were established on environmental management, SMEs were sometimes asked if they were certified of environmental management before doing business and given extra credit when they did during the bidding. Now, environmental management trend is shifting in the direction of industry standards.

- International Environmental Management Precedents

SME environmental performance is a problem around the world. For reference, we
review some of approaches by government and business communities in the United States, Taiwan, Europe, and Mexico to overcome internal and external obstacles on SME-VEM and push SMEs to adopt better environmental management practices. This review presents an overview of programs underway in public and private sectors. It is categorized as (i) government programs, (ii) government industry synergy programs (GISP), (iii) private sector supply chain environmental management.

So far, no one approach has offered a complete solution. Government programs benefit from having financial resources available, but lack reach and do not create a motivation for SMEs to participate. Industry programs create a strong incentive for SMEs and provide access to valuable technical experience. However, the number of supply chain programs is limited and companies must still balance their environmental expectations against traditional buying criteria such as cost and product quality. The solution to the SME problem lies in a combination of various approaches being tried.

**Conceptual Framework of EM and EMS**

A framework of environmental management was designed for this study to attain better understanding about environmental management as a process, and not as a tool, to help SMEs properly approach improving environmental performance.

It reviews the concepts of environmental management that identify common limiting factors and define the SME-VEM conceptual framework. It contains excerpts from a number of expert articles exploring basic definitions of environmental management and a number of its key concepts. The excerpts are divided into two main sections: (1) those pertaining to environmental management and (2) those to environmental management systems. It first provides a definition of environmental management and then delves into some of the benefits associated with environmental management, lays out the drivers and barriers peculiar to SMEs and environmental management system, and includes a diagram outlining the conceptual framework of environmental change. It also analyses the specific environmental management tools available to a company and how this relates to successful environmental management.

Secondly, it provides definition of environmental management systems and analyses the costs and benefits of SME-VEM, and then provide the conceptual framework for SME-VEMS. It also discusses in detail the costs and benefits of SME adoption of environmental management system.

**Environment Management Status of SMEs: Survey**

The study also carried out an investigation on the general status of Korean SMEs,
focused on putting their progress and competence in terms of environmental management in a broader context. This investigation was initiated through a survey, in which one hundred leading SMEs were asked to participate.

The survey was carried out to investigate the current status of environmental management practices of Korean SMEs. The survey dealt with seven distinct subjects: environmental management in general, the structure of environmental departments, difficulties encountered and efforts made in environmental management, supply chain management, environmental subsidies and assistance programs, quality management and the environment, and organizational commitment to environmental management. In addition to this, specific aspects of environmental management were analyzed in accordance with sizes and business types of SMEs, respectively. Also, efforts were made to draw correlations between several factors derived from the questionnaire analysis.

• Best Practices: Case Studies

Following the survey, case studies were prepared on thirty of these companies to obtain a closer look at their practical experiences and insights on environmental management. Through this process, detailed case studies of five exemplary companies were chosen for inclusion in the final report.

The case studies were chosen to demonstrate VEM best practices by exemplary, or "role model", SMEs. Results documented in the case studies are intended to motivate broader SME interest in VEM. Also, by covering a number of practical aspects regarding VEM adoption, the case studies serve as reference for SMEs seeking to improve their environmental management.

• Environmental Management Guidelines for SMEs

Recommendations were generated for both SMEs and the government in Korea. SMEs can consider these recommendations as a guideline to use during the environmental management process, while government can view them as added input when weighing actions to encourage SMEs to improve environmental management.

The guidelines for SMEs are provided based on a framework of continuous flow consisting of initiation, introduction, implementation, and learning processes of environmental management.

• Policy Recommendations for Government

To facilitate voluntary environmental management (including environmental
management of SMEs), it is important to set reasonable regulations that will serve as drivers for corporate environmental management applied to companies. However, these regulations should avoid becoming barriers when companies carry out their environmental management in a reasonable and efficient manner. To resolve this, flexibility is required in regulation applications.

We recommend two main directions or regulatory change: (i) policy differentiation - mixture of self-regulation and external regulation for different companies under different situations, (ii) regulation waiver - regulations should avoid becoming barriers when company is carrying out its environmental management.

The government’s roles to facilitate SMEs’ environmental management can be summarized as the following: (i) provide government-industry synergy programs to utilize organizational skills, industry associations, supply chain management, (ii) greening market to attract corporate environmental management, (iii) provide information, experience and training to help form basis for corporate environmental management, (iv) provide practical financial and technical support to carry out corporate environmental management.

For SMEs who are seeking ways to succeed, more and more good practices should be introduced and spread out. Moreover, the government should encourage SMEs and motivate them to carry out environmental management in voluntary. As doing this, regulations and supporting measures provided should make SMEs head in the direction to gain competitiveness in markets.

With last five year’s experience on environmental management, Korean SMEs have tried to manage their environmental issues. Though there have been many trial-and-error and many of SMEs still face difficulties regarding environmental management, they are seeking ways to resolve issues in their own way. This can be an asset to expand environmental management to other Korean SMEs and companies in other Asian countries.
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<Appendix>

Survey of SMEs’ Environmental Management

* Please refer to the following questions and check ✓ to the appropriate number.

A. Current status of the company

1. Name of the company:

2. Name and position of the respondent:
   Tel: (       )       -

3. What industrial type is your company in? ________________________________

4. What is the total sales of your company in 1999 or 1998?
   ① under 0.1 billion  ② 0.1～1 billion  ③ 1～5 billion  ④ 5～10 billion
   ⑤ 10～50 billion  ⑥ above 50 billion

5. How much is the total employee number?
   ① under 10  ② 11～20  ③ 21～50  ④ 51～100  ⑤ 101～200
   ⑥ 201～300  ⑦ 301～500  ⑧ above 500

6. Is your company registered as a pollutant discharging industry? If so, what type is it among the followings?
   ① air quality industry  ② water quality industry  ③ waste emission industry
   ④ none

B. Organization for the environment

1. Does your company have an environmental organization or a department?
   ① Yes (name of the organization/department:
      position:                  name:                      )
   ② No ( → please go to section C.)
2. What is the main job of the environmental department? (more than one answers available)
   ① relations with prevention management  ② relations with production process
   ③ relations with sales and consumption  ④ relations with R&D
   ⑤ others

3. Does your company have an environmental policy?
   ① Yes  ② No

4. Did your company achieved environmental management certification?
   ① Yes(year : )  ② No

5. Please brief changes (if there were) within the organization after establishing the environmental department. (year, department, role)

<table>
<thead>
<tr>
<th>Year</th>
<th>Department</th>
<th>Role</th>
<th>Remarks</th>
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C. Problems and solutions

1. Does your company have problems in abiding the present environmental regulations?
   ① Yes  ② No

2. Does the environmental regulations have a big impact upon the company's management policy?
   ① Not at all  ② A little  ③ neutral  ④ some  ⑤ definitely

3. What is the fields that require environmental improvement? (please check by the order of importance.)
   ① strengthening the regulations ( )
   ② gain competitiveness in the market ( )
   ③ image of the company ( )  ④ cost reduction ( )
5. Does your company have a self-regulatory environmental management policy?
   1. Yes  
   2. No (please go to section D.)

6. What are the efforts your company is doing to improve the environment? (more than one answers available)
   1. introducing environmental facilities  
   2. procedural change  
   3. introducing environmental management certification system(such as ISO14001)  
   4. establishing environmental department  
   5. environmental training  
   6. others __________________________________________

7. Which had the leading role in environmental improvement?
   1. CEO  
   2. department  
   3. external consultant  
   4. others __________________________________________

8. What are the achievements of the activities? (more than one answers available)
   1. reduction in pollutant discharge ( % decrease at present year _______ compared to year _______)
   2. cost reduction ( % decrease at present year _______ compared to year _______)
   3. sales increase ( % increase at present year _______ compared to year _______)
   4. find out new consumers  
   5. others __________________________________________

9. What are the factors that helped the activities? (please check by the order of importance.)
   1. supportive systems  
   2. facilities and technologies  
   3. external consultants  
   4. company staffs  
   5. information on environmental management (such as internet or books)  
   6. others __________________________________________
9. What were the difficulties during the activity? (please check by the order of importance.)

① lack of awareness of the CEO (  )  ② capital deficit (  )
③ lack of time and human capital (  )  ④ lack of information (  )
⑤ protests of the former organizational culture (  )  ⑥ others  ________________________________ (  )

10. Please note briefly about any experiences you had, to overcome above difficulties.

______________________________________________________________

D. Supply and purchase

1. What is the distribution process of your products?

① product→consumer  ② product→SMEs→consumer
③ product→conglomerate→consumer  ④ product→SMEs→conglomerate→consumer

2. Is your supplier requiring environmental management and achievements to your company? If so, what are the details?

① Yes (ISO14001certification, ISO 9001certification, energy efficiency, recycling , others  ________________________________ )
② No

3. How are the suppliers supporting your company for environmental improvement? (more than one answers available)

① technology  ② human capital  ③ information
④ management policy  ⑤ fund  ⑥ others  ________________________________
E. Source of revenue for the environmental management

1. Please name all the funding systems that you have experienced for the last 3 years.

2. What were the reasons if your company couldn't fully exploit above funding systems? (please check by the order of importance.)
   - lack of information (    )
   - meticulous procedures (    )
   - small budget of fund (    )
   - excluded from the fund (    )
   - lack of credit or mortgage (    )
   - others ________________ (    )

3. What method does your company usually use in order to fund for the environmental budgets? (Please check by the order of importance.)
   - bank bond (    )
   - private capital (    )
   - policy fund (    )
   - others ______________________ (    )

4. What was most difficult in budgeting the environmental capital?

5. What was the solution that your company has used to solve the difficulties?

F. Issues related to quality management

1. What are the efforts of your company related with quality management? (more than one answers available)
   - introduce ISO 9001 management certification system
   - 100ppm program
   - customer satisfaction program
   - 6 sigma program
   - others ____________________________

2. What are the objectives of above efforts? (more than one answers available)
   - reduce deficit rate
   - reduce energy and water consumption
   - reduce waste generation
   - improve working environment
   - others ____________________________
3. If your company has any major achievements according to above, please specifically describe. (for example, annual waste reduction of 200 tons)
   ① Yes ........................................................................................................
   ② No

4. Do you think it possible to improve the environment by quality management?
   ① Yes  ② No

G. Awareness of environmental management

Environmental management refers to a systemized management of environmental issues of a company. Generally, this management includes activities more than abiding the environmental regulations.

1. Are you familiar with environmental management?
   ① Yes  ② no (please go to section H)

2. How did you first get to know it?
   ① orders from the directors' board  ② mass media  ③ association
   ④ government  ⑤ other companies  ⑥ others

3. Till how far are the directors' board aware of environmental management?
   ① CEO  ② department and staffs that are related  ③ none  ④ others  ___

H. Others

Please detail any opinions on managerial improvements to the SMEs on environmental management fields.

__________________________________________________________________________

Thank you for your cooperation.