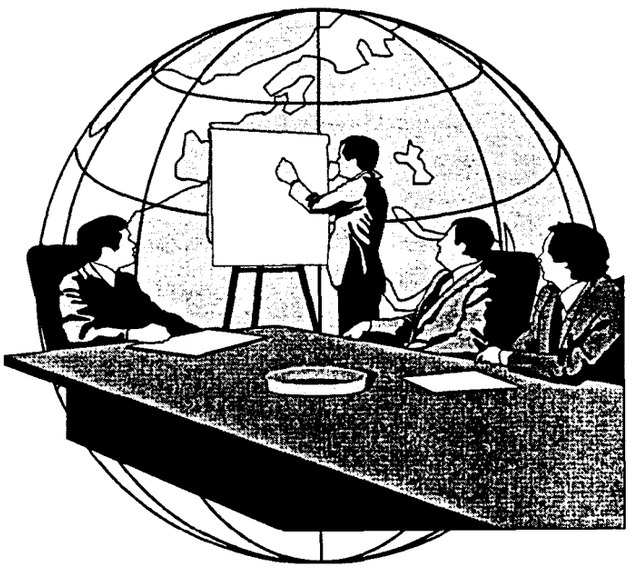
Business Opportunities in Asia for the North Carolina Recycling Industry



A Market Assessment

NORTH CAROLINA
RECYCLING BUSINESS
ASSISTANCE CENTER

1996

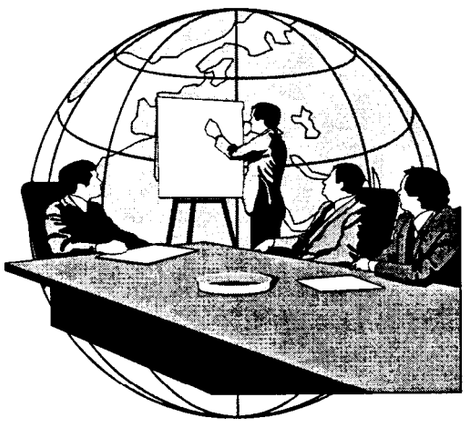
James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary, DEHNR
Gary E. Hunt, Director, DPPEA

DPPEA

This document has been funded by the United States Environmental Protection Agency under assistance agreement #X199457 1-94-0 to the NC Department of Environment, Health, and Natural Resources. The contents of this document do not necessarily reflect the views and policies of the USEPA, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

DPPEA-96-51.
200 copies of this public document were
printed on recycled paper at a cost of $335.96 or $1.68 per copy.
November 1996.

Business Opportunities in Asia for the North Carolina Recycling Industry: A Market Assessment



Prepared by
Dennis A. Rondinelli, Ph.D.

Center for Global Business Research
The Frank Hawkins Kenan Institute of Private Enterprise
University of North Carolina
Chapel Hill, North Carolina 27599-3440

Prepared for
North Carolina Recycling Business Assistance Center

North Carolina Division of Pollution Prevention and Environmental Assistance
North Carolina Department of Environment, Health, and Natural Resources
Commercial/Business Assistance Section

1996

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary, DEHNR
Gary E. Hunt, Director, DPPEA
Scott Mouw, Chief, CBAS
Bobbi Tousey, Manager, RBAC

NORTH CAROLINA
RECYCLING BUSINESS
ASSISTANCE CENTER

DPPEA

CONTENTS

I. INTERNATIONAL BUSINESS OPPORTUNITIES FOR NORTH CAROLINA'S RECYCLING INDUSTRY

North Carolina has a strong and vigorous waste recycling industry. A survey commissioned by the North Carolina Alliance for Competitive Technologies in 1996 found that North Carolina has more than 620 firms involved in recycling.' These firms earned more than $1 billion in total revenues from the collection, processing and remanufacturing of paper, plastics, glass, metals, wood, organic and other materials. North Carolina's recycling industry employees more than 11,000 people. The annual sales of recycling firms grew on average by 9 percent during the first half of the 1990s and employment grew by 4 percent a year during the same period.

Structure of the Recycling Industry

The structure of North Carolina's recycling industry is diverse and fragmented. Segments of the industry include:

- Recycling collectors
- Tire recyclers
- Oil and chemical recyclers
- Textile recyclers
- Scrap metal processors
- Paper stock processors
- Pallet and wood companies
- Reuse companies
- Multi material processors
- Materials brokers
- Manufacturing companies

In general, these companies are relatively small, single-site operations. The average number of employees is about 20 per firm; the median is 7. Median company sales are about $750,000 a year; average sales are slightly more than $2 million. Recycling companies compose the single largest sector of North Carolina's environmental industry, which consists of more than 3,500 firms that employ more than 45,500 people and generated sales of more than $4.1 billion in 1996.

Future of the Recycling Industry

The future of North Carolina's recycling industry depends on a variety of factors including: 1) the willingness and ability of municipalities, industries, businesses and households to separate and recycle reusable materials, 2) the costs of alternative

methods of disposal such as landfilling or incineration, 3) the costs of further separating and reprocessing materials for reuse, 4) shipping costs, 5) disparities between supply and demand, and the 6) costs of virgin or primary feedstocks such as timber, petroleum and ores.[2] The costs of reprocessing and the price of virgin materials tend to fluctuate widely, but overall demand for recyclables has been growing in the United States.

The survival of individual companies is often precarious, however, because the industry faces fluctuating demand for recycled feedstocks, misperceptions by some segments of the population that there are very limited uses for recycled materials, and tightening government budgets for investment in recycling collection and separation facilities. Although support for recycling among the public generally remains strong, new uses are being found for recycled feedstocks, and the use of recycled materials is growing, the continued good health of the industry in North Carolina will depend more heavily in the future on finding new markets for recycled materials and new opportunities for commercially transferring the technology, processes and know-how of North Carolina recycling companies to emerging markets around the world.

International Market Opportunities

The strength of North Carolina's recycling industry provides good opportunities for exploiting what inevitably will be the growth of recycling in emerging markets in Asia, Latin America, and Central and Eastern Europe over the next decade. As these countries continue to industrialize, urbanize, and grow economically, and experience rising incomes and increasing consumption. Both economic growth and increasing wealth are generating serious solid waste disposal problems. As incomes increase in these countries and more families enter the middle class, the consumption of goods packaged in paper, cardboard, glass, and plastics increases.

Newly industrializing countries face increasing problems of disposing of tires, metals, paper, plastics and aluminum. Nearly all emerging market countries now face serious solid waste disposal problems as landfills become overburdened and the location of new garbage dumps in cities and towns becomes increasingly unacceptable. Incineration is expensive and produces its own wastes that require disposal.

As governments overseas begin to recognize the importance of recycling as a means of reducing solid waste and of creating value from reusable materials, the need for recycling equipment and services and for recycled feedstocks will grow. Entering foreign markets, however, is neither an easy nor a rapid process. North Carolina recycling firms that are seeking new markets for their goods and services must identify those countries where demand is likely to grow over the next decade and

position themselves in those markets early.

Establishing trade relationships in emerging market countries requires patience, persistence, and knowledge. Although companies can make quick sales by pursuing international trade leads, establishing a market position overseas often requires companies to monitor opportunities regularly in selected countries, develop strong relationships with customer networks, forge strategic alliances with host country partners, test alternative entry channels, and establish a long-term presence in the market that will assure continued sales.

Clearly, recycling is an established industry in North America, Western Europe, and Japan and overseas markets in post-industrial economies offer opportunities for trade and investment. But competition is strong and markets have been solidly penetrated in these areas. North Carolina firms interested in overseas opportunities also need to explore emerging market countries where the recycling industry is young and growth is imminent.

Emerging market countries in Asia, Latin America and Central and Eastern Europe offer the potential for greater growth in recycling, but doing business there incurs greater risks and requires more careful analysis.

This report provides an overview of opportunities for North Carolina recycling firms to expand their businesses in one of the fastest growing economic regions of the world - East and Southeast Asia. Although recycling has occurred informally in Asia for decades, widespread commercial recycling is relatively new. Section II reviews the economic and environmental situation in Asia and identifies the forces that are likely to drive the growth of the recycling industry in the region.

Section III identifies the channels through which North Carolina recycling firms can enter markets in Asia to position themselves for trade and investment. Sections IV - XI provide profiles of potential markets in ***South Korea*** and ***Singapore,*** where recycling is becoming an important aspect of government strategies for solid waste disposal and new opportunities are opening for the use of recycled materials; ***Taiwan, Thailand,*** and ***China*** where serious solid waste problems are creating the potential for recycling to emerge as an important environmental management strategy; and ***Indonesia, Malaysia,*** and ***the Philippines*** where recycling is in its infancy, but where long-term opportunities are inevitable.

II. RECYCLING BUSINESS OPPORTUNITIES IN ASIA

Asians have recycled wastes informally for decades if not centuries. The relative poverty in which most Asians lived before the middle of the 20th century provided an incentive to minimize waste and to reuse any materials for which a good use could be found. Much of the waste-stream in Asia was composed of putrecsible materials that could be reused for fertilizers or animal feed.

With rapid economic growth, industrialization, and urbanization in most East and Southeast Asian countries over the past 30 years, however, new forces are driving the growth of the commercial recycling industry. In the newly industrialized countries of South Korea, Taiwan, Hong Kong, and Singapore, for example, solid waste disposal has become a major problem and natural resources such as timber and petroleum that supply virgin materials for manufacturing are in short supply.

The inadequacy of landfill capacity and the high cost of incineration, along with an increasing public acceptance of environmental controls, is focusing greater attention on the opportunities for recycling. In many of the poorer but growing Southeast Asian countries and in China traditional forms of recycling are still prevalent, but commercial recycling will inevitably emerge as an important component of environmental management over the next decade.

Although the recycling industry in most East and Southeast Asian countries is in the early stages of development, this is precisely the time when North Carolina companies need to position themselves in the market. The industry in most Asian countries is not yet structured, opportunities for recycling are only beginning to be identified, recycling systems are just emerging, and processing facilities are limited to a few locations, usually the largest cities.

But it is in the early stages of market development that the best long-term opportunities will emerge not only for the sale of recycling equipment and services, but for commercially transferring know-how and providing technical assistance in developing recycling systems, as well as for exporting recycled feedstock and developing new products using recycled materials.

In order to position themselves in the market for long-term growth, North Carolina companies need to monitor the emergence of the recycling industry, assess changes in the forces driving the market for recycling equipment and services and for recycled materials, and identify specific opportunities that will allow them to enter and sustain themselves in the market effectively.

Factors Driving the Market for Recycling in Asia

Although countries in Asia differ tremendously in culture, language, customs, politics, and economic structure, similar forces are driving the market for recycling equipment and services and for recycled feedstock throughout the region. North Carolina firms interested in entering the market in Asia should monitor the impacts of these trends on the potential for the expansion of recycling business opportunities. A better understanding of these trends can also help North Carolina firms to forecast market entry timing in specific countries. The driving forces for the region include:

- Rapid economic growth
- Structural transformation of economies
- Rapid and large-scale urbanization
- Increasing personal and household incomes
- Increasing consumption
- Growing volumes of solid waste and increasing solid waste disposal problems
- Changing waste streams
- Increasing awareness of the role of recycling in waste disposal and materials reuse

All of these factors taken together create the conditions in Asia under which demand for recycling is likely to grow in the future.

1. ***Rapid economic growth.*** East and Southeast Asian countries have been among the fastest growing economies in the world over the past decade and the region is likely to continue growing rapidly over the next quarter of a century. In the newly industrializing economies of Hong Kong, Singapore, South Korea, and Taiwan with a combined population of more than 75 million, gross domestic product has grown on average by about 7 percent a year since 1990. (See Table 1.) China, with more than 1.2 billion people, has a GDP growth rate that averaged 9.8 percent a year during the 1990s. The economies of the Southeast Asian countries, with a population of more than 300 million, have grown by more than 7 percent a year. Continued rapid economic growth will drive many of the other forces underlying the emergence of the recycling industry in Asia.

2. ***Structural transformation of Asian economies.*** Nearly all of the countries in East and Southeast Asia have undergone a rapid transformation from agricultural economies to industrial and service economies over the past half century. In Singapore, 64 percent of GDP now comes from services and 36 percent from industry.

Table 1. Growth of Gross Domestic Product (Percent Per Annum)

Country	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*
Newly Industrializing Economies	7.3	7.9	5.8	6.2	7.4	7.0	6.7
Hong Kong	3.4	5.1	6.3	5.8	5.5	5.6	5.6
South Korea	9.5	9.1	5.1	5.5	8.3	7.3	6.8
Singapore	8.8	6.7	6.0	10.1	10.1	9.0	8.5
Taiwan	5.4	7.6	6.7	6.3	6.5	6.7	6.8
China	3.9	8.0	13.2	13.4	11.8	9.8	8.9
Southeast Asian Countries	8.2	6.6	6.3	6.8	7.5	7.5	7.4
Indonesia	7.2	7.0	6.5	6.5	7.4	7.1	7.1
Thailand	11.6	8.4	7.9	8.2	8.5	8.6	8.0
Malaysia	9.7	8.7	7.8	8.3	8.5	8.5	8.0
Philippines	3.0	-0.6	0.3	2.1	4.3	5.0	5.5

Source: Asian Development Bank, Asian Development Outlook 1995 and 1996, Manila: ADB, 1995.

About 82 percent of Hong Kong's GDP is from services. In South Korea 43 percent of GDP comes from industry and 50 percent from services.

Even in countries that were predominantly agricultural a generation ago, services and manufacturing now contribute the most to economic output. The contributions from industry and services in Malaysia are 43 percent and 42 percent respectively, in Thailand, 39 percent and 50 percent; in Indonesia, 41 percent and 42 percent, and the Philippines, 33 percent and 45 percent. About 79 percent of China's economic output now comes from nonagricultural activities.[3]

Changes in the structure of the economies of Asian countries toward manufacturing and service industries will continue to produce large amounts of solid waste, much of which can be recycled for productive uses.

3. ***Rapid and large-scale urbanization.*** Along with economic growth and industrialization came rapid and widespread urbanization. In most Asian countries, this urban structure is dominated by one or two major metropolitan areas of very large size. The United Nations estimates that the number of cities with more than one million residents in Asian developing countries (excluding Japan) doubled from the 36 that existed in 1960 to 73 by 1980. The number will more than double again by the end of the 1990s.

The population of Asian cities with a million or more residents is likely to grow from the 85 million that lived in them in 1960 to about 498 million by the year

2000, a nearly five-fold increase in less than 40 years.

The population of the 119 cities in Asia and the Pacific with one million or more residents in 1990 will expand by nearly 130 million during this decade. The United Nations predicts that many metropolitan areas in Asia will grow to enormous size. Seoul, Jakarta, and Shanghai are likely to grow to more than 13 million in population. Manila, Bangkok, and Beijing will reach populations of more than 10 million, and Tianjin will have a population exceeding 8 million. By the end of the 1900s, 17 Asian cities will have more than 8 million residents and 18 others will have more than 4 million inhabitants. The 97 cities in Asia and the Pacific with 1 million to 4 million inhabitants in 1990 will add nearly 68 million people this decade while cities under 1 million population will expand by more than 390 million inhabitants.

4. ***Increasing personal and household incomes for larger segments of thepopulation.*** Rapid economic growth in Asia has been accompanied by relatively widespread participation in economic activities and, as a result, larger numbers of people are entering the middle class. GDP per capita, a good surrogate indicator of per capita income, has been rising steadily in Asia for the past decade.[3] Incomes in Hong Kong and Singapore are now on par with many "developed countries." And as Table 2 indicates, even in the poorer countries of Southeast Asia, incomes are increasing overall.

5. ***Increasing consumption.*** Table 2 shows that rising incomes have brought increasing consumption to East and Southeast Asian societies, especially in the cities. Private consumption has been growing by more than 6 percent a year in South Korea, China, Indonesia, Thailand, and Malaysia. It has been increasing by more than 4 percent a year in the Philippines and Singapore.[4] Growing middle classes can afford a larger array of consumer goods, which are usually packaged in paper, cardboard, plastic, aluminum, and glass.

6. ***Growing volumes of solid waste and increasing solid waste disposal problems.*** Industrialization, the growth of millions of small- and medium-scale enterprises, and the increase in the number of urban households have made waste disposal in cities a crucial problem. Taiwan, South Korea, and Hong Kong, which are now largely urbanized and have high economic growth rates, generate increasing amounts of solid waste:

- Hong Kong's municipal waste exceeds 21,000 tons per day and is stressing severely the city's limited landfill capacity.

Table 2. Growth in Private Consumption in Asian Countries and Gross Domestic Product Per Capita, 1995-1997

Country	Growth in Private Consumption (%)			GDP Per Capita ($ US)		
	1995	1996	1997	1995	1996	1997
Newly Industrializing Economies						
Hong Kong	1.8	2.0	1.6	**24,327**	25,596	29,180
South Korea	**7.9**	**6.7**	**6.5**	10,091	11,499	13,091
Singapore	5.1	**4.5**	**4.0**	**27,532**	**30,580**	**33,378**
Taiwan	**5.6**	**6.5**	**5.5**	12,514	13,415	14,777
China	**6.7**	**8.0**	**7.0**	**574**	**683**	**780**
Southeast Asian Countries						
Indonesia	**7.2**	6.1	6.3	1,022	1,146	1,280
Thailand	8.1	7.9	7.1	2,661	2,911	3,144
Malaysia	14.5	9.2	4.9	**4,049**	**4,233**	4,531
Philippines	**5.0**	**5.5**	**5.6**	1,079	1,135	1,178

Source: Economist Intelligence Unit Country Forecast and Country Risk Service, 1996

- Taiwan estimates that the solid waste generated will exceed 36,000 tons a day by the end of the decade.

- Jakarta, Indonesia, produces more than 5,000 tons of municipal waste per day, only about half of which is disposed of properly.

- Bangkok, Thailand, generates more than 7,000 metric tons of solid waste daily, and the amount is projected to increase to 13,800 a day within the next decade.'

In many Asian countries municipal governments are now spending more than one-third of their budgets on waste collection and disposal but still cannot keep pace with waste generation.[6]

Policies promoting the commercialization of waste disposal and recovery and of eliciting the participation of the private sector become more crucial as the cost of solid waste disposal becomes more expensive for cities. Costs of waste collection and

disposal tend to increase with the growth of urban population and vary with the type of disposal used. Individual littering and dumping are virtually costless to a municipality in the short run if it simply ignores these practices, but it becomes extremely costly to remedy their long-term ill-effects. Engineered filling of small depressions and channels and open dump burning are relatively inexpensive, but these options also impose high social costs in terms of environmental pollution and human health hazards. Sanitary landfills with daily cover and incineration with quenched ash disposal are more expensive means of disposing of urban solid wastes for municipalities.'

7. ***Changing waste streams.*** As the economies of Asian countries grow, the composition of their industrial sectors shifted from agro-processing industries that largely generated biodegradable waste to manufactured products, consumer products, chemicals, petrochemicals, electronics, machinery and equipment that produce environmentally hazardous wastes such as heavy metals, acid, oils, solvents, and alkaline.

Experience suggests that with economic progress comes changes in the composition of household waste that require new methods of disposal and recycling. The types of household and industrial solid waste recycling that are now being done in Japanese, United States, and many Western European cities can be adopted or transferred to rapidly growing Asian countries.

As cities industrialize they to generate lower density wastes with a higher percentage of paper, plastics, glass and metals. This type of waste is most effectively recovered for remanufacturing or reprocessing, or disposed of through incineration. Plants can be set up to produce ferrous metals, paper, plastics, fibers and compost. The shortage of suitable landfills in and around metropolitan areas in some Asian cities has forced the search for new ways of disposing of solid waste.

8. ***Increasing awareness of the role of recycling in waste disposal and materials reuse.*** In the more economically advanced countries in Asia, there is a growing recognition that recycling can conserve energy normally used in incinerating garbage, reduce environmental degradation, reduce dependence on chemical fertilizers that further pollute water resources, generate employment opportunities for small-scale enterprises, reduce dependence on foreign imports of paper, glass, plastics, metals and inorganic material, and conserve water resources.

Governments and nongovernmental organizations in Asia are now experimenting with several approaches to recycling wastes. They include:

- Inorganic materials recovery in which useable refuse is sorted and classified manually or mechanically for repair or remanufacturing;
- Processing of ferrous and non-ferrous metals, plastics and polymers for re-use in manufacturing;
- Protein humus and fertilizer reclamation for animal feeding, fertilization and aquaculture;
- Waste water reclamation for sewage farming, effluent irrigation and aquaculture;
- Use of processed waste for land reclamation; and
- Energy recovery through direct combustion, production of bio-gas, or recovery of energy equivalents in inorganic material.

Where neither governments nor private sector firms provide adequate services, scavengers and the poor often engage in informal sector recycling.* In Seoul's Nanjido landfill, where more than 30,000 tons of the city's wastes are dumped every day, and in Manila, where the metropolitan waste dump is referred to as "Smokey Mountain," hundreds of people earn a meager income from tapping the dumps to obtain methane gas and from recycling plastic, wood, metal, paper and other materials recovered from the trash heaps[9]. But informal sector scavengers often work in conditions that are detrimental to their health. Widespread commercialization of waste disposal and recovery may generate a sufficient number of jobs in Asian metropolitan areas to absorb many of the workers now engaged in informal sector scavaging.

Emerging Markets for the Recycling Industry in Asia

Most countries in Asia are slowly beginning to identify opportunities for commercialization of waste recycling. The most effective ways of commercializing waste collection, disposal and re-use differ among countries and among cities and regions within countries depending on economic, physical and social conditions, and they change as those conditions change. The composition of waste, for example, changes with the level of economic development, the distribution of income, and the size of the urban area that generates it. Urban refuse generation rates tend to increase with the size and income levels of cities, making commercial composting and private sector reprocessing economically feasible as metropolitan areas expand.

Among the recent signs that the recycling industry is emerging in Asia are the following:

- In Hong Kong, low-tech recovery of paper, glass, plastic and metal is done by small family-run businesses that sell recovered materials in

China and other Asian countries.[10] Paper is recycled on a limited scale to produce cardboard for packaging and recycled paper is imported for packaging and other uses.

- The government of Singapore is encouraging recycling to reduce the volume of solid waste requiring incineration or disposal. Households recycle newspapers and housing estate and apartment associations collect newspapers to sell to scrap and paper dealers.[11] About 45 percent of all paper in Singapore is recycled.

- Taiwan's Environmental Protection Agency is drafting new recycling regulations that impose stiff fines on businesses that do not recycle solid wastes.

Governments in several Asian countries have turned to incineration as the preferred solid waste disposal method. But the dumping of incinerator ash can also cause serious environmental problems. The ash often leaches from landfills into underground aquifers, contaminating well-water supplies. In the richer Asian countries where incineration is used to dispose of solid wastes, however, the potential for commercial uses of bottom and fly ash are growing.

Even in incineration, however, there are opportunities for recycling. American companies have developed a commercially feasible technology to turn incinerator ash into building blocks. Combined with portland cement and sand, bottom and fly ash yield building blocks that can be used for reef barriers along shorelines, highway barriers, cesspool rings, underground vaults, and a wide variety of construction that normally uses concrete blocks. Preliminary tests show that processing eliminates the leaching of metals and other contaminants."

In many cities in poorer Asian countries, composting is one of the most promising means of commercially recycling solid wastes because they consist largely of vegetable and putrescible materials. In cities in low-income countries, urban waste contains more than 75 percent vegetative, putrescible and inert materials, and in middle-income countries the content is more than 50 percent. This high-density, high-moisture content material is especially suitable for composting to produce methane gas, combustible pellets, and fertilizers. Compost made from vegetative material can also be used to feed pigs and in fish farming.[12] Experiments in 33 cities in India indicate that more than one-third of the wastes collected in nearly all of the urban areas are being composted and that the cities are able to sell all of the compost they produce.[13]

In many large cities in Asia, both government agencies and companies could benefit from public-private partnerships for effective solid waste disposal. In the United States local governments contract with private enterprises to provide services that municipalities cannot offer efficiently and effectively on their own and similar arrangements can be adopted in Asian countries.[14]

In brief, markets are growing in Asia for:

- Recycling process know-how, technical assistance and services
- Recycling equipment and technology
- Recycling systems and facilities

The markets for recycled materials is also growing rapidly in Asia. Recycled feedstock is increasingly used in

- Paper and cardboard production
- Packaging materials
- Plastics and resins
- ‘Aluminum cans and packages
- Glass products
- Steel and metals products
- Tires and other rubber products

In addition, potential opportunities exist to use recycled feedstock in the building materials industry. Asia, in particular, is a region with a rapidly expanding construction industry and many countries are importing building materials. The total market for building materials in the countries listed in Table 3, for example, was nearly $63 billion in 1993.[15] These countries import nearly $21 billion worth of building materials from abroad. In 1993, they imported about $4.3 worth of building materials from the United States. The largest markets for U.S. building materials were Japan, South Korea, Taiwan and Singapore. Creative North Carolina firms could develop markets for recycled plastic, paper, glass and metal components or substitutes for conventional building materials.

Hong Kong’s enormous construction market, estimated by the U.S. Department of Commerce at more than $5 billion a year, is driven by commercial, industrial and residential building and by massive airport and port infrastructure projects. China’s booming construction industry, which also drives Hong Kong’s building materials market, creates demand in both countries for steel, timber, tiles, and glass.

Governments and private organizations are beginning to cooperate in new ways to

commercialize the collection, recovery and recycling of environmentally damaging

Table 3. Import Markets for Building Materials in Asia

country	Total Market US$ mil 1993	Average Annual Growth	Import Market US$ mil 1993	Average Annual Growth	Imports from U.S. US$mil 1993	Average Annual Growth
China	6,534.0	8%	1,522.0	8%	196.0	6%
Hong Kong	875.0	15%	475.0	30%	95.0	27%
Indonesia	2,250.0	25%	525.0	15%	60.0	18%
Japan	16,500.0	12%	9,800.0	11%	3,100.0	11%
Malaysia	3,500.o	18%	320.0	7%	29.0	3%
New Zealand	850.0	2%	150.0	2%	18.0	1%
Philippines	2,416.0	45%	693.3	25%	82.2	15%
Singapore	1,855.0	6%	2,296.0	6%	125.0	6%
South Korea	16,210.0	6%	2,737.0	6%	242.0	3%
Taiwan	8,720.0	15%	1,780.0	18%	250.0	15%
Thailand .	3,116.0	5%	560.0	5%	72.0	5%

Source: U.S. Department of Commerce, 1994.

wastes. As East Asian countries continue to become more prosperous, the disposal, treatment and recycling of household, commercial and industrial wastes will form an economic sector that could be lucrative for North Carolina companies that are seeking to expand their markets in Asia and that will create new jobs and generate income that contribute to economic development both at home and abroad.

III. ENTERING THE ASIAN MARKET

North Carolina recycling companies seeking to enter markets in Asian countries have four major options (see Figure 1):

- Indirect export
- Direct export
- Contractual arrangements
- Foreign direct investment

Each of these channels of market entry has specific advantages and disadvantages for individual companies.[16]

Indirect Exporting Channels

For many smaller North Carolina companies and for some that are manufacturing standardized products, indirect exporting may be an appropriate initial entry channel. Indirect exporting only requires that a company sell its equipment to another, usually larger, domestic company that in turn exports or transfers it abroad. North Carolina firms could also sell their equipment to a U.S. agent or trade company that resells it to overseas customers.

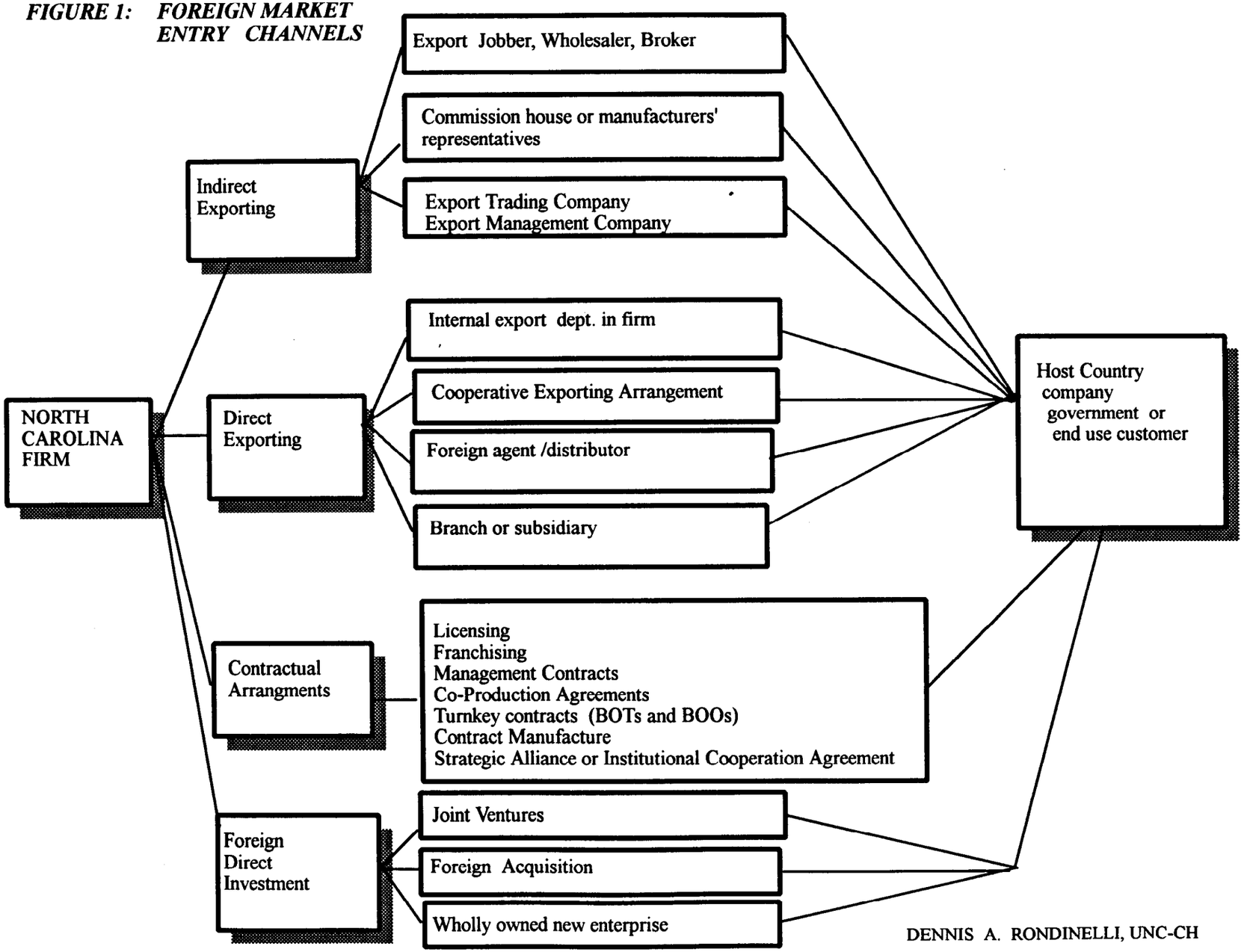
The advantages of indirect exporting are that it has relatively few costs for the North Carolina firm, no special managerial or production resources are required, and little export experience is needed. The company assumes little market or political risk, can obtain immediate payment for its goods in local currency, and gains access to indirect but weak market signals about the demand for its products abroad.

The disadvantages of this entry channel, however, are that: a) the North Carolina firm obtains little or no direct knowledge about the characteristics of the overseas market in which its goods are sold; b) the enterprise has little ability to support its products in overseas markets; and c) a substantial margin of profit can be syphoned off in fees, commissions, or discounts to an intermediary, trading company, or agent. All of these disadvantages make it more difficult for the enterprise to adjust its designs, quality levels, and product mix to changing foreign market demands.

Direct Exporting Channels

An alternative channel of market entry is direct exporting, in which the North Carolina company develops its own internal capability to find customers for its

FIGURE 1: FOREIGN MARKET ENTRY CHANNELS



DENNIS A. RONDINELLI, UNC-CH

products abroad, works closely with a foreign agent or distributor, or sets up its own distribution branch or subsidiary overseas. Direct exporting is a much more effective means for a North Carolina company to gain knowledge of a foreign market. It allows a company to analyze appropriate pricing and cost decisions, adjust product design and quality, improve delivery schedules, and provide appropriate after-sale service and support. For companies that want to maintain a long term presence in Asia knowledge of the market, direct contact with customers, and responsiveness to customer needs are critically important.

Developing direct export capacity, however, requires substantial investment by enterprises in obtaining overseas market information, monitoring market changes, establishing distribution and sales networks, and acquiring expertise in export procedures. A firm exporting directly must develop its own international marketing and sales department, be able to supply spare parts, provide repair and after-sales service, and be prepared to deal with financial and political risks associated with international transactions.

Use of foreign agents and distributors can reduce some of the costs of direct exporting for inexperienced firms. Foreign agents, distributors, and trade companies can provide market information for inexperienced companies, introduce the product into well-established distribution systems, offer assistance with export and import procedures, and provide related services like warehousing.

Use of a foreign agent, however, has some of the same disadvantages for North Carolina firm as indirect exporting. The firm will not develop a direct knowledge of the overseas market, will have to pay commissions or fees for the agent's services that reduce overall profits, and often will not have direct communication with the customers or end-users. The use of a foreign agent, distributor, or trading company can be an effective temporary charnnel for recycling firms that are inexperienced in direct exporting, however, and they develop the expertise and resources to sell their own goods.

Contractual Channels

Another means of entering Asian markets is through contractual arrangements with overseas firms or with multinational corporations with strong positions in the overseas market. North Carolina recycling companies have several options. They could:

a. Grant licenses to foreign companies to produce their equipment abroad and to sell it in either the host country or in third-country markets. This is an effective way for North Carolina firms to circumvent import barriers, high tariffs or

quotas in Asian countries. Licensing may be a way for service companies to transfer proprietary processes or know-how, or for companies with recycling equipment that require substantial adaptation in a foreign market to obtain assistance from a local manufacturer. Moreover, licensing is a preferred approach for many small- and medium-sized companies to get their products into foreign markets with a minimum of investment and risk. Most companies, however, will only license their technology if they are convinced that the host country will protect its intellectual property rights and the licensee will not use the arrangement to become a competitor.

Usually, companies that license their products require one or more of the following types of royalty revenues: a) lump sum royalties and disclosure fees; b) technical assistance fees; c) engineering or construction fees; d) equity shares in licensee firm; e) dividends on equity shares; f) profits from sales of equipment, machinery, raw materials, or other nonlicensed products; g) profits from purchase and resale of goods manufactured by licensee; h) savings from use of licensed products in licensor's own operation; or I) patents, trademarks, and know-how received from licensee (grant-backs). [17]

The royalties and fees are based on the licensor's estimate of cost of transferring technology and related services to the licensee over the life of the agreement. These usually include opportunity costs, start-up costs and ongoing costs. Figure 2 indicates the types of issues usually included in a licensing agreement.

b. Grant ***manufacturing contracts*** to overseas companies to produce goods or components to specification for sale in the host country, the home country, or third-country markets. Contract manufacturing is a hybrid between licensing and investment entry. A North Carolina company can get a product manufactured to its specifications in another country by transferring technology and know-how to a host country manufacturer, which in turn sells the products in its home market or exports it to third country markets.

c. Make ***co-production agreements in*** which both North Carolina and Asian companies produce portions of a product or equipment that are assembled in either country or in a third country. In such agreements there is usually little or no equity investment in each other's enterprise but simply an agreement to produce certain types of goods jointly.

Each of these channels gives North Carolina companies direct contact with Asian companies whose products already have identification in the overseas market and that often have technology, management expertise, and distribution channels overseas. These comparative advantages can be combined with the Asian partner's advantages

FIGURE 2: ELEMENTS OF A LICENSINGAGREEMENT

1. *Description of the Technology Package*
- **Definition or description of licensed industrial property**
- **Know-how to be supplied and its method of transfer**
- **Supply of raw materials, equipment and intermediate goods.**

2. *Use Conditions*
- **Field of use of licensed technology**
- **Territorial rights for manufacture and sale**
- **Sublicensing rights**
- **Safeguarding trade secrets**
- **Responsibility for defense\infringement action on patents or trademarks**
- **Exclusion of competitive products**
- **Maintenance of product standards**
- **Performance requirements**
- **Rights of licensee to new products and technology**
- **Reporting requirements**
- **Auditing/inspection rights of licensor**
- **Reporting requirements of licensee**

3. *Compensation*
- **Currency of payment**
- **Responsibilities for payments of local taxes**
- **Types of compensation**

4. *Other Provisions*
- **Contract law to be followed**
- **Duration and renewal of contract**
- **Cancellation or termination provisions**
- **Procedures for settlement of disputes**
- **Responsibility for government approval of the licensing agreement**

Source: Franklin R Root, Entry Strategies for International Markets, New York: Macmillan, 1994.

of lower-cost production or access to distribution channels.

North Carolina companies should, however, require firm contracts for cooperation that maintain product quality standards, that assure repatriation of profits or fees in convertible currency, and that limit the risk that the cooperating enterprise will merely become a competitor of the North Carolina licensor or manufacturer.

Foreign Direct Investment Channels

Finally, North Carolina recycling companies enter Asian markets through direct investment. This channel will become more important as more Asian countries sign regional trade agreements. Direct foreign investment can take several forms that include:

a. ***Creating a new enterprise*** that would produce recycling equipment or recycled materials in the United States or Asia, using some components or parts made in the new company;

b. ***Acquiring a foreign company*** that produces a similar product to that of the purchaser; or

c. ***Establishing a joint venture*** to produce recycling equipment or recycled products together with a partner in the overseas market. Joint ventures are popular ways for American companies to enter foreign markets where there is a well-established or rapidly growing market for their products and where there are strong benefits to having a host country partner who knows the political and economic situation, that has a good distribution system, and that has a strong reputation for good quality products.

A large number of joint ventures fail, however, unless they are well conceived, the partners trust and respect each other, and both sides are willing to compromise for the good of the overall venture. Joint venture agreements should be formalized and should be explicit about: a) the purpose of the joint venture, b) contributions of each partner, c) role of the host government, d) ownership shares, e) capital structure, f) management, g) production processes, h) finance, I) marketing, j) means of incorporation and settlement of disputes." The question of control is usually a critical issue that both sides must understand and agree to early in the partnership.

The advantages of direct investment for North Carolina firms are a) immediate access to the overseas market, b) increased knowledge of foreign market characteristics, c) eligibility for some host country tax advantages, d) access to marketing and supply networks in the host country, and e) lower levels of political risk and discriminatory regulation arising from national protection policies.

The drawbacks of such an entry channel are, of course, the complex problems of working with foreign partners and national governments over which the enterprise has little or no influence, reduced management control, and some financial and market

risks.

North Carolina companies will choose different entry channels depending on their size, the types of technologies they produce, their experience in overseas ventures, market and legal restrictions in foreign markets, and the legal and financial constraints under which they operate.

Although there are general advantages and disadvantages to each of these channels of market entry (see Figure 3), ***the channel chosen and the conditions associated with it will differ from company to company.***

FIGURE 3: POTENTIAL ADVANTAGES AND DISADVANTAGES OF ALTERNATIVE TECHNOLOGY TRANSFER AND MARKET ENTRY CHANNELS

	Advantages	Disadvantages
INDIRECT EXPORTING	No investment required No special resources required No export experience required No market or political risk Can bring immediate payment Allows testing of product acceptability	No knowledge acquired No control over marketing mix Limited ability to support products Syphons off gross profit margin as commission or discount
DIRECTEXPORTING		
Foreign Agent	Provides expertise for inexperienced seller Taps overseas market at at minimum cost Provide distribution network Can offer related services (warehousing, service etc.)	Reduces gross profits thru commissions Impedes communication with customers No direct knowledge of market for producer Lessens control over pricing, promotion, service, distribution
Foreign Branch	Minimum commitment of assets Full control of operation Acquire market contacts Acquire market knowledge directly No dilution of profits May be easier to form and collapse	Uncertain future Taxation problems Assume all market risks Exposureto economic and political risks Borrowings put lien on parent company
Foreign Subsidiary	Full control of operation Limited liability No dilution of profits Acquire market knowledge/contacts Host tax incentives Appearance of local commitment	Investment required Commitment of other resources and assets Assume market and economic risks

CONTRACTUAL ARRANGEMENTS

Licensing	No investment required No market or political risk Immediate payout thru royalties and fees in untapped markets Protection of patents Avoids high tariffs and import Less exposure to antitrust regs. Can test potential JV partner restrictions	Creates potential competitors Relatively low return on sales Can restrict or delay long term plans Royalties subject to high taxes in some countries Limits expansion of national markets Limits product or service development Strengthens negotiating position of licensee Licensee may try to market outside of territory
Contract Manufac-turing	No investment required Obtain lower labor costs Obtain local "made in" label Reduce political risk Avoids local labor problems Avoids investment approval rqmnts Avoids currency/exchange problems	Potential loss of control over quality More complex administration Transfer of production "know-how" Sacrifices manufacturing profits to contractor Trains potential competitor
Management Contracts	Control over operations Low risk entry into market Means of securing payment for know-bow Establishes clarity in admin. and operations Lessens disputes among JV partners	Complex legal arrangements Limits investment potentials Contract enforcement problems Potential labor problems

Compiled by: Dennis A. Rodinelli, Kenan Institute of Private Enterprise, University of North Carolina at Chapel Hill.

IV. RECYCLING BUSINESS OPPORTUNITIES IN SOUTH KOREA

The Republic of Korea is a country with a population of more than 45 million, a gross domestic product of $509 billion, and a per capita GDP of more than $11,000 per year.

Environmental Situation

Over the past 25 years, South Korea has experienced all of the serious environmental problems that accompany rapid industrialization and urbanization. Korea's environmental legislation is similar to that of the United States-- it has a general basic law and specific acts to cover air, water, waste, noise and other forms of pollution.[19] These legal standards and targets are often supplemented by ministerial guidelines and directives that sometimes impose stiffer restrictions on specific regions or industries.

The Basic Environmental Policy Act was recently amended to require Environmental Impact Assessments on new construction of 150,000 square meters or greater. The Air Preservation Act requires that inspections be done and permits acquired through the Ministry of Environment (MOE) before emissions discharging equipment can be operated. Future environmental planning for Korea includes implementation of the "Polluter Pays Principle" through an effluent charge system.

Environmental laws in Korea have been neither consistently applied throughout the country and among industries nor enforced with sufficient rigor to ensure compliance. Insufficient technical and manpower resources, weak prosecuting authority, and national policies that give higher priority to economic growth than to environmental protection weaken regulatory enforcement. In this uncertain regulatory environment, most U.S. firms in Korea hold their Korean operations to global standards which usually exceed local requirements.

Solid Waste Situation

Korea's rapid economic growth over the past 30 years has led to widespread industrialization, urbanization, and commercial consumption that has also increased its production of solid waste. In 1991, Korea was producing more than 92,999 tons of waste per day. Korea now has one of the highest levels of daily waste production per person in the world at 2.3 kg (approx. 5 lbs.) compared to 0.8 kg in Japan and 2.0 kg in the United States.

In 1991, the waste stream consisted of about 26,000 tons of sand-like residues from burned coal briquettes; 26,000 tons of food waste; nearly 14,000 tons of paper; 3,500 tons of wood waste; nearly 5,000 tons of metals; and about 17,000 tons of miscellaneous materials.Up to 20 percent of this could be recycled, but at present less than 8 percent is separated, processed and reused. Of the remaining waste, 89 percent is now landfilled, 1.6 percent is incinerated, and 1.7 percent is simply not collected. The volume of waste was estimated to be growing at about 6 percent a year. The cost of waste collection and treatment surpassed $US 637 million in 1991.

Because it is a relatively small country, Korea's existing landfills are rapidly filling up, and expansion or development of new ones is limited by the high price of land and by citizen opposition to the location of dumps in nearby neighborhoods. Increasingly, the Korean government has turned to incineration as an alternative to dispose of increasing amounts of waste. The Seoul Metropolitan Government plans to open 11 incinerators by 1999. Opposition from residents has already delayed the construction of two incinerators in Seoul scheduled to be completed by 1994 in the Mokdong and Nowon areas, however, and neither landfilling nor incineration can be used for toxic substances such as PCBs, mercury, and cadmium.

Recycling and reuse of waste have become high priorities in Korea's environmental policy. The government seeks to increase recycling of solid wastes from the current 7.4 percent to 20 percent by 1997 and to 30 percent by 2001. By the end of the decade, the government hopes to increase incineration to 25 percent for of the solid waste stream and to reduce landfilling from 89 percent to 45 percent.[21] Table 4 indicates the government's targets for recycling by the year 2001.

Table 4. Korean Government Targets for Recycling Solid Waste

Target	1992	1997	2001
General Waste Recycled (tons/day)	5,912	16,900	27,844
Percent Recycled	7.9	20.0	30.0
Industrial Waste Recycled (tons/day)	37,230	65,588	102,152
Percent Recycled	53.6	60.0	65.0
Total Volume Recycled (tons/day)	43,142	82,488	129,996
Percent Recycled	29.8	42.6	52.0

Source: Republic of Korea, Ministry of Environment, 1994.

To achieve that objective, the Korean government recently drafted the "Resource Conservation and Recycling Promotion Law" to increase public awareness of the need to recycle. The law promotes a return-for-deposit system on recyclables and special surcharges on non-recyclables. Responsibility for waste management and recycling has been given to the state-run Korea Resources Recovery & Reutilization Corporation (KORECO).

In 1991 the government introduced a waste separation system to promote recycling. The country was divided into waste-collection districts, with rules determined by whether the district contains an incinerator or a landfill. Sorting of waste is the responsibility of each household or business. In districts with a landfill, they must sort into plastic, aluminum, paper, glass (recyclables), coal-briquette residues, and other materials. In districts with an incinerator, they must sort into various categories of recyclables, combustibles, and other materials. KORECO and municipalities are then responsible for collecting the recyclables.

Although the Korean government has given high priority to recycling, difficulties with both collection and sale of recyclables has slowed progress. The program has not expanded as rapidly as expected because of the difficulty in getting people and industries in many districts to cooperate. In addition, the collectors lack adequate personnel and facilities. Korean companies have also been slow to purchase recyclables, fearing customer backlash against products made from recycled components. Korean consumers, fearing poor quality, are still somewhat wary of purchasing products made of recycled materials.

In order to promote better public understanding of the need for recycling the government has sponsored advertising campaigns and enlisted the support of citizens groups. One of Korea's largest newspapers, the ***Chosun Ilbo,*** has also focused on the issue, regularly running stories that appear on the front page or on entire inside pages.

Demand for Recycling Equipment

The U.S. Department of Commerce estimated the size of the Korean market for recycling equipment at $86 million in 1992 and expected it to grow by about 25 percent a year from 1994 to 1996. At that rate of growth, the market should be about $210 million in 1996 and about $500 million by the end of the decade.

The major driving forces are: 1) the steadily increasing volumes of waste; 2) the limited capacity to build new landfills; 3) the public reaction against the location of landfills and incinerators in their neighborhoods; 4) the need for recycled materials in some industries; and 5) government's policy to promote the expansion of the

recycling industry. By far, the strongest market driver is the government's determination to reduce the amount of solid waste that must be landfilled or incinerated.

The Ministry of Environment administers a waste management fund financed by charges on solid wastes. Moreover, the Korean government's "Resource Conservation and Recycling Promotion Law" requires deposits on recyclable items and special surcharges on non-recyclables. A return-for-deposit system applies to paper packs, metal cans, glass bottles, batteries, tires, lubricating oil, and household appliances. The surcharge covers products such as cosmetics, cookies, cigarettes, gum, and disposable diapers.

The U.S. Department of Commerce estimates that the import market for recycling equipment totaled $35 million in 1993 and will grow by about 15 percent a year (see Table 5).

Table 5: Marketfor Recycling Equipment in Korea

	(Millions $US)			Estimated Average Annual Real Growth
	1991	1992	1993	1994-1996
Import Market	24	30	35	15%
Local Production	48	60	78	
Exports	1	4	6	
Total Market	71	86	107	25%
Imports from U.S.	4	6	11	18%

Source: U.S. Trade Promotion Coordinating Committee, 1994..

According to the U.S. Trade Coordinating Committee, the best sales prospects for U.S. recycling equipment companies are: [22]

- Balers
- Separators
- Shredders
- Compactors
- Freon recovery equipment
- Mercury recovery systems
- Crushers
- Grinders
- Plastic recycling equipment

- Regeneration air sweepers
- Trammel screens
- Computer software

About 20 percent of Korea's imports of recycling equipment now come from the United States, with Japan providing 26 percent, Germany accountable for 17 percent, and other countries providing 37 percent.

Since Korea signed the Montreal Protocol in 1992, the use and production of CFC has been restricted, thus increasing the demand for CFC recycling. Although Korean companies have developed recycling technology for certain types of CFC, they still need technology and equipment that can recycle most CFC substances. Since the signing of the Montreal Protocol, Freon gas in Korea has become 10 times more expensive. Car care centers and manufacturers of refrigerators are potential customers for Freon gas recovery systems.

Although the government and private sector are increasingly recognizing the need to recycle, the industry is still in its early stages of development in Korea and the market for recycling equipment is still quite small compared to other pollution control equipment segments. The market is expected to grow, however, with the introduction of new recycling technology and the reduction of public prejudices against recycled products.

Demand for Recycled Materials

The Korean Government has set specific targets for the recycling of commercially useable materials by 1998: 55 percent of waste paper; 52 percent of waste glass; 40 percent of scrap iron (cans) and 20 percent of waste plastics.

The major segments of the recycled materials market include?

- ***Paper***

About 70 percent of the raw materials in paper and paperboard manufacturing in Korea are waste paper. About $240 million a year worth of recycled paper is imported by Korean companies annually. Although the government is seeking to reduce scrap paper imports by increasing the paper recycling rate from 43 percent to more than 50 percent, the market for recycled paper should remain strong for the near future. Waste paper is now collected from consumers by paper collectors such as KORECO, and then sold to paper recycling companies. There are now about 78 paper recyclers in Korea.

- ***Plastics***

Per capita plastic consumption has been increasing in Korea and rose from about 22 kg in 1983 to 61 kg in 1991. Waste plastic accounts for only about 6 percent of total wastes, but is a major disposal problem because it is not degradable and cannot be completely burned in incinerators. KORECO has been collecting High Density Poly Ethylene (HDPE) and Low Density Poly Ethylene (LDPE) since it was established in 1980. KORECO has built plastic recycling factories in Chongju and Andong that are producing pellets from more than 10,000 tons of waste HDPE. KORECO sells these pellets to private recycling companies for plastic sheet, plastic pipe and various packaging materials. There are about 166 companies in Korea handle or treat synthetic resin.

- ***Aluminum Cans***

More than 750 million aluminum cans were used in 1991, mainly for beer and soft drinks. Waste aluminum cans are collected and compacted, melted and sold to recycling companies that produce machine parts and utensils.

- ***Glass Bottles***

Korea manufactures nearly 771,000 tons of glass bottles for soft drinks, cosmetics, drugs, and other food containers. The recycling program for glass bottles focuses on two categories: returnable, refillable bottles, and one-way bottles. Returnable, refillable bottles can be reused from 7 to 18 times after washing and sterilization, and they account for 30 percent of all waste bottles. One-way glass bottles are collected., shredded for cullet, and used to manufacture new glass bottles. In 1991, cullet accounted for about 50 percent of the raw material used in new glass production. There are 88 glass bottle recycling companies in Korea.

- ***Steel***

In 1991, crude steel production in Korea reached more than 26,000 tons, of which about 40 percent relied on waste steel materials. Crude steel producers imported about 4 million tons of of waste steel in 1990. About 19 companies are recycling waste steel for crude steel production.

Entry Channels

The opportunities for U.S. companies to sell recycling equipment and recycled materials to Korea remain generally good. Korean perceptions of U.S. recycling products are favorable in terms of reliability, durability and quality. However, some customers complain that some U.S. suppliers are slow to respond to inquiries or orders and provide insufficient after-sales service. The major considerations of Korean companies for importing recycling equipment are quality, price, product durability, on-time delivery, warranties, after-sales service including prompt delivery of replacement parts, and free technical training for users.

Many Korean companies including subsidiaries of large conglomerates are beginning to create environmental business teams to deal with environmental issues. However, Korea does not yet have large specialized industry in recycling equipment. Most Korean suppliers of recycling equipment are small- and medium-sized companies and no single company or group clearly dominates the market. And although Korean companies have developed basic technologies for environmental pollution control, the small size of the recycling market has not until now provided incentives for them to manufacture recycling equipment.

KORECO and municipalities are major end-users of recycled wastes and are also customers for recycling equipment. Paper and steel manufacturers use waste paper and metal scraps and are installing recycling equipment such as shredders and compactors. In addition, manufacturers that produce large waste volumes are potential customers for balers and compactors.As wages increase, it is more costly for companies to continue handling wastes manually.

KORECO is a major end-user of recycling equipment. It's functions are to collect, treat, and reutilize wastes, to develop technologies for the recovery and reuse of used resins, and to promote recycling. KORECO has also assumed a central role in a variety of waste reutilization programs and it operates reutilization plants. KORECO has an $88 million annual budget, more than 1,700 employees, 10 regional offices, 85 branch offices, and 587 vehicles to collect recyclable wastes. In 1992, KORECO collected 52,191 tons of used vinyls, 16,930 tons of used bottles for agricultural chemicals, and 330,385 tons of reusable goods.

Municipal landfills and incinerators are also purchasing shredding and bailing machines. For example, the Pusan city government has recently purchased bailing machines for its two landfill sites in the Yongjongdo area. The Seoul Metropolitan Government is considering the purchase of shredding machines for its Kimpo Landfill area.

Currently there are more than 400 recycling companies registered with Ministry of Environment. They recycle paper, steel, synthetic resin glass, aluminum and clothes, and they are all customers of waste recycling equipment.

There are no major restrictions on importing recycling equipment into Korea. Tariff rates vary from 9 to 13 percent. The Korean government also has an annual import duty reduction plan which will bring the rate down to the 7 to 8 percent range. Special tariff discounts have been given to pollution-related items since 1991 to encourage manufacturers to adopt anti-pollution and recycling facilities in the face of mounting public grievances over deteriorating environmental quality. A total of 88 anti-pollution and waste treatment products have been subject to an 80 percent reduction in customs duties by the Ministry of Finance. The items affected by this tariff cut include shredders (HS# 847982), crushers (HS#847982), chopping machines (HS# 847980), cutters (HS# 84621), automatic baling presses (HS# 842240, HS# 847989), and Freon recovery equipment (HS# 841940).

In Korea recycling equipment is either sold directly by the manufacturer to the end-user or through sales agents. The Korean government purchases equipment through the Office of Supply of the Republic of Korea (OSROK) which issues international public bids for national and local government projects. U.S. firms can enter the market through Korean sales agents who provide full market information and effective sales support.

A special Ministry of Environment fund helps Korean companies that invest in pollution control equipment -- including recycling equipment -- to finance equipment purchases. The fund is replenished from fines levied on factories that do not meet environmental regulations and from taxes collected at hotels, restaurants and supermarkets based on estimates of their waste generation. From this fund, the Korean Environmental Management Corporation (EMC), a state-run company, provides 7 percent annual interest rate loans to be paid back in 7 years with a 3-year grace period.

Key Trade Development Contacts

1. ***Government of the Republic of Korea:***

Director, Waste Management Bureau or
Director, Recyclable Waste Management Division
Ministry of Environment (MOE)
7-16, Shin Chun-dong, Songpa-ku, Seoul
Tel: 82/2/42l-0303 Fax: 82/2/42l-0280

Manager
Korea Resources Recovery and Reutilization Corporation (KORECO)
24-5, Yoido-dong, Youngdeungpo-ku, Seoul
Tel: 82/2/780-4613 Fax: 82/2/780-4620

Chairman
Environmental Management Corp. (EMC)
Kangwon Bldg., 1024-4, Daechi-dong, Kangnam-ku, Seoul
Tel: 82/2/563-7211, 563-7234 Fax: 82/2/563-0054

Director
National Institute of Environmental Research (NIER)
280-17, Bulkwang-dong, Eunpyong-ku, Seoul
Tel: 82/2/389-6711 Fax: 82/2/389-8712

President
Korean Environmental Technology Research Institute
5th Fl., Samsung Bldg., 9-3, Samsung-dong, Kangnam-ku, Seoul
Tel: 82/2/512-1846 Fax: 82/2/512-1848

2. ***Major Trade Associations:***

Chairman
Association of Foreign Trading Agents of Korea (AFTAK)
Dongjin Bldg., 218 Hankangro 2-ka, Yongsan-ku, Seoul
Tel: 82/2/782-4411 Fax: 82/2/785-4373

Secretary General
Korea Environmental Preservation Association (KEPA)
Rm. 1221, KCCI Bldg., 45, Namdaemunro 4-ka, Seoul
Tel: 82/2/777-7360 Fax: 82/2/756-6141

President
Korea Pollution Control Association
Poongjun Bldg., 11-3, Jung-dong, Jung-ku, Seoul
Tel: 82/2/774-0123 Fax: 82/2/775-7043

3. ***Major Trade Publications Suitable for Equipment Advertisements:***

Bulletin of the Korea Environmental Preservation Association (Monthly)
Publisher: Korea Environmental Preservation Association
Rm. 1221, KCCI Bldg., 45, Namdaemunro 4-ka, Seoul
Tel: 82/2/777-7360 Fax: 82/2/756-6141

Bulletin of the Korean Environmental Managers Federation (Monthly)
Publisher: Korean Environmental Managers Federation
41-15, Kuro 5-dong, Kuro-ku, Seoul
Tel: 82/2/862-2591 Fax: 82/2/867-8474

Bulletin of the Korea Pollution Control Association (Monthly)
Publisher: Korea Pollution Control Association
Poongjun Bldg., 11-3, Jung-dong, Jung-ku, Seoul
Tel: 82/2/774-0123 Fax: 82/2/775-7043

4. ***Major Recyclers in Korea***

A. Paper Recycling

President
Sampoong Paper Mfg Co., Ltd.
224, Chang-dong, Nowon-ku, Seoul
Tel: 82/2/992-3171

Daehan Pulp Co., Ltd.
49-17, Choongmuro 2-ka, Chung-ku, Seoul
Tel: 82/2/270-9234
Contact: Mr. CHOI Byung Min, President

Ssangyong Paper Mfg Co., Ltd.
7-23, Shinchum-dong, Songpa-ku, Seoul
Tel: 82/2270-9234
Contact: Mr. ROH Chul Yong, President

B. Steel Recycling

Dongkook Steel Co., Ltd.
50, Sooha-dong, Chung-ku, Seoul
Tel: 82/2/317-1114
Contact: Mr. KYE Chan, President

Pohang Iron and Steel Co., Ltd.
700, Kumno-dong, Dongkwangyang City, South Cholla Province
Tel: 82/0667-770-0114
Contact: Mr. CHO Ma1 Soo, President

C. Synthetic Resin Recycling

Sun Jin Plastic Co., Ltd.
675-10, Siheung 3-dong, Kuro-ku, Seoul
Tel: 82/2/805-8338
Contact: Mr. KIM Sang Wook, President

Seokwang Ind. Co., Ltd.
482, Sangam-dong, Mapo-ku, Seoul
Tel: 82/2/397-3957
Contact: Mr. KIM Sang Ok, President

Pyonghwa Plastic Co., Ltd.
393-1, Donghwa-ri, Bongdam-myun, Hwasung-kun, Kyonggi Province
Tel: 82/0331-292-7771
Contact: Mr. LEE Jong Ho, President

D. Glass Recycling.

Dongyang Glass Ind. Co., Ltd.
284-58, 2-ka., Seongsoo-dong, Sungdong-ku, Seoul
Tel: 82/2/46l-3131
Contact: Mr. KIM Chul Nam, President

Hyundai Glass Co., Ltd.
18-24, Kayang-dong, Kangso-ku, Seoul
Tel: 82/2/664-3960
Contact: Mr. WOO Je Aln, President

E. Aluminum Recycling

Chunil Metal Co., Ltd.
672, Pusan-dong, Osan City, Kyonggi Province
Tel: 82/0339/374-3580
Contact: Mr. KWON Soon Sun, President

Wooil Ind. Co., Ltd.
596, Hogye-dong, 88-2, Kokang-dong, Chung-ku, Pusan
Tel: 82/032/671-2755
Contact: Mr. LEE Sang Hee, President

F. Cloth Recycling

Hankang Textile Co.
85- 11, Woonam-ri, Eunhyun-myun, Yangju-kun, Kyonggi Province
Tel: 82/2/364-3939
Contact: Mr. SONG Chang Hak, President

Puyang Co., Ltd.
895-5, Paseo-ri, Hanam-eup, Milyang-kun, South Kyongsang Province
Tel: 82/2/391-5482
Contact: Mr. LEE Jung Hwa, President

V. RECYCLING BUSINESS OPPORTUNITIES IN SINGAPORE

Singapore is a city-state with a relatively small population of 3 million but a large and growing economy. It's 1996 gross domestic product was $93 billion and GDP per capita reached $30,500. Its GDP has been growing on average by nearly 8.5 percent annually. Singapore has developed into a strong production, service, financial, assembly and shipping hub for the Southeast Asian region. It serves as the regional headquarters for a large number of multinational corporations.

Environmental Situation

The industries that flourished in Singapore during the 1960's -- petroleum, timber, chemicals, textile dyeing and metal finishing -- discharged untreated wastes that polluted both the air and water. During the 1980's, Singapore's industries began to shift toward production of higher value-added products. As the structure of industry shifted Singapore experienced new discharges of insufIiciently treated wastes into the atmosphere, rivers and seas.[24]

The rapid pace of industrialization and development during the 1960s and 1970s made the Singaporean government sensitive to environmental issues earlier than those in most other Asian countries. It adopted effluent control laws in the 1970s and environmental public health regulations in the 1980s. The government issued a comprehensive blueprint for natural resource conservation and environmental protection in 1992 that seeks to make Singapore a "model green city" by the year 2000 and to develop advanced environmental technologies industries to make Singapore a regional "environmental technology center."

The government seeks to apply technologies that minimize waste production and that dispose of solid and liquid wastes cleanly and efficiently. It makes attractive tax incentives and financial assistance available to local enterprises and small industries to adopt green technologies at the same time that it is imposing and enforcing strict effluent, air emission and odor control requirements.

The government established the Ministry of Environment (ENV) in 1972 to recommend and enforce environmental laws and to contract for projects in odor control, sludge treatment and incineration. Although awareness of environmental problems is widespread in Singapore, the country is still behind the United States in the field of environmental technology. Thus, Singapore still offers a significant domestic market for environmental equipment and can serve as a gateway to the ASEAN region.

The ENV is responsible for environmental pollution prevention and control in Singapore. The department handles air and water pollution, hazardous substances and toxic wastes control, environmental planning and building development. Singapore requires factories and plants to obtain approval from the ENV's Pollution Control Division.

Solid and Recyclable Waste Situation

The city-state of Singapore collects more than 5,700 tons of refuse a day, about half of which is generated by households and businesses and half by industries.[25] Food and garden materials make up about 44 percent of Singapore's waste. About 28 percent is paper, cardboard and wood waste. Nearly 15 percent is plastics, textile and rubber materials and 13 percent consists of metals, glass and ceramics.

More than 2,000 firms in Singapore use or handle hazardous industrial chemicals and industrial and toxic waste disposal is a serious problem. The major sources of industrial wastes in Singapore are power stations, chemical factories, petroleum refineries, cement works and engineering works. Existing plants and factories either have their wastes treated on site or have them collected by private contractors for disposal. Private contractors collected about 1.16 million tons while the ENV collected 1.1 million tons in 1992.

ENV is burning all incinerable wastes in two existing incinerators and has a third under construction. Ash and non-incinerable wastes are disposed of at the landfill in Tampines, a site expected to be filled by 1998. Locating additional landfills is difficult because of the land shortage. The government is therefore seeking other means of reducing and disposing of wastes.

About 80 percent of industrial hazardous waste collected in Singapore by licensed collectors is recycled, reused, or sorted for valuable components prior to disposal. Among the most frequently recycled materials are spent solvents including chloroform, ethyl acetate, acetone, methylene chloride and toluene; photographic wastes such as spent fixers and bleaches, and spent etchants from the electronics industry.

Demand for Recycling Equipment and Recycled Materials

Singapore offers opportunities for recycling equipment for municipal and industrial waste. Also, the government actively encourages environmental companies to use Singapore as a base to market their technologies to the Southeast Asia region. Singapore's National Science and Technology Board has a US$ 1.2 billion incentives

and grant program for private companies to conduct research and development on energy and environment.

The U.S.-Asia Environmental Partnership and the U.S. Foreign and Commercial Service identify the following types of environmental equipment and services as the most promising for U.S. companies to export to Singapore:

- Soil remediation equipment and services
- Industry and household waste recovery and recycling equipment
- Toxic waste collection, treatment and disposal equipment
- Incineration technologies for medical and hazardous waste
- Industrial waste minimization technology
- Solvent recovery systems

As Table 6 indicates, the U.S. Embassy's Commercial Service in Singapore estimates that the import market for the industrial waste equipment exceeds $350 million a year and is growing at about 13 percent a year. U.S. companies supply about 35 percent of the industrial waste equipment imported into Singapore.

Table 6. Industrial Waste Equipment Market in Singapore

	Value ($US millions)			Average Annual Real Growth Rate
	1991	1992	1993	
Import Market	275	300	350	13%
Local Production	33	36	40	7%
Exports	113	130	135	9%
Total Market	196	206	255	14%
Imports from USA	68	79	85	7%

Source: U.S. Foreign and Commercial Service, 1994.

The United States enjoys the largest share of the environment market in Singapore because American technologies are estimated to be about 5 years ahead of Singapore firms in development. Major U.S. company competitors are firms Europe and Japan.

Markets are especially strong for suppliers of hazardous substances and toxic waste recycling and disposal equipment. Singapore firms produce only a small portion of the industrial waste treatment equipment that is needed in the country. Much of the domestic involvement in equipment production is in mechanical engineering design and the supply of electrical and mechanical components. The local industry has

limited capabilities in professional environmental engineering services. The U.S. Commercial Service in Singapore estimates that American companies provide the widest range of environmental technologies. In order to promote U.S. exports to Singapore the United States-Asia Environmental Partnership (US-AEP) recently set up an office there to assist American environment firms.

Although local importers continue to look to US firms as their as their main suppliers some complain that American firms do not respond fast enough to their enquiries and that they can often obtain price quotations more quickly from European and Japanese firms.

Entry Channels

The U.S. Commercial service advises American companies that want to do business in Singapore to establish a local presence. Although sales can be made through contracts between buyers and sellers, much of the business done in Singapore is through face-to-face interaction and long-standing good relationships. About 150 companies in Singapore deal with industrial waste products and services. Equipment is usually imported from several countries by distributors who sell directly to dealers or end-users.

Singapore is virtually a duty free port. There are few trade barriers and the Singapore Government does not interfere in relationships between U.S. manufacturers and Singaporean agents and distributors. The government does encourage joint ventures between local firms and foreign companies for products and services involving technology transfer and it provides subsidies and tax incentives to foreign companies that take a 30 percent or more position in Singapore firms in “high tech” or creative businesses.

Joint ventures provide access to the local market and a network of contacts that is essential to long term growth in Singapore. Singapore has few restrictions on establishing a direct presence in the market. Many U.S. companies assigned staff to Singapore to handle local and regional business. But working with an distributor or an agent may be more cost-effective for smaller companies or those less experienced in foreign trade. Most Singapore distributors also have access to other Southeast Asian markets.

The U.S. Commercial Service in Singapore points out that letters of credit are usually acceptable payment terms for first-time business deals. Reliable end users and dealers are normally given credit terms from overseas suppliers. Japanese and European firms offer credit terms of 60 days or more to their best customers. U.S.

firms that do not want to offer credit terms can explore financing arrangements with discount houses.Singapore users will usually work with those suppliers that offer credit terms unless the product is proprietary, in high demand, or lower priced.

Key Trade Development Contacts

1. ***Government Organizations:***

Pollution Control Department
Ministry of the Environment
40 Scotts Road #12-00
Singapore 0922
Tel: (65) 73l-9658 Fax: (65) 73l-9651
Contact: Mr. Loh Ah Tuan - Head

Environmental Policy and Management Division
Ministry of the Environment
40 Scotts Road
Singapore 0922
Tel: (65) 73l-9446 Fax: (65) 73l-9651
Contact: Mr. Khoo Chin Hean - Director

United States-Asia Environmental Partnership
1 Colombo Court #04-07A
Singapore 0617
Tel: (65)3343141 Fax: (65)3341757
Contact: Ms Simone Altfeld - Director

Singapore Institute of Standards & Industrial Research
1 Science Park Drive
Singapore 0511
Tel: (65) 778-7777 Fax: (65) 778-0086
Contact: Kee Teck Koon - Director

2. ***Other Contacts:***

Chem-Solv Technologies Pte Ltd.,
29/31 Pioneer Sector 2
Singapore 2262
Tel: (65) 861-4277 Fax: (65) 861-8151
Contact: Ishar Singh Gill - Operations Manager

Colex Disposal
18A Jalan Tukang, Jurong Town
Singapore 2261
Tel: (65) 268-7711 Fax: (65) 264-1219
Contact: Mr. William Mak - Operations Manager

Pure Chemical Industries Pte Ltd.,
20 Gul Crescent
Singapore 2262
Tel: (65) 861-7975 Fax: (65) 861-5326
Contact: Edward Goh - Manager

Waste Treatment Engineering Pte Ltd.,
12 Benoi Place
Singapore 2262
Tel: (65) 861-2898 Fax: (65) 861-5677
Contact: Mr Lee Heng Choong - Managing Director

Malafon Technologies Pte Ltd
Blk 11 Marsiling Ind. Est. Rd 1 #0l-35
Singapore 2573
Tel: (65) 368-8233 Fax: (65) 368-8200
Contact: Mr. Vincent Gan - Managing Director

Novo Technology Development (NTD) Pte Ltd
1 Science Park Drive
Singapore 0511
Tel: (65) 772-9691 Fax: (65) 778-0437
Contact: Mr Chris Ong - Senior Business Development Executive

Technochem Manufacturers Pte Ltd
23 Tuas Avenue 11
Singapore 2263
Tel: (65) 862-3130 Fax: (65) 861-1873
Contact: Mr. Robert Lim - Operations Manager

Ong Kah Hoe Industrial Pte Ltd
7 Liu Fang Road
Singapore 2262
Tel: (65) 262-1229 Fax: (65) 261-5306
Contact: Mrs Ong Chwee Phong - Managing Director

Islandwide Disposal Services
23 Chu Yen Street
Singapore 2366
Tel: (65) 760-4457 Fax: (65) 468-1085
Contact: Mr. H. Basant - Operations Manager

Cleanway Disposal Services Pte Ltd
45 Shipyard Road
Office Unit No. 4A, Jurong Marine Base
Singapore 2262
Tel: (65) 264-4411 Fax: (65) 264-0715
Contact: Mr Jimmy Chong - Operations Executive

Waste Management Pte Ltd
23 Jalan Buroh
Singapore 2261
Tel: (65) 268-5338 Fax: (65) 268-5584
Contact: Mr Tan Kang Leong - General Manager

VI. RECYCLING BUSINESS OPPORTUNITIES IN INDONESIA

Indonesia is a multi-island country with the fifth largest population in the world. In 1990 Indonesia had more than 196 million people. Its gross domestic product reached $87 billion in 1996 and GDP has been growing by more than 6 percent a year. Although still a relatively poor country with a GDP per capita of $1,135, Jakarta and other large cities have growing middle income groups concerned with environmental issues.

Environmental Situation

Indonesia's rapid economic growth and industrialization have generated serious environmental problems, especially in the densely populated cities and towns. Indonesia faces severe environmental problems in water quality and availability from the strains on water resources brought about as the result of rapid population growth, continuing rural to urban migration, and increasing industrialization. The widespread dumping of untreated municipal and industrial wastes has, at the same time, degraded water quality. More than half of the rivers on the island of Java, where more than 60 percent of Indonesia's 196 million people live, are now highly polluted.

As a result of these problems, the Indonesian Government is giving high priority to solid waste and water pollution control and to requiring environmental impact assessments (EIAs) for new projects. EIAs are now required for all new projects and for those existing facilities producing toxic or hazardous wastes. The government is also making environmental law enforcement more stringent and enacting hazardous waste programs. In addition, it is giving higher priority to air pollution control, reversal of environmental degradation, sewage regulation, and the environmental effects of small-scale commercial and manufacturing activities.

Some large environment projects are planned or are being implemented with grants and loans from the World Bank, Canadian International Development Agency, Japan International Cooperation Agency, United Nations Development Program, U.S. Agency for International Development, the governments of Germany, Sweden, Australia, Belgium and the Netherlands, and the Asian Development Bank.

A central government environmental protection agency (BAPEDAL) was created in 1990 to coordinate environmental regulations pursuant to Presidential Decree No. 23/1990. BEPEDAL has authority over environmental regulations in Jakarta, but actual monitoring and enforcement are implemented at the provincial level.

Because Indonesia is relying more heavily on non-oil exports to sustain economic growth, many of its export products must meet ISO 9000 and ISO 14000 standards. Regional and international trade agreements are putting increasing pressures on Indonesian manufacturers competing in world markets to become more conscious of environmental concerns.

Demand for Recycling Equipment

Markets for environmental technologies are evolving quickly but the market for recycling equipment and services is still immature in Indonesia. Overall environmental awareness is still limited despite Indonesia's impressive economic growth, which has led to the emergence of a larger middle and upper class with stronger consumer power.

However, solid waste management problems are becoming more severe and particularly in the oil, chemical, electronics, electroplating, pulp and paper, textiles, leather tanning, and leather products industries. Opportunities exist for ambitious and persistent North Carolina companies to position themselves in what will inevitably be a growing market for industrial waste reduction, recycling and reuse.

Among the waste management products for which markets now exist are:[26]

- Industrial waste minimization and reclamation technology
- Toxic and hazardous waste management technology
- Landfill containment technology

American equipment is generally well received for its quality. However, many Indonesian customers view U.S. products as expensive and difficult to obtain quickly due to long shipping times. Technology from Taiwan Korea, and China is usually less expensive and can be obtained more quickly.

The U.S.-Asia Environmental Partnership (USAEP) and the U.S. Department of Commerce note that although significant opportunities exist for American firms in the environmental area, the competition is already intense for the still relatively small market.*' Foreign competitors have already penetrated some segments of the Indonesian environmental market by establishing a local presence through a representative office or contracts with local agents and distributors. Australian, German, and Dutch companies are very active in Indonesia. Dutch and German companies have been in the Indonesian market for decades. All these countries, unlike the United States, provide flexible soft loans, foreign aid tied to national product procurement requirements, or concessionary financing to encourage

purchases from their companies.

Demand for Recycled Paper Products

One segment of the market that holds strong potential opportunities is in recycled paper feedstock.The paper products industry has grown rapidly in Indonesia since the mid-1980s, driven by the consumption patterns of a growing middle class, the increase in Indonesian exports requiring paper and packaging materials, the expanding tourism industry, and the emergence of wholesale and retail markets for books and other goods made from paper[28]. Industrialization and improved methods of processing and packaging foods are also leading to an increasing demand for paper products. More families now use sanitary, tissue and napkin papers. The use of paper is increasing in both government and private offices. Currently, Indonesians spend about $2.0 billion annually on paper products.

Indonesia now has about 50 paper mills (with about 3 million tons a year of production capacity) and 25 are under construction or expansion. Large amounts of paper pulp and waste paper are needed to meet growing demand. In 1992 paper manufacturers used 2.3 million tons of paper pulp and 1.2 million tons of waste paper. The demand for waste paper and related materials is increasing by about 20 percent a year and is likely to continue doing so through the end of the 1990s.

The total market for paper products in Indonesia in 1992 was more than $823 million. About 54 percent, or $446 million worth of materials and products, were imported. Imports of paper materials are increasing at about 15 percent a year. In 1992, Indonesia imported about $190 million worth of paper pulp and waste paper from the United States. Indonesia has also become an exporter of paper and packaging products. Exports of paper products grew to $278 million in 1992 and are increasing by 15 percent annually. (See Table 7.)

Only about 25 percent of the recycled paper needed by Indonesian paper manufacturers is supplied by domestic waste paper collection.[29] The volume of imports for waste paper increased from 225,418 tons in 1987 to 882,493 tons in 1992. It is likely that total domestic collection of waste paper will increase annually, especially for newspapers, periodicals and other publications.

The United States is the major source of pulp paper and waste paper materials for Indonesia. American companies supply more than 42 percent of the Indonesian market, followed by Canada (11 percent); Taiwan (11 percent) and New Zealand (7 percent). Other competitors include Singapore; Sweden; the Benelux countries; Brazil; and Australia.

Table 7. Paper Pulp and Waste Paper Market in Indonesia.

	U.S. $ MILLIONS			
	Year 1990	Year 1991	Year 1992	Est. Avg. Annual Real Growth - Next 3 years
Import Market*	268.1	286.0	446.3	15%
Local Production**	308.0	294.0	393.0	
Exports***	74.9	61.1	51.6	
Total Market****	531.2	551.9	823.4	15%
Import from U. S *	94.3	113.3	190.5	

Source: U.S. Embassy, Jakarta, 1994.
*Value of both imported paper pulp and waste paper;
** Value of locally produced paper pulp only;
*** Value of exported paper pulp (export of waste paper is nil.
**** Value of all paper pulp, and all imported and domestically collected waste paper used in domestic manufacturing of paper products.

Currently the largest users of paper pulp and waste paper are paper manufacturers that produce cultural paper, newsprint, industrial paper, tissue paper and the like. Paper factories range in size from small to large and include both Indonesian and national and multinational companies. Some are integrated manufacturing plants that cultivate wood pulp trees, process wood pulp, and manufacture paper products. Most factories supply the domestic market, but some specialize in export products.

Based on information collected by the U.S. Embassy and the U.S. Department of Commerce, the following individual raw materials for producing paper (specifically paper pulp and waste paper) appear to have good sales prospects in Indonesia through the end of the 1990s.

- Chemical wood pulp, soda or sulphate, unbleached;
- Waste of paper and paperboard of unbleached kraft paper for paper making purposes;
- Other waste paper for paper making purposes;
- Mechanical wood pulp;
- Waste of scrap paper and paperboard of other paper for paper making purposes;
- Unsorted waste and scrap for paper making purposes;
- Chemical wood pulp, sulphite, unbleached;

- Chemical wood pulp, soda or sulphate, bleached;
- Chemical wood pulp, soda or sulphate, unbleached;
- Cotton linters pulp;
- Chemical wood pulp, sulphite, bleached;
- Semi-chemical wood pulp; and
- Pulp of other fibrous cellulose materials.

The total weight and import value paper pulp and waste is presented in Table 8. The cheaper price of foreign paper pulp products has been the main reason for continuing imports from abroad. Waste paper imports are growing for three main reasons: 1) the price level is attractive; 2) there is a limited domestic collection; and 3) there is growing use of waste paper for producing specific paper products such as newsprint in Indonesia. It is estimated that there will be an annual average 15 percent increase in waste paper imports through 1996.

In 1993, the Indonesian Government's Capital Investment Board ceased granting permits to establish paper pulp plants that use wood fibers as raw materials in response to pressures from local and international environmental protection groups against further exploitation of Indonesian tropical forests.

Table 8. Weight and Import Value of Paper Pulp and Waste Paper in Indonesia

Year	Product	Volume (tons)	Value (US$000)	Growth (Percent)
1987	Pulp	267,977	154,142	–
	Waste paper	225,418	52,615	–
1988	Pulp	247,374	178,752	(7.7)
	Waste Paper	323,733	77,178	43.6
1989	Pulp	287,221	223,072	16.1
	Waste Paper	381;653	88,178	17.9
1990	Pulp	297,857	176,690	3.7
	Waste paper	463,472	91,329	21.4
1991	Pulp	337,878	187,192	13.4
	Waste Paper	551,204	98,878	18.9
1992	Pulp	576,869	297,238	70.7
	Waste paper	882,493	149,124	60.1
1993*	Pulp	675,000	300,000	17.0
	Waste Paper	795,000	140,000	(9.9)

Source: U.S. Embassy, Jakarta, 1994.
Note: * estimate; percentage growth based on import volumes.

Factors influencing the purchases of paper pulp products include selling price, quality, and service and "brand name." The relatively high prices of domestic products drive the mills' import of foreign products. In terms of sales and service, local users are attracted by favorable terms of payment such as deferred payment and punctuality in delivery. The importance of "brand" results from the practice of importing particular products that customers have used for a long time.

The most important competitive factors in the import of waste paper are: 1) price level, 2) quality, 3) homogeneity of collected waste paper, 4) continuity of supplies, and 5) willingness of exporters to settle trade complaints about the quality of imported goods.

Although U.S. products are generally well-received, some Indonesian importers complain about the unwillingness of U.S. suppliers to deal effectively with their dissatisfaction with quality or homogeneity of collected waste paper. These trade disputes may cause Indonesian importers to shift their orders to suppliers from other countries.

Entry Channels

The U.S. Department of Commerce's International Trade Administration advises that the keys to doing business successfully in Indonesia are patience and a partner. Developing business relationships and alliances in Indonesia may mean as much as if not more than having good technology, equipment or services. Small- and medium-sized companies interested in doing business in Indonesia can receive assistance from the U.S.-Asian Environmental Partnership technical representative office, which can help these companies to learn about the complexities of doing business in Indonesia.

There are no non-tariff barriers affecting the importation of paper pulp and waste paper to Indonesia. Import tariffs range from 0 to 5 percent import duty plus a 10 percent import sales tax.

Paper pulp and waste paper materials are usually imported directly by the paper industry or by agents or distributors. End users or distributors both usually search for the best prices using *Indo Chemical*, a bi-weekly survey publication for chemical and related products or their own contacts in the paper industry. Indonesian importers will often shift their orders to companies in those countries providing paper pulp and waste paper materials at the best prices and with the best service. End users and distributors that have already developed good relationships with particular suppliers abroad will usually stay with a satisfactory supplier that offers competitive prices and good service.

End users of paper pulp and waste paper usually pay in cash immediately or by deferred payment to distributors or wholesalers. Agents and distributors often stock large amounts of imported paper pulp and waste paper. Depending on the terms of the agreement between local agents or distributors and foreign exporters, some importers may offer cash down payments of 25 percent to 50 percent when the order is placed and final payment upon arrival of the shipment or at a fixed time after delivery.

North Carolina firms seeking to do business in recycling equipment or recycled materials should explore three major entry channels: sales through Indonesian representatives or agents, sales through contractual arrangements such as joint ventures or licensing, and sales to the government.

1. ***Representatives and Agents.*** Under Indonesian law foreign firms cannot directly market their products to customers in Indonesia. With a few exceptions, all foreign products must be marketed through Indonesian agents or distributors. Foreign firms can be involved primarily through the assignment of foreign technical representatives to the local firm.

Import and export and wholesale and retail distribution activities are generally reserved for Indonesian companies (51 percent Indonesian ownership). North Carolina firms can open local representative offices with the approval of the Indonesian Department of Trade. The representative may be an Indonesian company or individual or a foreign national, but only one trade representative office per firm is permitted. Trade representatives cannot engage in direct sales but can promote and market products or provide market research and technical advice.

In order to establish a representative office, a firm must obtain a business permit from the appropriate Government agencies. Several government agencies may be involved in issuing a business permit, depending on the nature of the business. Foreign companies may open a representative office by submitting a business permit to the Indonesian Department of Trade, If the application is approved, the Department makes recommendations to the Immigration Office of the Department of Justice to obtain a “stay permit” and to the Indonesian Department of Manpower for the “work permit”.

The services of an aggressive agent will be an important means for North Carolina recycling firms to enter the market and expand sales in Indonesia. Representative offices of many foreign companies have established close connections with Indonesian national importers. The Indonesian company acts as an import distributor

for overseas principals and the foreign company promotes products and, if necessary, provides technical assistance.

The U.S. Commercial Service points out that Indonesian importers usually do not specialize in particular product lines. Agent agreements should be developed with firms that handle a complementary range of products.

In Indonesia, agents, unlike representative offices, can perform all trade activities and can have several offices throughout the country. Agents can also work with or employ expatriates after they are appointed by foreign firms that set up representative offices in Indonesia.Such an arrangement allows foreign firms legally to gain more direct control over the marketing and sale of their products. A separate agreement between the expatriate personnel and the foreign employer may be necessary to regulate this relationship. The tax liability of the foreign firm is limited to the income tax of the expatriates assigned to the representative office, while any other taxes are borne by the agent.

2. ***Management Agreements.*** Cooperation under a management agreement allows the foreign company in Indonesia to play a more active role. Three types of management agreements are permitted in Indonesia:

- A ***technical assistance*** agreement limits the foreign firm's function to providing technical assistance to the Indonesian company.

- A ***management agreement*** allows foreign firms to manage the company or a division within the company.

- A ***management agreement coupled with a financial agreement*** allows a foreign firm to finance the Indonesian operation, either under the name of the Indonesian company or a division of it.

Remuneration to the foreign company can be in the form of a fixed fee, a commission, or profit-sharing. The fee arrangement must be described clearly in the agreement, and it must be applicable under the present Indonesian laws. In order to protect their interests properly North Carolina firms must draw up a bona fide and comprehensive agreement with Indonesian agents.

2. ***Joint Ventures and Licensing.*** The Indonesian government lifted most requirements for domestic equity and joint ventures in 1994. Those who opt for 100 percent initial ownership must divest some share, as little as 1 percent, after 15 years.

This can be accomplished through the stock market.

North Carolina recycling firms interested in joint venturing should seek a partner that has strong business skills, a broad knowledge of local markets, and an extensive network of contacts. Selection of a partner should be done carefully because partnerships in Indonesia are difficult to dissolve. Indonesians place great importance on personal relationships and mutual understanding. Thus successful partnerships are based more on genuine accord than on a written contract. A licensing or joint venture agreement should be clearly understood by both sides. Conflicts over contracts can cause serious operating problems.

It is generally difficult to obtain references and credit information on Indonesian companies. Banks, advisory companies, the American Chamber of Commerce in Indonesia (AMCHAM), and the U.S. Embassy Commercial Service (World Traders Data Report) can provide some assistance.

Licensing arrangements may be more cost-effective than joint ventures for less experienced North Carolina companies that seek to do business in Indonesia, but the same cautions apply.

3. ***Sales to the Government.*** Although many products can be sold to the government through direct negotiations, North Carolina firms are likely to be more successful with the services of an Indonesian agent or distributor. Projects that are to be undertaken each year are listed in the "Blue Book." The list is published annually by the National Planning Agency (BAPPENAS) and is the official list of projects that can be considered for allocation of export credit financing, among other things. Virtually all of the projects listed in this book request "soft loan" (low interest rate) financing.

Projects listed in the Blue Book have already been formulated and developed, however, often with the assistance of local agents and foreign suppliers of specific products or services. Listing in the Blue Book may mean that a specific firm has already participated in the development process and therefore may have an inside track on obtaining the procurement. North Carolina firms interested in sales to the government must have an agent that is well connected to appropriate government agencies or the firm should have a presence in Indonesia to assure that its products are included in the specifications when a project is being developed.

Key Trade Development Contacts

1. Indonesian Pulp & Paper Association (AIKP)
   Jalan Cimandiri No. 6 Flat I/2
   Jakarta Pusat, Indonesia

2. Indonesian Packaging Institute
   Jalan Cikini Raya IV/8
   Jakarta 10330, Indonesia
   Contact: Mr. Soedono Soemardi, Officer
   Fax: 62-21-333663

3. Association of All National Importers (GINSI)
   Jalan Kesejahteraan No. 98
   Arena Jakarta Fair
   Jakarta Pusat, Indonesia
   Contact: Mr. Daryatmo, Chairman
   Telex: 46793 GINS1 IA

4. Association of State-owned Trade Enterprises
   c/o PT. Dharma Niaga
   Jalan Abdul Muis 6-10
   Jakarta Pusat, Indonesia

5. Federation of Food Processing Industries
   Jalan Pulo Mas 31
   Jakarta 13210, Indonesia

6. Aneka Baru Kertas (distributor)
   Jalan Daan Mogot KM l0/22
   Jakarta Barat, Indonesia

7. P.T. Jayasejati Purapratama (distributor)
   Jalan Kalibesar Barat No. 38-B
   Jakarta Barat, Indonesia

8. C.V. Aqua Mas (distributor)
   Jalan Sunan Giri 1
   Jakarta 13220, Indonesia
   Fax: 62-2l-489-3344

9. P.T. Basarindo Buana Tama (distributor)
Jalan Karet Pasar Baru I/97-A
Tanah Abang, Jakarta Pusat, Indonesia

10. P.T. Buana Paja Utama (distributor)
Pusat Tekstil Mangga Dua Blok C III/26
Jalan Mangga Dua
Jakarta 14430, Indonesia
Fax: 62-21-601-3300

11. P.D. Jaya Baru (distributor)
Jalan M.T. Haryono 104
Semarang, Indonesia
Telex: 22300 JABAR SM

12. P.T. Mas Djawa (distributor)
Jalan Raya Jakarta-Bogor KM 3
Cimanggis, Jakarta Timur, Indonesia

13. P.T. Eseco Jaya (distributor)
Jalan Gajah Mada 16-K
Jakarta Pusat, Indonesia
Fax: 62-21-380-8883

14. P.T. Galih Karang Sari (distributor)
Jalan Tebet Timur Dalam III-F 4
Jakarta Selatan, Indonesia

15. Jaspis Trading Co. (distributor)
Jalan Veteran No. 1
Surabaya 60175, Indonesia
Fax: 62-03l-23612

16. P.D. Karunia Baru (distributor)
Jalan Kenari 3 G -357
Jakarta Pusat, Indonesia
Fax: 62-21-417-369

VII. RECYCLING BUSINESS OPPORTUNITIES IN THAILAND

Thailand has one of the fastest growing economies in Asia. In 1996 it had a gross domestic product exceeding $177 billion and a population of more than 61 million. Thailand's GDP per capita is about $3,000. Its economy has been growing by more than 8 percent a year for most of the 1990s.

Environmental Situation

Because of its high rate of economic growth, its rapid transition from an agricultural to an industrial and service economy, and intensive urbanization, Thailand is experiencing serious environmental pollution and natural resource degradation.

Since 1991 the government has given more serious attention to environmental protection, making a special budget of US$240 million available for all provinces through the Office of Policy and Planning (OPP) of the Ministry of Interior to propose and implement local activities.

In 1992, the Royal Thai Government enacted a comprehensive "National Environmental Quality Act," that updated a wide array of environmental regulations and increased penalties for pollution.[29] The new law upgraded to cabinet status the National Environmental Board by absorbing it into the Ministry of Science, Technology, and Environment (MOSTE) and designated the prime minister as the chairman of the National Environmental Committee. The law created two new funds - one for environmental management and the other for energy conservation -- to help businesses and individuals to meet the costs of higher environmental standards. The new law gave the government power to create emissions standards for industry and to increase the penalties for pollution to include jail terms and fines as high as two million baht (nearly $80,000).

Underlying the new emphasis on enforcement was the adoption of the "polluter pays" principle which imposes the costs of pollution control and cleanup directly on those organizations responsible for pollution. The legislation also allows local administrative agencies such as sanitary districts and municipalities to license the private sector to operate central waste treatment facilities for industrial and household waste.

Large industries are required to install waste disposal equipment that meet the standards of the Ministry of Science, Technology and Environment and to submit

environmental impact reports prepared by qualified engineers prior to beginning construction. At the same time, the government updated and strengthened the Hazardous Substances Act to control the importation, production, use, and disposal of poisonous wastes and modified the Factories Act to increase penalties under the "polluter pays" principle against industrial plants that emit pollutants.

Although lax enforcement of environmental regulations is often correctly attributed to inadequate manpower and budgets in the environmental protection agencies, it is also difficult to enforce the penalties such as imprisonment and fines because Thai culture tends to avoid litigation and courts are used only as a last resort. However, increasing adverse publicity resulting from Thailand's environmental degradation, both within the country and internationally, has begun to make government agencies and private companies operating in Thailand more sensitive to the need for more active prevention and cleanup programs.

As a result of increased public attention to the adverse effects of environmental degradation, both the government and the private sector have begun to take actions to increase public awareness of environmental issues and offer incentives for individuals and companies to adopt environmentally safer practices.

Solid and Hazardous Waste Situation

Municipal solid waste management is a growing problem in Bangkok and the provinces. Bangkok alone generates more than 7,000 tons of solid waste a day and by the end of the decade this amount is projected to increase to 10,000 tons a day. As much as 20 percent of the solid waste generated in Bangkok is being left in the streets or dumped illegally. Increasing property values and congestion make it more difficult to locate acceptable waste disposal sites in Bangkok and other major cities. In order to solve the growing solid waste disposal problems in Thailand's cities, government and industry must use more effective and efficient technologies in all stages of solid waste management, including waste recycling, cornposting, and incineration. The government is also considering privatization of municipal solid waste projects in Bangkok and other cities.

Rapid industrialization and urbanization have exacerbated the problems of disposing of solid waste. Industries in Thailand now generate more than 2 million tons of solid hazardous waste a year, and most of it is from heavy metal sludge and solids.[30] Only about 10 percent of all solid waste in Bangkok goes completely uncollected; but much that is collected is improperly disposed of, and more than half of the collected waste is merely left to decompose.[31] One of Bangkok's

landfills has already closed, and two others will quickly reach capacity. About one-quarter of all solid wastes are dumped into the streets, on vacant land, or in canals and drains.

Thailand has invested little in toxic-waste treatment facilities, and its existing plants can handle only about 4 percent of all of the toxic wastes that are produced and dumped in the country. Yet, nearly one-third of Thailand's more than 60,000 registered factories produce at least moderate amounts of hazardous waste, and the number doing so is growing.[32] More than 120,000 small industrial and manufacturing operations in Thailand -- including numerous informal sector enterprises -- generate more than 2 million tons of hazardous waste a year. Oil, organic sludge, acid waste, heavy metal sludge, and municipal and medical wastes are deposited into rivers, canals, illegal landfills, and uncontrolled dumps.

The Government of Thailand now provides support for provincial waste management projects in pollution control zones throughout the country. It provides grants and soft loans from the U.S.$250 million Environmental Fund. Funds have been allocated to provincial governments in Pattaya, Samutprakam, Phuket and Haadyai, and the government also plans in the near future to open the Fund to private sector industrial pollution projects.[33]

Demand for Recycling Equipment and Recycled Materials

Thailand offers one of the potentially fastest growing new markets for environmental companies.[34] Currently, the market for pollution-control equipment alone in Thailand is estimated at more than $210 million a year and is expected to grow by 20 percent to 25 percent annually until the year 2000, when spending in this segment of the industry is likely to reach $1.5 billion. Moreover, the government of Thailand, recognizing the adverse impacts that environmental pollution, hazardous waste problems, and environmental degradation are having on the Thai economy and on the health of the Thai people, has committed itself to investing in environmental protection facilities.

Thai officials estimate the demand for all types of environmental technology and services at nearly $10 billion over the next decade, including $3 billion for energy efficient products, $2 billion each for municipal water supply and vehicle air pollution equipment, and more than $2.5 billion for municipal and industrial wastewater treatment facilities, industrial air pollution, and solid and hazardous waste disposal.[35]

More than US$200 million will be needed for waste treatment plants in Bangkok alone, and about US$50 million in 12 other cities. The Ministry of Industry plans to invest about US$l60 million in developing 7 industrial waste and 3 hazardous waste treatment facilities in major industrial parks around the country.

1. *Solid Waste Treatment and Disposal Systems*

The following opportunities exist for North Carolina companies to provide equipment and services for solid waste management.

- Collection and transportation operations and management
- Waste recycling systems
- Composting and reprocessing systems
- Waste separation and volume reduction equipment
- Incineration systems and equipment
- Management of solid waste collection and transfer stations

It is important that waste recycling equipment that North Carolina firms offer in Thailand be appropriate to local conditions. Household solid waste in Thailand contains mostly organic matter with average moisture content of 60 percent or 70 percent and for which composting is an appropriate technology. Because of the high cost of land in and near Bangkok, two of the Bangkok Metropolitan Area's transfer stations - On-nut and Nong-Klaem - have composting systems to reduce the volume of solid waste sent to landfills.

2. *Plastic Materials and Resins*

Although Thailand produces plastics and resin materials, domestic supply is not sufficient to meet demand and Thai manufacturers import substantial amounts of plastic resins to meet local needs. U. S. companies are major sources of supply.

Firms that are members of the Thai Plastic Industries Association are upgrading and expanding processing technology and broadening the product mix to include, in addition to traditional household goods, such products as sophisticated electronic goods, automobile parts, and other industrial products of higher value-added content. Since the early 1990s, Thailand has produced basic PE, PP, PS and PVC resins, but demand exceeds the domestic supply and imports are an important source of raw materials. The most promising sectors are polypropylene in primary forms and polypropylene copolymers.

The U.S. Department of Commerce identifies the need for the following items in Thailand:

- Polyvinyl chloride in primary forms
- Polyethylene with a specific gravity of less than 0.94 in primary forms
- Polyethylene in primary forms, haying a specific gravity of 0.94 or more
- Acrylonitrile Butadiene Styrene (ABS) copolymers in primary forms
- Polypropylene in primary forms
- Propylene copolymers in primary forms
- Epoxide resins in primary forms
- Saturated polyallylesters and other saturated polyesters in primary forms
- Phenolic resins in primary forms
- Polyurethanes in primary forms
- Melamine resins in primary forms
- Polyethylene terephthalate (PET) in primary forms
- Silicone in primary forms

Table 9 estimates the demand for plastic resins from 1991 through 1996. Imports of plastic resins from the United States is estimated at more than $200 million in 1996 and the total market exceeds $2.5 billion.

Table 9. Demandfor Plastic Resins in Thailand, 1991-1996.

	($USMillions)			(Percent Gain/Loss)
	1991	1992	1993	Est. Avg Annual Real Growth-Next 3 Years
Import Market	587.0	704.4	845.3	20%
Local Production	696.6	780.2	873.8	12%
Exports	124.9	137.4	151.1	10%
Total Market	lJ58.7	1,347.2	1,568.0	20%
Imports from U.S.	87.8	105.4	126.5	20%

Source: Royal Thai Government Customs Department, 1993.

Plastic resins are used by more than 3,000 plants in Thailand to produce bottles, automobile spare parts, television cabinets, softdrink cases, office supplies, furniture,

battery cell cases, containers, artificial flowers and trees, artificial leather, floor coverings, shoes, toothbrushes, bags, and other household utensils. About 70 percent of these products are used domestically and the remaining 30 percent are exported.[37] The United States is Thailand's largest supplier of PVC and PP in primary forms and provides substantial amounts of PE and ABS.

Entry Channels

North Carolina recycling firms can enter the Thailand market through 1) distribution and sales agents, 2) joint ventures or licensing, or 3) sales to the government.[38]

1. ***Distribution and Sales Agents.*** North Carolina firms seeking to export or do business in Thailand can use three main entry channels for sales and distribution in the private sector:

a. ***Trading Companies.*** Among the most important channels of distribution are well-established trading companies with a strong presence in the industrial sector, strong financial resources and high sales volumes. Among the trading companies through which North Carolina recycling companies might distribute their products are the Thai organization, Berli Juker, the U.S. firm, Louis T. Leonowens, and European trading companies such as B. Grimm, Diethelm, East Asiatic Company, FE Zuellig, and Inchcape. Most of these large trading companies have formed marketing or production joint ventures with foreign firms. They also have a network of sub-dealers or agents who possess the requisite contacts or expertise to market specialized equipment or products.

b. ***Specialized Small Imports.*** Another entry channel in Thailand is through smaller importers who specialize in one line of products for which they have strong local networks and market know-how.

c. ***Start-up Import Companies.*** The third channel of entry into Thai markets is through start-up companies that are just learning the import and distribution business and that may be able to place recycling products in niche markets.

Agreements between U.S. suppliers and Thai agents or distributors are governed by general contract law, the "Thailand Civil and Commercial Code." The agreements usually form a buyer-seller relationship under a sale of goods contract. The Thai Revenue Code allows the supplier to avoid any tax liability. The Thai agent or distributor is responsible for applying for any licenses that may be necessary to

import products.

North Carolina recycling firms seeking to do business in Thailand should use agents or distributors with good local contacts, market expertise, and technical know-how. They will have to invest sufficient tune to identify and select a qualified agent and provide whatever training for marketing and technical support staff that may be necessary. They must also keep in close contact with their Thai representatives, especially in the initial stages, in order to build a good working relationships and ensure that their agents share their values and goals.

The U.S. Commercial Service at the U.S. Embassy in Bangkok provides assistance in locating potential representatives and acquiring preliminary market data. Commercial Service staff can also help North Carolina firms to identify reputable local consultants to help design market entry strategies and recommend local business partners. The services of a local attorney are required for executing distributorship agreements and setting up offices in Thailand. Local lawyers are needed for registering patents and trademarks and for taking other legal measures to protect a product from intellectual property right infringement. The U.S. Commercial Service office at the American Embassy in Bangkok can provide a list of Thai lawyers and American legal consultants who specialize in commercial law.

2. ***Joint Ventures or Licensing.*** North Carolina recycling firms that are more experienced in international business can enter the Thai market through joint ventures and licensing agreements. Local production is an appropriate entry channel into Thailand for those North Carolina firms that seek to overcome costly freight charges, import restrictions, or competition from cheap local goods. The U.S. Commercial Service reports that many Thai firms actively seek U.S. joint venture partners who bring technical, marketing, and management skills to a business relationship. Thai firms can bring to the partnership the capital, local vendor and government contacts, and established business relationships that are essential to success in the Thai market.

The U.S.-Thai Treaty of Amity and Economic Relations of 1966 grants U.S.-majority-owned businesses incorporated either in the United States or Thailand equal treatment with Thai corporations. North Carolina firms can establish wholly-owned subsidiaries or branch offices in Thailand without the constraints that other foreign firms face from Thailand's "Alien Business Law." To register under the Treaty of Amity, a North Carolina firm should file an application with the Department of Commercial Registration at the Thai Ministry of Commerce.

3. ***Selling to the Government.*** The U.S. Commercial Service advises that

the key to successful bidding on Thai government contracts and supply tenders is to have a reputable local representative with good access to the procuring agency and knowledge of specific requirements. Foreign firms will find it difficult to win a government project without such an intermediary. Agents can provide early information before the tenders are issued and can ensure that their principal's product is specified.

The "Prime Minister's Procurement Regulations" govern public sector procurement in Thailand. These regulations require that non-discriminatory treatment be accorded to all potential bidders. They do, however, provide preferential treatment to domestic suppliers who receive an automatic 15 percent price advantage over foreign bidders in initial round bid evaluations. The specific laws that apply to international tenders are Regulations 87 and 89, which generally adhere to established international procedures.

In awarding contracts for projects, both the Bangkok Metropolitan Authority and the Department of Public Works are required by law to select the lowest bid that meets their requirements. However, this process is not always transparent. Foreign companies that are involved in development stage of a project generally get preference over other competitors when the project is bid.

4. ***U.S. -Thailand Development Partnership.*** North Carolina firms seeking markets in Thailand may be able to receive assistance through the U.S.-Thailand Development Partnership initiated by the U.S. Agency for International Development (USAID) and managed by the Frank Hawkins Kenan Institute of Private Enterprise at the University of North Carolina--Chapel Hill and the Kenan Institute Asia. The Partnership focuses on the environmental sector in Thailand, one of the fastest growing economies in the world. The Partnership helps identify environmental needs and opportunities for which U.S. businesses possess relevant and commercially transferable technologies and know-how. The Partnership uses relatively small but critical amounts of dollars to leverage this technology and know-how to address these environmental needs through joint projects and commercial linkages between American companies and their Thai partners or customers. The Partnership neither finances nor manages the projects; this is done by the partners themselves. Instead, the Partnership assists with and shares the cost of project development, market research, match-making, technical assistance, training, and technology demonstration,

Partnership projects are typically proposed by the private-sector organizations that will carry them out. Each request for funding is fully reviewed by the Partnership

Secretariats in the United States and Thailand to ensure that it directly and effectively addresses an important environmental problem and provides mutual benefit to Thailand and the United States in increasing jobs and trade. The Partnership elicits most of the shared costs from the firms and assures that the proposals are commercially sustainable following fund seeding. For larger grants, the Partnership seeks to recover its costs. Technical, managerial, and due-diligence reviews must be conducted for each project approved by the joint Kenan Institute-USAID-Royal Thai Government Working Group, which meets bi-weekly in Bangkok. As a general rule, the Partnership supports only U.S. firms with an established track record and a proven commercially transferable product or service.

Most Partnership grants help U.S. companies and their Thai partners to carry out technical assistance and training activities that support their joint commercial activities and provide immediate development impact. Other Partnership matching grants support technology demonstration and testing, project development, or other activities that cement relationships and help get joint activities off the ground. Assistance is available for joint ventures, licensing agreements, distributorships, major sales, and contracts involving American firms.

The Partnership brings the firms together and helps them plan joint activities, but the technology transfer activities funded by matching grants are carried out directly by the parties involved. Together with the cost-sharing requirement, this method of operation greatly increases the number of activities that can be carried out, speeds up implementation, and strengthens the linkage to ongoing, sustainable commercial activities. The Partnership plays a vital role in cementing relationships, keeping projects on track toward implementation, complying with Thai laws and regulations, and resolving difficulties encountered along the way. The business skills of the Partnership managers and the businesslike principles under which they operate create a management. environment in which unpromising projects are weeded out and viable activities are brought forward quickly.

Since the first Partnership proposals were approved in July 1994, more than 60 projects commercially transferring U.S. environmental technology to Thailand have been implemented using seed funds ranging in value from $10,000 to $150,000. Since July 1995, the Partnership has allocated $3.6 million to catalyze joint environmental ventures with the U.S. and Thai entities cost-sharing approximately $17 million to develop the projects. Partnership projects have introduced the first zero-emission electric vehicles to Thailand and supported Thailand’s first managed hazardous waste facility. They have assisted the siting of a nationwide network of

wastewater facilities, initiated a venture to convert Bangkok's garbage to energy, and introduced products reducing industrial air pollution.

North Carolina companies interested in competing in Thailand should establish a strong local presence. Thais prefer to deal face to face. In general, they rely less on written agreements and more on trust and mutual understanding. Successful competitors usually have a strong joint venture partner to assist with market entry and business development. A foreign company (or joint-venture) with an established presence in Thailand and a well trained Thai technical staff has a major competitive advantage over other foreign companies.

Key Trade Development Contacts

1. ***Thai Government Contacts***

Dr. Anuphan Ittharattana, Section Head
Domestic Waste Water Section
Pollution Control Department
Ministry of Science, Technology and Environment
Gypsum Metropolitan Tower, 17th Floor
53912 Sri-Ayudhya Road
Bangkok 10400
Tel: (011) (662) 642 5021 through 5024 Fax: (011) (662) 642 5025 and 5026

Mr. Pakit Kiravanich, Director General
Pollution Control Department
60/l Soi Pibulwatana 7
Thanon Rama IV
Bangkok 10400
Tel: (011) (662) 279 8552; 279 7180 -- 7189 Fax: (011) (662) 271 3226

Mr. Phaithoon Koolchai, Director
Waste Water Treatment Division
Department of Drainage and Sewerage
Bangkok Metropolitan Administration
173 Thanon Dinso
Bangkok 10200
Tel: (011) (662) 246 0316, ext. 2322

Mr. Mana Noppandh, Director

Department of Drainage and Sewerage
Bangkok Metropolitan Administration
173 Thanon Dinso
Bangkok 10200
Tel: (011) (662) 240 0270 and 0307, ext. 2300 and 2303

Mr. Kachomsak Wongprecha, Director
Department of Public Cleansing
Bangkok Metropolitan Administration
173 Thanon Dinso
Bangkok 10200
Tel: (011) (662) 245 2652, ext. 1233 and 1234

Mr. Prajaya Sutabutr, Director General
Public Works Department
218/l Thanon Rarna IV
Khet Phayathai
Bangkok 10400
Tel: (011) (662) 273 0879 Fax: (011) (662) 273 0887

Mr. Vichai Kunaratskul
Director of Sanitary engineering
Chiangmai Municipality
(Home) 84/99 Wangsingcome Rd.
Chiangmai 50000
Tel: (053) 252-478 (Office)
(053) 235-379 (Home)
01-851-5355 (Hand Phone)

Mr. Vichan Vongvivat, Director
Sanitary Engineer Division
Public Works Department
Ministry of Interior
Tel: (662) 281-1507 Fax: (662) 281-9053

2. ***U.S. Government Contacts***

Commercial Attache
American Embassy
US & Foreign Commercial Service
Diethelm Towers, Tower A, 3rd Floor
93/l Wireless Road
Bangkok 10110
Tel: (011) (662) 255 4365 through 4367;
252 5040 through 5049Fax: (011) (662) 255 2915

3. Private Firms

Acer Freeman Fox Consultants Ltd.
4th Floor, While Croup Building
75 Soi Rubia, Sukhumvit 42
Bangkok 10110
Business 662-391-7366-7 Fax : 662-381-1298
Business 662-3 92-6020

Mr. Kiat Sittheeamom, Managing Director
Pro-En Consultants and Management Co
2A/6A Ruam Rudi Building
566 Ploenchit Road
Bangkok 10330
Tel : 662-251-1052 Fax : 662-25l-2851

Appliance Technology Supply Co., Ltd.
713/57-8 Rama 3 Rd., Bangkok
Tel : 294-0146-9 ,284-2536 Fax : 294-2036

Boonyium & Associate Ltd.
3915-9 Srinakarin Rd.,
Suanluang Pravee, Bangkok
Tel : 322-1678-83, 322-4330 Fax : 322-4329

Kijja Consulting Co., Ltd.
143-145 Soi Thadeabarnnimitrail Rd.,
Bangkok
Tel : 569-5622, 591-4954 Fax : 591-4954
Dr. Padoong Torranin, Managing Director

Aggie Consult Co., Ltd.

2102/20-3 Ramkhamhang Rd.
Hua-Mark, Bangkapi
Bangkok 10240
Tel: (662) 374-0074
Fax: (662) 374-7018

Mr. David Tar-rant, Assistant Director, Corporate Advisory
The Brooker Group Ltd.
2nd Fl., Zone D, Room 201/2
Queen Sirkit National Convention Center
60 New Rachadapisek Rd.
Klongtoey
Bangkok 10110
Tel: (662) 229-3111 Fax: (662) 229-3127

Mr. Paul Wedel, Executive Director
Kenan Institute Asia
2nd Floor, Zone D, Room 201/2
Queen Sirikit National Convention Center
60 New Rachadapisek Road
Klongtoey, Bangkok 10110
Tel: (011) (662) 229-3128 Fax: (011) (662) 229-3130

Mr. Thomas A. Seale, Executive Director
American Chamber of Commerce ion Thailand
140 Wireless Rd.
P.O. Box 1l-1095
Bangkok
Tel: (662) 25l-92669-7,
251-1650 Fax: (662) 255-2454

4. ***Plastics Resins and Raw Materials***

Mr. Wang Choo-Ekawongse, President
Thai Plastic Industries Association
127/2 Soi Phaya Mai
Somdej Chao Phaya Road
Bangkok 10600, Thailand
Tel: (662) 438-9457-8 Fax: (662) 437-2850

Mr. Paotep Chotinuchit, Chairman

Plastic Industry Club
Federation of Thai Industries
394/14 Samsen Road
Bangkok 10300, Thailand
Tel: (662) 280-0951 Fax: (662) 280-0959

Mr. Kamolchai Pattarodom, President
National Petrochemical Corp. Ltd.
21st Floor, Sino Thai Tower
32/51 Soi Asoke, Sukhumvit 21
Bangkok 10110, Thailand
Tel: (662) 260- 131l-6 Fax: (662) 260 1318

Mr. Pala Sookwesh, Managing Director
Thai Olefins Corp. Ltd.
18th Floor, Pacific Tower Bldg.
21 Vibhavadi Rangsit Road
Bangkok 10900, Thailand
Tel: (662) 273-8 141-64 Fax: (662) 273-8167, 273-8168

Mr. Anuchin Suphon, President
The Aromatics (Thailand) Co., Ltd.
16th Floor, Pacific Place Bldg.
140 Sukhumvit Road
Bangkok 10110, Thailand
Tel: (662) 254-5720 Fax: (662) 254-5866

Country General Manager,
Dow Chemical Thailand Ltd.
75 Soi 42 (Rubia) Sukhumvit Road
Bangkok 10110, Thailand
Tel: (662) 381-1028 Fax: (662) 381-1523

Mr. Thirachai Ongmahutmongkol, President
Du Pont (Thailand) Ltd.
9th Floor, Yada Building
56 Silom Road
Bangkok 10500, Thailand
Tel: (662) 236-0026, 238-436H Fax: (662) 238-4396, 236-6798, 236-0027

Managing Director

HMC Polymers Co., Ltd.
14th Floor, Maneeya Center Building
518/5 Ploenchit Road
Bangkok 10330, Thailand
Tel: (662) 254-8294 Fax: (662) 254-8225

Mr. Niyut Krungvong, Managing Director
Inca Plastics (Thailand) Ltd.
342/l Ekamai Soi 20
Sukhumvit 63
Bangkok 10110, Thailand
Tel: (662) 391-1323, 381-0985 Fax: (662) 391-7318

Managing Director
Union Carbide Thailand Ltd.
6th Floor, Yada Building
56 Silom Road
Bangkok 10500, Thailand
Tel: (662) 235-4157-66 Fax: (662) 236-2746

Mr. Paisam Chatralakavanich, Director
Liack Seng Trading Co., Ltd.
18/l Soi Yen Arkas 3, Yannawa
Bangkok 10120, Thailand
Tel: (662) 287-2431, 287-1690-4 Fax: (662) 287-2925

Mr. Vorasit Talomsin
Talomsin Plastics Co., Ltd.
227173 Rama III Road
Bangkok 10120,Thailatid
Tel: (662) 294-6300-12

Mr. Apipom Pasawat, Managing Director
Thai Polyethylene Co., Ltd.
1 Siam Cement Road
Bangkok 10800, Thailand
Tel: (662) 586-4851 Fax: (662) 587-2188

Mr. Somchai Kongsala, General Manager

Thai Plastic & Chemical Co., Ltd.
5th Floor, Asia Sathom Building
191 South Sathorn Road
Bangkok 10120, Thailand
Tel: (662) 287-2985, 213-2667 Fax: (662) 287-2983

Dr. Pramuan Leophairatana, President
Thai Petrochemical Industry Co., Ltd.
Bangkok Union Insurance Building
175- 177 Surawongse Road
Bangkok 10500, Thailand
Tel: (662) 235-0310-9 Fax: (662) 236-3110

Mr. Gerald Barnich, Managing Director
VinyThai Co., Ltd.
6th Floor, Central Plaza Tower
1693 Phaholyothin Road
Bangkok 10900, Thailand
Tel: (662) 541-1604-09 Fax: (662) 541-1611

Dr. Pailin Chucottaworn
Bangkok Polyethylene Co., Ltd.
26th Floor, C.P. Tower
313 Silom Road
Bangkok 10500
Tel: (662) 23l-0491-4 Fax: (662) 23l-0490

Mr. H. Yoshibara
HMT Polystyrene Co., Ltd.
Regent House
183 Rajdamri Road
Bangkok 10330, Thailand
Tel: (662) 253-0343, 294-5485

Mr. Sanan Angubolkul, President
Srithai Superware Co., Ltd.
355 Suksawad 36
Bangkok 10140, Thailand
Tel: (662) 427-0200 Fax: (662)427-4278

Hymix Co., Ltd.

455 Soi Wat Darn
Sukhumvit Road
Samutprakarn 10270, Thailand
Tel: (662) 322-2226-7 Fax: (662) 384-4611

Nagase (Thailand) Co., Ltd.
21st Floor, Thaniya Plaza Building
52 Silom Road
Bangkok 10500, Thailand
Tel: (662) 23l-2252-6,23 1-2258-61 Fax: (662) 23l-2262, 23l-2263

Polymers Marketing Co., Ltd.
14th Floor, Maneeya Center
518/5 Ploenchit Road
Bangkok 10330, Thailand
Tel: (662) 254-8135-9, 254-8174-5 Fax: (662) 255-6830

Siam Brother Import-Export Co., Ltd.
65 Group 5, Suksawad Road
Bangkok 10140, Thailand
Tel: (662) 463-1236-7 Fax: (662) 463-6747

Somponphan Co., Ltd. (P.V.C.)
157-546 Soi Suksawad 22
Bangkok 10140, Thailand
Tel: (662) 427-5033, 427-5247,
427-4355 Fax: (662) 427-6559

Srithepthai Corporation Ltd.
109 Group 8, Bangna-Trad Road
Bangkok 10270, Thailand
Tel: (662) 398-0027, 399-2400-13 Fax: (662) 315-1359

T.P. Victory (Thailand) Co., Ltd.
8 Chalermkhet 4
Bamrungmuang Road
Bangkok 10100, Thailand
Tel: (662) 223-8520, 223-6213 Fax: (662) 224-9160

Wah Tech Industrial Co., Ltd.

23rd Floor, ITF Building
160 Silom Road
Bangkok 10500, Thailand
Tel: (662) 233-3164, 234-2052 Fax: (662) 238-4439

VIII. RECYCLING BUSINESS OPPORTUNITIES IN TAIWAN

Taiwan has one of the largest economies in Asia. In 1996, gross domestic product surpassed $308 billion. GDP has been growing by more than 6.5 percent a year on average throughout the 1990s. Its 21 million people have a per capita GDP of more than $14,000. As household income has increased and more families have achieved middle income status, concern for the public health affects of environmental pollution has grown.

Environmental Situation

The rapid industrialization on this island country has brought the full panoply of environmental problems: air in cities is polluted from vehicle exhausts and industrial emissions, industrial and human wastes are destroying rivers and coastal waterways, and stressed landfills contain large quantities of hazardous waste. Public fears of human health hazards from environmental pollution have moved Taiwan to the forefront of environmental management in Southeast Asia.[39]

The government created the Taiwan Environmental Protection Agency (EPA) in 1988. Since then the EPA has imposed fines and shut-down orders on manufacturers improperly disposing of waste and provided financial incentives for industries to purchase pollution control equipment. The stiff fines seek to raise industries' costs for non-compliance. In addition, counties and municipalities are drawing up long-term plans for waste minimization and disposal.

Solid Waste Situation

Taiwan's development as an urban industrial and prosperous economy has resulted in an enormous increase in solid waste. Taiwan's 21 million people are crowded onto about 36,000 square kilometers of land (approximately the size of Massachusetts). Space for landfills is scarce.

Solid waste generated by households and industrial and commercial establishments has risen substantially. The EPA estimates that municipal waste will increase by more than 4 percent a year from 8.5 million metric tons in 1993 to 9.8 million metric tons in 1996. Industrial waste will continue to grow by 3 percent to 5 percent a year for the foreseeable future. About 30 million metric tons of industrial waste is now generated on Taiwan, and hospitals produce about 20,000 metric tons of waste annually. Hazardous and infectious waste disposal continues to be largely unregulated.

The EPA estimates that about 60 percent of municipal waste is properly disposed of, primarily in landfills. Of this, only about 4 percent is currently incinerated, 1 percent is composted, and 10 percent is recycled or disposed of through other means. The remaining 40 percent or more is dumped in open spaces or the ocean. Solid waste in Taiwan is not compacted or baled prior to disposal in landfills, and trash compacting and baling technology will be an expanding market as landfill space becomes more scarce.

The EPA has developed a five-year plan to overcome solid waste management problems. The overall strategy for municipal waste management involves:

1. Reducing the annual growth rate of municipal waste from six percent to five percent;
2. Increasing the proportion of properly disposed waste from 60 to 85 percent;
3. Increasing the amount of waste recovered to 9,500 metric tons daily;
4. Increasing the amount of refuse collected per day from 0.9 metric tons to 1.6 metric tons; and,
5. Increasing the amount of collection and disposal from 2.9 metric tons to 3.8 metric tons per refuse collection vehicle.

In 1992 the EPA turned to incineration as the primary means of relieving the solid waste disposal problem on Taiwan by planning to build 23 incinerators, purchase 722 collection and disposal vehicles, construct 60 landfills, and develop one compost site.

Recycling is just beginning on Taiwan. The "Hsi Fu" association has emerged as the primary recycling organization on the island and is responsible for the collection and recycling of plastic bottles. The government of Taiwan is encouraging private investment in pollution control by providing attractive incentives and financial support for polluting companies to purchase solid waste control equipment and technology.

Demand for Recycling Equipment and Recycled Materials

In 1993, Taiwan installed $764.5 million worth of environmental management equipment. About 77 percent ($588 million) of this equipment was purchased abroad and about 20 percent of the entire environmental management market in Taiwan was in solid waste management equipment. The American Institute of Taiwan, the equivalent of the American Embassy, predicts that as solid waste continues to pose the greatest visible problem for the island, solid waste management markets will grow.

1. *Solid Waste Management Equipment and Recycling Equipment*

The American Institute in Taiwan estimates that the market for solid waste contro equipment will increase by 20 percent to 25 percent a year through 1996 Privatization of municipal incinerators, waste recycling, and industrial wast management will expand markets and investment opportunities. Stricter enforcement of environmental regulations driven by public opinion and the upgrading of th Taiwan EPA to ministerial status should create more opportunities in the privat sector for foreign suppliers.

The solid waste management products that are likely to find the best prospects i Taiwan are:

- Incinerators
- Equipment for treatment of factory process wastage and spare parts for such equipment
- Garbage trucks and soil tank lorries
- Recycling equipment
- Technical assistance and services in recycling

Demand is strong for foreign technology and equipment for municipal waste disposa The government is the major purchaser of solid waste management equipment, but is now privatizing municipal incinerators, waste recycling facilities, and industri waste treatment centers.

Stricter enforcement is also expected new opportunities for overseas suppliers Customers are likely to include hospitals, the petrochemical industry, the pulp an paper industry, and educational institutions.

Although there is a strong market for solid waste treatment equipment, Taiwanes companies and government agencies sometimes hold negative stereotypes of U.S suppliers. North Carolina firms should stress customer service, proven produ designs, and service track records. Particularly for larger value projects, intereste suppliers are advised to become involved early in project planning to assure favorab bid specifications. Japanese competitors spend months and even years makin contacts with Taiwanese decision-makers, provide training, and work with Taiwanes engineering firms that help draft bid specifications.

The EPA-launched recycling project, “Hsi-Fu,” focuses on collecting and recyclin PET bottles. The EPA is currently evaluating treatment and recycling programs for wastes that are considered recoverable, non-biodegradable, or toxic. Such recycling

is likely to concentrate on:

- Tires
- Used lubricant oils
- Waste paper
- Aluminum cans
- Glass
- Cars and motorcycles
- Fluorescent light tubes
- Mercury cell batteries

The EPA's target is to recover 50 percent of recyclable waste and 40 percent of the islands total waste. Although all of these efforts are at an early stage of development, they offer North Carolina firms with technical expertise in these areas the opportunity to position themselves in an emerging market .

2. Plastic Materials and Resins

Taiwan's demand for engineering plastics has increased tremendously, especially in the automobile, building, electronics, electrical, and computer industries.[40] The American Institute in Taiwan estimates the total market for plastics materials and resins at $4.7 billion in 1993 and that it has been increasing by about 3 percent a year. Imports of plastic materials and resins exceed $1.4 billion. Imports of plastic materials and resins from the United States exceeded $351 million in 1993 and represented about 25 percent of the import market. The market for plastic is expected to grow by 7 percent a year in the future..

Higher imports are likely to be stimulated by public investment projects and private industrial upgrading. Sales prospects for U.S. engineering plastics are promising in the Taiwan market. These include:

- Polytetrafluoroethylene
- Polyacetals
- Other Polyethers
- Polycarbonates
- Polyethylene terephthalate
- Polybutylene terephthalate
- Polyamide 6
- Polyamide 6,6
- Polyamide-11-12, -6,9, -6,10 or -6,12
- Polysulfone

- Polyoxylene oxide
- Polyimide

Table 10 indicates the size of the market for plastic materials and resins in recent years and estimates of growth through 1997. The Taiwan market for engineering plastics is forecasted to grow at an average annual rate of 9 percent from $282.6 million in 1993 to $398 million in 1997.

Because U.S. engineering plastic materials and resins are superior in thermal and abrasion resistance and can replace metals, they are well regarded in Taiwan for reliability and technological superiority.

Table 10. Markets for Plastic Materials and Resins in Taiwan, 1992-1997

	($US Millions) 1992	1993	1994	Est. Avg. Annual Real Growth
Import Market	244.6	256.9	277.3	9%
Production	34.8	52.2	61.5	
Exports	17.5	26.6	31.3	
Total Market	261.9	282.5	307.5	9%
Imports from U.S.	69.5	67.3	71.9	8%

Source: The American Institute in Taiwan, 1994.

There are no known non-tariff barriers imposed on imports of engineering plastics in Taiwan. Nor are there any impediments that threaten market access. Currently, there are no forthcoming regulations and no legislation that might prove to be an impediment to imports.

3. *Paper Materials*

Waste paper recycling has been done by small private firms for decades on Taiwan. However, increasing wages and business costs have made importing recycled paper from the United States and Germany less expensive than collecting paper domestically. Local waste paper collection efforts have diminished significantly and the EPA has not initiated a paper recycling program.

Entry Channels

North Carolina companies interested in entering the Taiwan market for recycling equipment and recycled materials can do so through the following channels:

1. ***Alliances with Local Engineering Companies.*** Working with local engineering companies allows foreign firms to develop market contacts and be in early on preparation of specifications for government bids. U.S. firms interested in supplying the Taiwanese equipment market should work with local engineering firms as agents or as subcontractors.

2. ***Turnkey Arrangements.*** Turnkey contracts are generally used by large and medium sized private industrial plants and by government agencies for solid waste disposal facilities.

3. ***Sales Agents and Importers.*** Imported equipment is marketed through sales agents and consulting engineers. Engineering plastics are marketed in Taiwan through sales agents distributors and direct purchases. The sales agents and distributors are the most important channel for recycled plastic and paper materials.

4. ***Sale to the Government*** Almost all government agencies and public corporations in Taiwan import equipment through open tender bidding. The Central Trust of China (CTC) usually procures for state-run enterprises if the enterprise's purchase exceeds $600,000.

5. ***Technical Cooperation Agreements with Local Manufacturers.*** Creating a technical cooperation relationship with domestic manufacturers is an effective marketing channel for solid waste equipment firms. From 60 percent to 70 percent of all solid waste systems require assembly in Taiwan, and North Carolina companies can supply parts of the systems that are imported.

The Taiwan environmental management market is dominated by customers who do not generally have strong technical backgrounds, and advanced technology may not fit existing needs. Taiwanese companies and government agencies look for suppliers with proven performance in Taiwan or other Asian countries. North Carolina companies need to stress their equipment track records to sell successfully in Taiwan.

Key Trade Development Contacts

1. ***Solid Waste Equipment Customers:***

Mr. Chih-Hung K'o, Deputy Director General
Bureau of Solid Waste Control
Environmental Protection Administration
41, Section 1, Chung Hwa Rd., Taipei
Phone: 886-2-311-7722 Fax: 886-2-331-7741

Mr. Ron-hisn Chang, Director
Engineering and Service Division
Industrial Technology Research Institute
Bldg. 64, 195, Section 4, Chung Hsing Rd., Chutung, Hsinchu
Phone: 886-2-35-916-433 Fax: 886-2-35-820-230

Mr. Chia-Hsiung Lin, Section Chief
7th Division (Incinerators)
Industrial Development Bureau
41-3 Hsinyi Rd., Section 3, Taipei
Phone: 886-2-754-1255 Fax: 886-2-704-3753

Mr. Chih Sen Lin, Section Chief
8th Division (Waste Minimization)
Industrial Development Bureau
41-3 Hsinyi Rd., Section 3, Taipei
Phone: 886-2-754-1255 Fax: 886-2-704-3753

Mr. H.C. Ling, Deputy Director
Environmental Engineering Department
Sinotech Environmental Engineering Corporation
171, Nanking E. Rd., Sec. 5, Taipei
Phone: 886-2-760-2 151 Fax: 886-2-765-5010

Mr. C.F. Lin, Project Manager
Environmental Project Group
CTCI Corporation (engineering group)
21Fl., No. 77, Sec. 2
Tun Hwa South Road, Taipei
Tel: 886-2-700-9659 Fax: 886-2-709-9303

Mr. Jack H.H. Huang, General Manager
Hotteen Environmental Engineering Co., Ltd.
4F, 12 Lane 238, Tun-Hwa N. Rd., Taipei
Phone: 886-2-713-5331 Fax: 886-2-718-2439

Mr. C.Y. Wu, President
Faithful Standard Inc.
135, Chien Kuo Road, Sec. 2, Taipei
Phone: 886-2-503-7687 Fax: 886-2-507-2936

Mr. CC. Chen, President
Taiwan Machinery Manufacturing Co.
3, Tai Chi Road, Hsiao Kang District, Kaohsiung
Phone: 886-2-802-0111 Fax: 886-2-803-3515

Mr. Sheng-Fa Hsu, Chairman
Chinese National Federation of Industries
12th Fl., 390 Fuhsing S. Rd., Sec. 1, Taipei
Phone: 886-2-703-3500 Fax: 886-2-703-3982

The Taiwan Environmental Engineering Association
4th Floor, No. 6, Lane 59, I-Tung Street, Taipei
Phone: 886-2-507-1354 Fax: 886-2-508-4422

Hsi-Fu Association
3F-1, No. 10, Section 1, Hoping East Road, Taipei
Phone: 886-2-366-1455 Fax: 886-2-366-1494

2. ***Plastic Materials and Resins***

Industrial Development Bureau., MOEA
4th Division: Yen Ping-ho, Director
4l-3 Hsin Yi Rd., Sec. 3, Taipei, Taiwan
Tel: (02) 703-1773 Fax: 886-2-7030160

Union Chemical Laboratories
Industrial Technology Research Institute (ITRI)
195 Chung Hsing Rd., Sec. 4, Chutung, Hsinchu, Taiwan
Tel: (035)721-321 Fax: 886-35-728743

Plastics Industry Development Center
62,35th Road, Taichung Industrial Park, Taichung, Taiwan
Tel: (04)359-5900 Fax: 886-4-3595855

Chi Mei Trading Co., Ltd.
7F., 9 Ai Kuo W. Rd., Taipei, Taiwan
Exec: S. P. Houng
Tel: 02-314-9411 Fax:02-314-9419

Taiwan Engineering Plastics Co., Ltd.
11F, 54 Min Sheng E. Rd., Sec. 4, Taipei, Taiwan
Exec: Juergen Baeuerle
Tel: 02-7 19-2805 Fax: 02-718-8153

Ding Yih Trading Co., Ltd.
12, Lane 345, Lung Chiang Rd., Taipei, Taiwan
Exec: S. K. Yang
Tel: 02-505-4101 Fax: 501-0885

Wah Lee *Industrial Corp.
10F., 235 Chung Cheng 4th Rd., Kaohsiung, Taiwan
Exec: Ray C. Chang
Tel: 07-2 16-4311 Fax: 07-25l-2208

Amber Glow Trading Co., Ltd.
155 Chi Lin Rd., Taipei, Taiwan
Exec: W. H. Huang
Tel: 02-542-6671 Fax: 02-53l-9232

Nagase Wah Lee Plastics Corp.
9F, 37 Min Chuan E. Rd., Sec. 3, Taipei, Taiwan
Exec: J. C. Chang
Tel: 02-506-2400 Fax: 02-506-2401

Pena Yen Corp.
69-4 Ta Feng 1st Rd., Sanmin Dist., Kaohsiung, Taiwan
Exec: Mei Jung Liao
Tel: 07-383-8000 Fax: 07-381-l190

Genius-Five Ent. Co., Ltd.
l- 16 Tuku Vill., Jenteh Hsiang, Tainan Hsien, Taiwan
Exec: Yeven Sun
Tel: 06-27l-8306 Fax: 06-271-8309

Alpha Plastech Corp.
6, Alley 71, Lane177, Yuan Chi Rd., Sec2., YuanlinChen,
Changhwa Hsien, Taiwan
Exec: P. Y. Chang
Tel: 04-557-1664 Fax: 04-557-1339

Union Chemical Ind., Co., Ltd.
7F., 47 Chung Shan N. Rd., Sec. 3, Taipei, Taiwan
Exec: S. W. Lee
Tel: 02-595-4321 Fax: 02-595-9698

Yuh Yang Co., Ltd.
7, Lane 126, Chung Yang Rd., Sec. 3, Tu Cheng City
Taipei Hsien, Taiwan
Exec: Ted Tseng
Tel: 02-265-4475 Fax: 02-265-4476

Pro Wonderful Inc.
6F- 1, 185 Sung Chiang Rd., Taipei, Taiwan
Exec: C. C. Wu
Tel: 02-501-3775 Fax: 02-508-3150

Tong Shing Inc.
6F., 123 Nanking E. Rd., Sec. 2, Taipei, Taiwan
Exec: H. S. Lin
Tel: 02-506-0700 Fax: 02-508-0662

Dynachem & Co., Ltd.
6F, 115 Huan Ho N. Rd., Sec. 2, Taipei, Taiwan
Exec: Charles Wu
Tel: 02-586-6311 Fax: 02-586-6324

Chin Mou Co., Ltd.
12F., 296 Hsin Yi Rd., Sec. 4, Taipei, Taiwan
Exec: C. F. Lu
Tel: 02-704-6561 Fax: 02-755-2595

Kisso Co., Ltd.
4F., 191 Fu Hsing N. Rd., Taipei, Taiwan
Exec: Tery Wang
Tel: 02-713-3456 Fax: 02-7 18-0567

Chemmate Ent. Co., Ltd.
6F., 184 Chung King. N. Rd., Sec. 2, Taipei, Taiwan
Exec: C. Y. Guo
Tel: 02-553-2890 Fax: 02-553-2893

Jex Trading Co., Ltd.
53 Min Sheng Rd., Sec. 1, Tainan, Taiwan
Exec: T. T. Tso
Tel: 06-226-7133 Fax: 06-221-2310

Yew Ye Ind. Co., Ltd.
61 Fu Tay St., Taishan Hsiang, Taipei Hsien, Taiwan
Exec: C. F. Li
Tel: 02-909-5595 Fax: 02-909-7486

Ix. RECYCLING BUSINESS OPPORTUNITIES IN THE PEOPLE'S REPUBLIC OF CHINA

China is one of the largest and fastest growing economies in Asia.[41] Although per capita gross domestic product was only $610 in 1996, with a population of 1.2 billion China will offer enormous opportunities for companies in the solid waste management industry. China's gross domestic product reached $740 billion in 1996 and the economy has been growing on average by a little more than 10 percent a year since 1991.

Environmental Situation

China has serious enviromental problems. It accounts for 11 percent of the world's carbon emissions and 16 percent of sulfur emissions.[42] Increasing amounts of waste are polluting China's atmosphere and damaging its soil and ground water. Unregulated landfills are degrading farmland and increasing the risk of disease. China has a major problem with acid rain. Pollution is causing both human health problems and economic difficulties. About 80 percent of the rivers and lakes in China are polluted, causing an estimated 2000 tons of fish, shrimp, and shellfish to die every year.

In 1993, China announced a major effort to clean up its environmental problems, reduce energy consumption and air pollution, create a stronger environmental legal framework, and reduce sulfur dioxide emissions. China budgeted nearly $14 billion for environmental spending for the 1990-1995 period and is seeking foreign assistance in environmental management.[43]

Solid Waste Situation

China is giving more attention to solid waste management as the problems of adequately disposing, treating and recycling solid waste associated with rapid urban and industrial expansion become more serious.[44] Municipal waste from home and commercial sources reached 100 million tons in 1993. The increasing material prosperity resulting from China's high rates of economic growth are manifested in large trash heaps in streets and vacant lots and overflowing urban landfills. Moreover, the government estimates that more than 620 million tons of industrial waste is produced annually and that nearly 6 billion tons of industrial waste has been stored or discarded improperly over the past decade.[45]

In 1991, the government increased pollution fees by 40 percent on enterprises discharging solid-waste illegally. The National Environmental Protection Agency (NEPA) announced a 5-year clean-up plan to process about 45 percent of solid waste

by 1998. More stringent waste-management regulations are under consideration to monitor the waste disposal, treatment and recycling industry.

The growing concern for solid waste management opens new markets for advanced equipment and technology, some of which is being funded with loans from the World Bank, the Asian Development Bank (ADB) and the United Nations Global Environment Facility (GEF).

In 1992, China experienced 25 percent growth in industry and a 20 percent increase in urban population. These two phenomena resulted in the generation of more than 587 million tons of industrial waste and 100 million tons of municipal waste -- home and commercial garbage-- in 1993. Currently only a little more than 40 percent of the solid waste is being processed and only a little more than 3 percent is being recycled.[46]

China's National Environmental Protection Agency (NEPA) is implementing a 5-year clean up plan that seeks to increase the processing of solid waste from a little under 40 percent in 1993 to 45 percent by 1998. More stringent waste-management legislation seeks to regulate the growing waste disposal, treatment and recycling industry.

In April 1996, the "Law of the PRC on Preventing and Controlling Environmental Pollution Caused by Solid Waste" went into effect imposing strong new obligations on organizations involved in generating, collecting, storing, transporting, using and disposing of garbage, industrial solid waste, and hazardous waste.[47] All enterprises in China were made responsible for properly disposing of their solid waste.

Demand for Recycling Equipment and Recycled Materials

The difficulties in managing the growing volumes of waste in China has led the government to upgrade reutilization capacity. Most enterprises process their industrial waste collectively and a few large enterprises use their own separate facilities. The materials involved in industrial recycling are scrap copper, iron, and tin, rubber, plastics, paper, glass, leather, wood products and electrical equipment. The little inorganic municipal waste that is recycled is done mainly through the informal sector.

At the beginning of the 1990s China had 4,500 small recycling companies at county level or higher with over 126,000 recovery stations. The China Recycling Development Corporation, organized in 1989 under the Ministry of Internal Trade, coordinates the official industrial recycling network. The corporation buys waste

material, processes, and then resells the recycled products back to factories. Iron and steel scrap have accounted for largest volume of waste recycled through this government subsidized but independently managed and profit-oriented organization.

Demand for recycling equipment and know-how is growing in China as the government implements policies for improving the country's capability to manage its solid waste. NEPA's strategy is to target the following areas:

- Developing technology for resource utilization of sludge
- Improving landfill technology for hazardous waste
- Improving incineration technology for hazardous waste
- Identifying, monitoring and assessing the risks of toxic and hazardous wastes
- Undertaking methodological and technical studies on solid waste management
- Expanding composting technology for municipal wastes
- Improving collection and transportation technology for municipal needs

The U.S. Embassy reports that in the industrial waste market, there is a need to improve utilization of desulpherized soda recovery technology for straw and pulp paper mills.Aluminum plants are trying to develop the means to recover a greater percentage of zinc from the processing residue. There is also great demand for equipment which can improve reutilization of steel slag.

Composting is one of the major recycling processes now used in China. In the process refuse is divided into organic and inorganic waste. About 40 percent of composted waste is plant and animal organic waste and 60 percent is inorganic waste--bricks, ashes, dust, and other waste-goods. After composting, the organic waste is used as agricultural fertilizer.

Although there are strong potential opportunities for North Carolina recycling firms in China, there is currently little information available on the size of the market or the volume of U.S. exports to China in this industry. Moreover, market access is made difficult by inadequate funding for recycling at the national and municipal levels, nontransparent business policies, and difficulties in developing contacts and counterpart relationships. U.S. firms are competitive on price and quality but often lose contracts because they can not compete with the low interest, soft loans offered by other governments in support of their exporters.

The U.S. Embassy in Beijing points out, however, that these factors should be weighed against the market's long-term potential. The government's growing

emphasis on protecting the environment, emerging controls for waste management, and increased international lending for pilot projects offer long-term business opportunities for North Carolina firms that have the resources, risk tolerance and patience to develop a strong long-term position in China's market. Because of limited capacity in China to safely treat and recycle solid waste, the government is turning more toward foreign investment in industry and aid-funded pilot projects for municipalities to solve growing waste-management problems.

Entry Channels

North Carolina firms interested in selling recycling equipment and recycled materials in China should explore two separate markets: the industrial solid waste market, and the municipal solid-waste market. Currently industrial and municipal waste are independently treated, disposed and recycled.

The Government of China is planning to develop multi-purpose waste management facilities in major cities that can store, incinerate, vitriolize and recycle both industrial and municipal waste. But with limited funding available, the government is seeking to expand its recycling capability and to standardize treatment facilitates.

China's solid waste sector is regulated by both national and local bureaucracies with overlapping and sometimes competing areas of jurisdiction. North Carolina companies interested in accessing the Chinese market can minimize bureaucratic complexities by focusing on major cities or special economic zones and working with municipal mayors and local or provincial environmental agencies.

International lending institutions such as the World Bank and the Asian Development Bank are helping to fund selected waste-management pilot projects in some municipalities and special economic zones and a careful monitoring of these loans can help North Carolina firms to anticipate the market for specific types of equipment or materials.

Key Trade Development Contacts

National Environmental Protection Agency (NEPA)
Contact: Ma Hongchang, Deputy Director of Solid Waste Administration
No. 115 Xizhimenei, Beijing 100035
Telephone: 832-9911 Ext. 3609 Fax: 832-8013

NEPA Research Center for Environment and Economy
Contact: Hu Tao, Research Fellow
No. 115 Xizhirnermei, Beijing 100035Telephone: 605-5635 Ext. 15221

Ministry of Construction
Contact: Liu Jingyuan, Deputy Division Chief of Municipal Construction Dept.
9 Sanlihelu, Haidian District, Beijing 100835
Telephone: 839-3434 Fax: 83l-3669

Ministry of Agricuture
Contact: Gao Shangbin, Engineer
Department of Environmental Protection and Energy, and
Deputy Director Department of International Cooperation
Chinese Biogas Society
11, Nongzhanguan Nanli, 100026 Beijing, China
Telephone: 500-3478 Fax: 500-2448

Ministry of Chemical Industry
Contact: Ma Yibing
Division of Economic and Technical Cooperation
Foreign Affairs Department
Building No. 16 Qiqu Heping li
Telephone: 42l-6025 Fax: 422-53 83

Ministry of Machinery
Contact: He Shengtao
Deputy Director of Industry Development Dept.
46 Sanlihe, Xicheng District, Beijing 100823
Telephone: 859-4947 Fax: 859-5474

China Recycling Development Corporation
Contact: Hu Xingxing, Manager
Beijing Fuxingmemrei Dajie No. 45 100801
Telephone: 601-7419 Fax: 602-5723

Yuqing Development Center For Chemical Environmental Protection Industry
Contact: Liu Han Jie, President and Senior Engineer
Liupukang Andingmenwai, Beijing P.R. China 100011
Telephone: 201-9933 Ext. 458 Fax: 204-6825

Ministry of National Machinery Import/Export Corp. (CMC).
Contact: Zhang Jianmin, 3rd Business Department
3A Beiwa Lu, Haidian Qu, Beijing 100044
Telephone: 841-1642 Fax: 842-1956

United Nations Development Programme
Contact: Richard Conroy, Assistant Resident Representative
2 Dongqijie Sanlitun Beijing 100600
Telephone: 532-3731 Ext. 280 Fax: 532-2567

World Bank, Representative Office in China
Diaoyutai, Bldg. 5, No.2 Fu Cheng Lu,
Beijing
Telephone: 85l-2227 Fax: 85l-5902

U.S. Department of Commerce
U.S. and Foreign Commercial Service
Contact: Commercial Officer
American Embassy, No. 3 Xiu Shui Beijie,
Beijing 100600, China
Telephone: 532-3831 Ext. 486

X. RECYCLING BUSINESS OPPORTUNITIES IN MALAYSIA

Malaysia has a population of nearly 21 million and a gross domestic product that reached $87 billion in 1996. Malaysia's economy has grown on average by more than 8 percent a year during the 1990s. Private consumption grew by 14 percent in 1995 and is projected to grow by more than 9 percent in 1996.

Environmental Situation

Environmental quality is becoming a more important issue in Malaysia as the government enforces pollution control regulations more stringently. The government has become more concerned with industrial pollution. It is targeting the high levels of water pollution from the food processing industry, sludge and heavy metal pollution from the electroplating industry, and wastes from electronics, chemicals and pulp and paper factories.[48]

In 1988, the government issued an "Action Plan for a Beautiful and Clean Malaysia," to improve local management and planning of waste management in four stages extending to 2010 and to be implemented by the Ministry of Housing and Local Government.

Solid Waste Situation

Malaysia's rapid economic growth has led to increasing consumerism and growing amounts of domestic solid waste that is putting strains on the existing waste management system. As part of its Vision 2020 (Malaysia's plan for becoming an industrialized economy by the year 2020) the government is seeking to improve environmental protection and integrate its solid waste management systems.

Malaysians in urban areas generate about 7,000 tons of garbage per day. The solid waste stream contains very high concentrations of organic wastes with high moisture content and a bulk density of approximately 200 kg per cubic meter. In urban areas paper and plastics are also a significant part of the solid waste disposed of by households and businesses. The typical waste stream for Malaysian cities is exemplified by that of Petaling Jaya Municipality, estimated and projected for the next 15 years in Table 11.

Table 11. Waste Composition for Petaling Jaya Municipality From 1990 to 2010 (Projected)

COMPOSITION	(Percent by Weight) 1991	1995	2000	2005	2010
Paper	27.0	29.5	32.0	34.0	36.0
Vegetable & putrescibles	36.5	32.0	28.0	24.0	20.0
Textile & leather	3.1	3.4	3.8	4.1	4.5
Metals	3.9	4.3	4.8	5.3	5.8
Plastics	16.4	16.0	15.6	15.1	14.8
Glass	3.1	4.5	6.1	7.7	9.7
Timber Wastes	7.0	7.0	7.0	7.0	7.0
Others					
- Organics	2.0	3.3	2.7	2.8	2.2
- Inorganics	0.4	3.3	2.7	2.8	2.2

Source: U.S. Embassy, 1994.

Solid waste management is now the responsibility of state and local authorities under the Ministry of Housing and Local Government and supporting services are provided by the local Health and Engineering Departments. Local authorities spend about 80 percent of their annual revenues on solid waste management. However, few local authorities practice sanitary landfilling. Wastes are collected manually from houses and transported by garbage truck to open dumping grounds. The system focuses on waste collection and not waste disposal.

Although the central government favors combined methods of sanitary landfill and incineration to solve national solid waste management problems, it is also considering alternative methods such as recycling, composting and waste-to-energy plants. Local municipal councils and many environmental scientists in Malaysia favor integrated waste management systems with a stronger focus on waste reduction, reuse and recycling.

Demand for Recycling Equipment and Recycled Materials

Little information exists on the size of the market for solid waste management products in Malaysia, but based on Ministry of Housing and Local Government estimates, the U.S. Embassy calculates the overall market potential for export of waste disposal goods and services to Malaysia is approximately $150 million to $160 million a year over the next 10 years.

The Government of Malaysia is planning to privatize the national solid waste disposal and management system—the management, collection and disposal of solid wastes, and the maintenance of disposal facilities. Some municipalities are also privatizing the construction of disposal facilities, although they will continue to manage the collection and disposal systems.

According to the U.S.-Asia Environmental Partnership, North Carolina environmental and recycling firms interested in the Malaysian market will find opportunities in the following segments:

- Industrial waste reduction and recovery technologies
- Hazardous waste incinerators
- Solid waste composting equipment
- Solid waste shredders and crushers
- Municipal waste incinerators

Markets can be found in Malaysia for small- and medium-sized high-tech composting facilities for cities with integrated waste management systems. The Penang Municipal Council, for example, has mandated the composting of yard wastes since 1993.

There is a growing awareness of recycling in major metropolitan areas and the central government has expressed interest in formalizing the recycling program. Several cities use recycling, but efforts to recover recyclables from municipal waste have been limited by the public's reluctance to separate garbage and the lack of a recyclables supply.

The waste disposal industry is heavily dependent on imported component parts, some of which are reexported. Although markets exist for North Carolina recycling firms, they may face strong competition from Japanese companies, which have been active in solid waste management and provide technical assistance through Japan's foreign assistance program. Canadian firms have also been active in Malaysia over the past 5 years, as have companies from Switzerland, Germany and Denmark.

Entry Channels

The Government of Malaysia provides tax and other incentives for industry to invest in environmental protection equipment. No duties are imposed on most pollution control equipment, but they are levied on components with multiple functions.

Consulting firms and equipment suppliers must be registered and licensed by the government but foreign consultants in a joint venture with a Malaysian firm can operate under the local firm's license.

The U.S. Embassy in Kuala Lumpur suggests the best way to enter the Malaysian market is by establishing some form of local presence through an agreement with a local agent or distributor or by finding a joint venture partner. Being part of a joint venture is important for firms competing for government business. A local representative or partner is better able to pursue opportunities quickly and to provide after-sales service.

Key Trade Development Contacts

1. ***Government Departments and Agencies***

Ministry of Housing and Local Government (MOHLG)
Technical Unit, Local Government Department
4th Floor, Block K
Pusat Bandar Damansara, Damansara Heights
50644 Kuala Lumpur
Tel: 603-254-7033 Fax: 603-254-0781
Contact: Mr. Mohamad Ridhuan Ismail, Director

Department of Environment (DOE)
12th & 13th Floor, Wisma Sime Darby
Jalan Raja Laut
50662 Kuala Lumpur
Tel: 603-293-8955 Fax: 603-293-6006
Contact: Dr. Abu Bakar Jaafar, Director-General

Ministry of Science, Technology & Environment (MOSTE)
Conservation & Environmental Management Division
19th Floor, Wisma Sime Darby
Jalan Baja Laut
50662 Kuala Lumpur
Tel: 603-293-8955 Fax: 603-291-4345
Contact: Mr. Raman Letchumanan, Director

Malaysian Industrial Development Authority (MIDA)
Advisory Services Center
Ground Floor, Wisma Damansara
Damansara Heights, P.O. Box 10618
50720 Kuala Lumpur
Tel: 603-255-3633 Fax: 603-255-7970
Contact: Ms. Che Asmah Ibrahim

Urban Services Department
Majlis Perbandaran Petaling Jaya
Jalan SS 8/2
47300 Petahng Jaya., Selangor
Tel: 603-777-4032 Fax: 603-777-4518
Contact: Pn. Kamariah Mohamad Noor, Director

2. ***Industrial Federations and Associations***

Environmental Management & Research Association of Malaysia (ENSEARCH)
38A Jalan SS21/58
Damansara Utama
47400 Petahng Jaya, Selangor
Tel: 603-717-3819 Fax: 603-717-7596
Contact: Ir Kumaresivam, President

Association of Environmental Consultants and Contractors of Malaysia (AECCOM)
P.O. Box 8125, Kelana Jaya
46782 Petahng Jaya
Tel/Fax: 603-73l-3340
Contact: Mr. Chen Yew Seong, President

Institute of Malay Engineers Malaysia
602 Bangunan Loke Yew
JaIan Mahkamah Persekntuan, P.O. Box 11118
50736 KuaIa Lumpur
Tel: 603-298-5566/5590 Fax: 603-292-6442
Contact: Ir Hussein bin Haji Mohamed

3. ***Business Organizations***

Massabudi Environmental Technology & Services Sdn Bhd
7 Jalan 51A/235A
46100 Petaling Jaya
Tel: 603-775-6003 Fax: 603-776-5931
Contact: Mr. Abdul Rahman Jaafar, Managing Director

Yomart Environmental Consultants
11 Lorong Riang
Off Jalan Kampung Gajah
12300 Butter-worth, Penang
Tel: 604-3 13-945Fax: 604-3 17-678
Contact: Dr. Lee Aik Heng

Far East Link Sdn Bhd
3 Jalan Ayer Molek 1
Taman Titiwangsa
53200 Kuala Lumpur
Tel/Fax: 603-422-6250
Contact: Elizabeth Lewis, Director

Chemical Waste Management Sdn Bhd
Lot 12, Persiaran Kemajuan (16/16)
40000 Shah Alam, Selangor
Tel: 603-550-7800 Fax: 603-559-6563
Contact; Mr. Yamin Vong, Director

UMW-BFI Waste Services Sdn Bhd
Jalan Utas 1517
P.O. Box 7052
409 15 Shah Alam, Selangor
Tel: 603-559-1201 Fax: 603-559-6889
Contact: Mr. Lance Robinson, Project Manager

Scomi Sdn Bhd
14 1-D Jalan Utas 15/7, Section 15
Shah AIam Industrial Estate
40000 Shah Alam, Selangor
Tel: 603-550-6118 Fax: 603-550-8918
Contact: Major (Retired) Ng Chun Hoo, General Manager

XI. RECYCLING BUSINESS OPPORTUNITIES IN THE PHILIPPINES

The Philippines, with a population of more than 62 million, has been growing both demographically and economically over the past decade. During the 1990s it has maintained an average annual GDP growth rate of nearly 3 percent. Its gross domestic product in 1996 was nearly $80 billion. Private consumption has expanded on average by more than 5 percent a year.

Environmental Situation

Over the past few years the government in the Philippines has given increasing attention to environmental problems. The "Philippine Strategy for Sustainable Development" focuses on the need to see economic growth and environmental protection as mutually compatible. The Department of Environment and Natural Resources (DENR) has been given greater authority to implement and enforce environmental regulations and to prevent environmental degradation.

Despite the efforts of DENR and other government agencies, enforcement of environmental regulations in the Philippines remains weak, in part because regulatory agencies lack technically qualified personnel, adequate laboratory facilities and equipment to monitor pollution, and strong enforcement mechanisms. Nongovernment organizations (NGOs), however, actively criticize environmental degradation, lead protests against polluting firms and planned projects with polluting effects, and monitor the environmental impact of government and private sector development projects.

NGOs have put increasing political pressure on industries to comply with environmental regulations and this is opening new markets for pollution control equipment and services. The government is also an important customer of environmental equipment and management services. In the private sector, industrial estates, coconut oil milling and refining plants, sugar milling and refining plants, metallic mining industries, textiles manufacturers, cement manufacturers, and iron and steel mills will purchase more pollution control equipment in the future.

Solid Waste Situation

Much of the recycling of solid waste in the Philippines is now centered in Metropolitan Manila and is carried on mainly by small scale businesses and informal sector operations. Junkshop owners and pushcart operators pick up waste paper from households, government offices, private business establishments, printing presses,

schools and churches. More than 80 percent of household waste paper is old newspapers sold to pushcart owners by housewives and maids.

Government offices, private businesses, printing presses, schools and churches generate the full range of waste paper, but recycled materials collected from these institutions accounts for less than 20 percent of the total waste paper generated. Lack of proper disposal systems accounts for the low collection rate from these institutions. Half of the waste paper generated from government offices and private establishments is high-value white waste. Janitors and building administrators in private companies sell waste paper to junkshop owners and dealers. Government offices have a centralized disposal system for filed papers.

Garbage scavengers also sort solid waste from garbage dumps, but paper recovered from dumps is usually contaminated, raising the costs of recycling from this source. While the country's collection system is relatively extensive, only a small percentage of recovered waste paper is available for recycling. Only about 8 percent to 16 percent of waste paper is recycled in the Philippines. This is due to its high moisture content, inadequate disposal and collection systems, and the lack of information about the value of waste paper among households, companies and government agencies. Also, the competing uses for waste paper reduce the size of the waste stream.

Demand for Recycling Equipment and Recycled Materials

Business opportunities exist for North Carolina firms in two areas: 1) solid waste treatment and recycling equipment, and 2) recycled paper and paperboard.

1. ***Solid Waste Treatment and Recycling Equipment***

The U.S.-Asia Environmental Partnership points out that the most promising subsectors for exports to the Philippines include:

- Municipal waste disposal equipment
- Solid waste incinerators
- Biological waste treatment technology
- Toxic and hazardous waste treatment technology
- Composting, digester and stabilizer equipment for solid waste treatment

Little information is currently available on the size of the market for recycling equipment in the Philippines.

2. ***Paper and Paperboard***

Paper and paperboard is a major industry in the Philippines.[49] Paper is used in a wide variety of economic activities from publishing, education and banking to packaging, hygiene and home furnishing. The Philippine industry uses both virgin pulp from wood and non-wood materials and recycled or waste paper. The U.S. Embassy in Manila emphasizes that recycled paper is currently the principal raw material in the manufacture of paper and paperboard products in the Philippines.

Paper and paperboard mills use 25 to 100 percent recycled feedstock, depending on the grade and quality of paper and paperboard to be produced. The total market for waste paper was nearly $27 million in 1992 and is growing by more than 4 percent a year.

Most of the waste paper is supplied through imports because of the inadequacy and unreliabilty of local waste paper production. Most mills prefer imported recycled paper because of its better quality. Locally generated waste paper accounts for less than 1 percent of the total market. For the remainder of the 1990s the average demand for recycled paper is expected to be 338,000 tons to 584,000 tons a year. Demand may increase, however, if the Philippines' economy grows faster than expected.

Firms in the United States are the major suppliers of imported paper and paperboard materials, accounting for more than 60 percent of total imports. Waste paper from the United States is highly sought after, despite its higher cost and shipping prices, because of its long fiber content and because U.S firms strictly follow the Paper Stock Institute Standard, thereby resulting in fewer rejected shipments from U.S. companies than from suppliers in other countries.

The U.S. Embassy suggests that the following recycled paper products provide the best prospects for North Carolina exports to the Philippines:

- Newsprint -- newsprint trimmings, old newspaper, white waste
- Chipboard -- chipboard trimmings, mixed waste (no newspaper) including kraft paper, kraftboard and magazines
- Corrugating Medium/Containerboard -- old corrugated cartons
- Printing and Writing Paper -- white ledger, e.g., bond paper, white writing paper, bookpaper, register forms, onion skin, tracing paper (should be free from used coated paper), colored ledger, e.g., printed colored ruled pad writing paper, telephone directories, colored duplicate forms (should be free from treated and coated paper)

- Linerboard -- old corrugated cartons
- Sanitary and Hygienic Paper Product -- white trimmings, computer printouts, folders, white shavings, assorted ledger, selected flat waste paper

The Philippine government is projecting the demand for waste paper to grow by 5 percent to 6.5 percent average a year until the year 2000, as indicated in Table 12. Newsprint, mixed white wastes, and old corregated cartons are likely to be in highest demand for the remainder of the 1990s.

Quality, price and reliable delivery are the major factors affecting the decisions of paper and paperboard mills in selecting overseas suppliers. Paper mills prefer waste paper that has not yet been processed or that has been recycled only once because it generally contains longer fibers. Philippine customers also take cleanliness and consistency into consideration. The mills are also particular about the ability of overseas suppliers to meet their waste paper specifications.

Table 12. Demandfor Recycled Paper in the Philippines (in thousand tons)

Type of Recycled Paper	1993	1995	2000
Newsprint Waste (newspapermagazines, newsprint trimmings, mimw paper)	84.8 - 100.6	93.5 - 114.1	119.3 - 145.3
Mixedwhite Waste (bond paper, onion skin, copy paper, continuous forms, letterhead)	79.6 - 102.0	87.7 - 118.9	112.0 - 165.1
Mixed Paper waste @inted forms pad/ruled pads)	34.3 - 38.7	37.8 - 42.2	48.3 - 48.9
Other Waste Paper (boxes, cartons, folder, cartolinas, brown envelopes)	84.5 - 219.8	93.2 - 253.8	118.9 - 358.8
TOTAL DEMAND	283.2 - 461.1	312.2 - 529.0	398.5 - 718.0

Entry Channels

Many paper and paperboard manufacturers obtain waste paper by buying back corrugated trimmings, spoiled cartons, trimmings, newsprint and offset paper from major customers. Millers import waste paper directly or through local agents of foreign suppliers. Some mills have either established their own purchasing operations or make their own arrangements with foreign suppliers. North Carolina suppliers can introduce their company to mills through letters. Most local agents have more than one principal; some source waste paper from only one country, others from several. The agents' sales representatives regularly visit mills to market their principals' products.

Key Trade Development Contacts

1. ***PaDer Industp***

Mr. Francisco Monge, President
Pulp and Paper Manufacturers Association of the Philippines
12th Floor, 1010 Bldg., A. Mabini St., Ermita
Manila
Tel./Fax No.: 522-42-66

Mr. Simon Lee, President
Association of Paper Traders of the Philippines
1245 Paz St., Pace, Manila
Tel. No.: 57-57-11 Fax No.: 52l-95-74

Mr. Freddie M. Agregado, Manager
Procurement Division
Paper Industries Corporation of the Philippines Centerpoint Building
Julia Vargas Ave. cor. Garnet St.
Ortigas Center, Pasig,
Metro Manila
Tel. Nos.: 633-99-57; 633-59-35 to 46 Fax No.: 633-59-49

Ms. Leonor Cristobal, Planning Manager
Kimberly-Clark Phils., Inc.
United San Pedro Subdivision,
San Pedro, Laguna
Tel. Nos.: 846-00-31 to 32 Fax No. : 846-00-84

Mr. Ramon Fuentabella, Purchasing Manager
United Pulp and Paper Co., Inc.
5th Floor, Phinma Bldg.,
166 Salcedo St., Legaspi Village,
Makati, Metro Manila
Tel. No.: 817-64-42 Fax No.: 818-8l-58

Mr. Tito Gan, Purchasing Manager
Paperland, Incorporated
Leland Drive, Balintawak, Quezon City
Tel. No.: 361-85-31 Fax No.: 362-36-07

Mr. Roberto Jarencio,Vice President - Procurement
Worldwide Paper Mills, Inc.
22 Baler St., San Francisco de1 Monte,
Quezon City
Tel. No.: 99-56-32 Fax No.: 922-72-19

Mr. Hans Lim, Purchasing Manager
Aclem Paper Mills, Inc.
501 Juan Luna, Binondo,
Manila
Tel. No.: 40-38-71 Fax No.: 530-10-83

Mr. Willie Lu, Administrative Manager
Vanson Paper Industrial Corp.
150 R. Delfin Street, Marulas, Valenzuela,
Metro Manila
Tel. Nos.: 361-29-72; 361-29-70 Fax No.: 361-20-14

Mr. Carlos Lumage, Import Officer
Container Corporation of the Philippines
60 Old Samson Road, Balintawak,
Quezon City
Tel. No.: 361-98-01 Fax No.: 362-03-70

Mr. Mario Mabalay, Purchasing Manager
Holland Pacific Paper Inc.
226 Quirino Highway, Baesa,
Quezon City
Tel. No.: 35-50-51 Fax No.: 362-06-50

Col. Vicente 0. Novales, Senior Vice President
Manila Paper Mills
Union Ajinomoto Bldg.
331 Sen. Gil J. Puyat, Ave., Makati,
Metro Manila
Tel. Nos.: 87-60-81 to 87Fax No.: 812-73-64

Mr. Peter Pua, Purchasing Manager
Trust International Paper Corporation
2nd Floor, Ace Bldg., 101 Rada cor. De la Rosa Sts.,
Legaspi Village,Makati,
Metro Manila
Tel. No.: 85-97-81 Fax No. : 815-94-60

Mr. Amando Rios, Director for Administration
Bataan Pulp and Paper Mills, Incorporated
2nd Floor, Ace Bldg., cor. Rada and de la Rosa Sts.
Legaspi Village, Makati,
Metro Manila
Tel. No.: 85-97-81 Fax No.: 815-94-60

Mr. Wilson Wy Tiu, Chief Executive Officer
Philippine Paper Mills, Inc.
570 Honorio Lopez Blvd., Tondo,
Metro Manila
Tel. Nos.: 21-21-90; 21-22-82 Fax No.: 27-41-88

2. Paper Dealers

Ms. Leonila Arceo, President
L. Arceo Trading
2486 Pasay City
Tel. No.: 87-41-83

Mr. Wilmer Embuscado, President
Los Angeles Trading
41 Mendez St., Baesa,
Quezon City
Tel. No.: 361-71-13

Mr. Ricky Mendoza, Proprietor
Riole Trading
12 St. Joseph St., Paradise Village
Quezon City
Tel. No.: 98-03-80

3. Paper Agents and Indentors

Mr. John Aspinall, President
Aspinall Marketing
Executive Suite 223, Hotel Nikko Manila Garden,
Makati, Metro Manila
Tel./Fax No.: 819-09-l1

Mr. Ariel Caakbay, Group Sales Manager
Unimer Trading Corp.
Phinma Bldg., 166 Salcedo St.
Legaspi Village, Makati
Metro Manila
Tel. No.: 810-18-31 Fax No.: 819-10-77

Ms. Maryanne Esnaola, Marketing Executive
NZFP Pulp and Paper Mills, Inc.
Mezzanine Floor, Jaka I Bldg., 6794 Ayala Ave.
Makati, Metro Manila
Tel. No.: 810-03-01 Fax Nos.: 810-39-27; 810-66-23

Ms. Dolores Lim, Executive Vice President
Dolart Marketing, Inc.
50 Kennedy Drive
Pleasant View Subdivision
Tandang Sora, 1107
Tel./Fax No.: 97-69-15

Mr. Edward Lim, President
Trademakers Enterprises
8 Chico Road, Pilar Village, Las Pinas
Metro Manila
Tel./Fax No: 805-64-40

Mr. Joeffrey Uy, Sales Representative
JND International Corp.
1965 Sandejas St.
Pasay City
Tel. No.: 521-87-19 Fax No.: 52l-06-65

Mr. Pekka Vainio, President/General Manager
PRW Trade and Commercial Co (Asia Pacific), Inc.
23-A 6th Street, New Manila,
Quezon City
Tel. No.: 721-47-50 Fax No.: 721-47-96

Mr. Francis Wong, Proprietor
La Lun Paper and Fibre
Rm. 301 Alpha Bldg., 77 Born Serrano Ave.
Quezon City
Tel./Fax No: 72l-50-54

Mr. Manuel Yu, President
The Best Co.
P.O. Box 634 Manila
Tel. No.: 530-06-23 Fax No.: 530-02-36

4. Government Agencies

Ms. Angela Fernando
Chief, Pulp and Paper Division
Forest-Based Industries Department
Board of Investments
Industry and Investments Bldg.
385 Sen. Gil J. Puyat Ave.
Makati, MetroManila
Tel. No.: 818-90-62; 818-18-31 to 39 lot. 241

REFERENCES

1. North Carolina Alliance for Competitive Technologies, "North Carolina Environmental Business Study," Research Triangle Park, N.C.: NCACTS, 1996

2. SCS Engineers, "Final Project Report: Assessment of the Recycling Industry a Recycling Materials in North Carolina," Raleigh, NC: State of North Carolina Department of Environment, Health and Natural Resources, 1995.

3. World Bank, ***World Development Report*** 1996, Washington: World Bank, 1996.

4. Business International Asia/Pacific, ***Asia/Pacific and the Environment: Investing in the Future,*** Hong Kong: Business International, 1992.

5. Royal Thai Government, ***Investment Opportunities Study: Environmental Markets in Thailand,*** Bangkok: Office of the Board of Investment, 1995.

6. C.G. Gunnerson and D.C. Jones, "Costing and Cost Recovery for Waste D and Recycling," paper presented at UNEP/BMFT International Symposium on S Waste Management, Karlsruhe, Germany, 1983.

7. C.G. Gunnerson and D.C. Jones, "Costing and Cost Recovery for Waste D and Recycling," paper presented at UNEP/BMFT International Symposium on Waste Management, Karlsruhe, Germany, 1983.

8. S. Cointreau, C.G. Gunnerson, J.M. Hall, N. Seldman, ***Recycling from Municipal Refuse,*** (Washington: World Bank, 1984), pp. 42, 76.

9. Clifford, op. cit. p. 34.

10. Business International Asia/Pacific, ***Asia/Pacific and the Environment, op. cit.***

Lucia Mouat, "Ash Turned Into Building Blocks," ***The Christian Science Monitor*** (September 11, 1991): 12.

12. S. Cointreau, ***Environmental Management of Urban Solid Wastes in Developing Countries,*** Washington, D.C.: World Bank, 1982.

13. Ibid. p. 42.

14. Mureen Lewis and T. R. Miller, "Public-Private Partnership in African Ur Development," Washington: USAID, 1986.

15. U.S. Department of Commerce, "World- Building Materials," Washington, DC USDOC, 1994.

16. For a more detailed discussion of the advantages and disadvantages of alternati market entry channels, see Franklin R. Root, ***Entry Strategies for International Markets,*** New York: Macmillan, 1994.

17. Root, ***Entry Strategies for International Markets,*** Chapter 5.

18. Root, ***Entry Strategies for International Markets,*** Chapter 6.

19. S.B. Lee, "Market Research Reports: Korea--Pollution Control Equipment," Report ISA9510, (Washington, D.C.: U.S. Department of Commerce, 1996) 20 pp.

20. This section draws heavily on USDOC, International Trade Administration, "Market Research Reports: Korea - Recycling Equipment," Report No. ISA9306, Washington: USDOC, 1996; and K.S. Kim, "The Recycling Equipment Market in Korea," Seoul, Korea: U.S. Embassy, 1993) 11 pp.

21. Republic of Korea, "Environmental Protection in Korea," Seoul: Ministry of Environment, 1994.

22. U.S. Trade Coordinating Committee, "South Korea: Environmental Technologies Export Market Plan," Washington: United States-Asia Environmental Partnership, 1

23. Ibid.

24. See Leo Lee, "The Industrial Waste Treatment Equipment Market in Singapore Singapore: U.S. Embassy, 1993.

25. Joo-Hwa Tay, "Improving the Management of Toxic and Hazardous Wastes: A Case Study of Singapore," ***Regional Development Dialogue,*** Vol. 14, No. 3 (1993): 83-104.

26. U.S. Department of Commerce, "Indonesia: Marketing U.S. Products and Services," Washington, D.C.: USDOC, International Trade Administration, 1996.

27. Harlow Russell, "Indonesia - Environmental Market Overview" Report No. IM1960221 (Washington: U.S. Department of Commerce, 1996): 10 pp.

28. This section draws heavily on Pirmian Sihombing, "The Pulp and Waste Paper Products Market in Indonesia," (Jakarta, Indonesia: U.S. Embassy, 1994) 13 pp.

29. See David Jolly, "Environment: Cleaning Up Their Act," ***Far Eastern Economic Review, (20*** August 1992): 46-47.

30. Brian Johns, "Thailand Seeks Help to Get Environmental House in Order," ***The Journal of Commerce*** (October 15, 1993): lA, 8A.

31. United Nations, ***Population Growth and Policies in Mega-Cities: Bangkok,*** ST/ESA/SER.R/72, (New York: UN, 1987): 31.

32. Board of Investment, ***Investment Opportunity Study: Environmental Markets in Thailand,*** (Bangkok: Royal Thai Government, 1992): 8-9.

33. Environmental Business Group, "Thailand--Water/Solid Waste Treatment Equipment and Services," Report No. ISA9503, (Washington, DC: U.S. Department of Commerce, International Trade Administration, 1995):22 pp.

34. See Dermis A. Rondinelli, "Thailand's Expanding Markets for Environmental Technology and Services: Opportunities for U.S. Trade and Investment," ***Journal of Asian Business,*** Vol. 10, No. 1 (1994): l-23.

35. Brian Johns, "'Thailand Seeks Help to Get Environmental House in Order," ***The Journal of Commerce,*** (October 15, 1993): pp. lA, 8A.

36. U.S. Department of Commerce, "Plastic Materials and Resins," Report ISA9304, Washington, D.C. : USDOC International Trade Administration, 1993.

37. Somsak Chinvanthananond, "The Plastic Materials and Resins Market in Thailand", (Bangkok, Thailand: U.S. Embassy, 1993): 10 pp.

38. U.S. Department of Commerce, "Thailand: Marketing U.S. Products and Services," Washington, D.C.: U.S. DOC, International Trade Administration, 1996.

39. This section draws heavily on Jeffrey Miller, "The Solid Waste Management Equipment Market in Taiwan", Taipei, Taiwan: The American Institute, 1994.

40. Peter Yen, "The Engineering Plastics Market in Taiwan," (Taipei, Taiwan: The American Institute in Taiwan, 1994): 9 pp.

41. Megan Ryan and Christopher Flavin, "Facing China's Limits," in Worldwatch Institute, State of the World 1995, (New York: Norton, 1995):113-131.

42. U.S. Department of Commerce, "World Pollution Control Equipment," Report No. BMR9403, Washington, D.C. : USDOC International Trade Administration, 1994.

43. P.T. Bangsberg, “China Begins Major Drive to Clean Up Environment,” ***The Journal of Commerce*** (November 1, 1993): pp. LA, 5A.

44. Peter Wonacott, ***China - Solid Waste Management*** Report No. ISA9402, Washington, U.S. Department of Commerce, International Trade Administration, 1995.

45. Ellen R. Spitalnik, “Getting a Grip on Solid Waste,” ***The China Business Review,*** Vol. 23, No. 2 (1996): 36-40.

46. Peter Wonacott, “The Solid Waste Management Market in China”, Beijing, China: U.S. Embassy, 1994.

47. Ellen R. Spitalnik, “Getting a Grip on Solid Waste,” ***The China Business Review,*** Vol. 23, No. 2 (1996): 36-40.

48. Grace Wong, “The Solid Waste Management Market in Malaysia”, Kuala Lumpur, Malaysia: U.S. Embassy, 1994.

49. This sections relies heavily on information provided by Victoria A. Montesines, “The Recycled and Waste Paper Market in the Philippines”, Manila: U.S. Embassy, 1993.