

EBI Market and Industry Research Methods

ENVIRONMENTAL BUSINESS INTERNATIONAL, INC.

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1. Overview

Environmental Business International, Inc. (EBI) is a strategic market research, publishing and consulting firm devoted to the environmental products and services industry. EBI is publisher of the leading business publication on the industry, the *Environmental Business Journal*, founding this publication in Fall of 1988. EBI maintains extensive databases and personal industry contacts of thousands of companies actively engaged in doing business in this industry, both in the United States, as well as worldwide. The company has become recognized as the industry leader in defining and providing strategic intelligence and contacts within and for this industry, both on the sell-side (environmental product and service vendors) as well as the customer or buy-side (polluting industries and municipalities, the so-called “regulated community”).

EBI has thousands of subscribers to its publications and has worked on hundreds of projects with presidents and business development managers of start-ups to fortune 50 firms doing business in the environmental industry. The EBI research staff has also worked with various government agencies to provide market intelligence and industry briefings (e.g. the U.S. EPA, the U.S. DOC, the United Nations, the U.S. Agency for International Development, etc.). In addition, EBI principals have performed numerous introductions for the purposes of financing, strategic partnerships or merger/acquisition relationships between environmental firms and the development of public/private partnerships and project finance.

As part of this ongoing work, EBI employs a full time market research, editorial and consulting staff of 15 people. The EBI research staff is continuously engaged in performing primary and secondary business and market intelligence research. Secondary research is fairly standard—review of published material, i.e. books, reports, publications and databases (both hardcopy and electronic, via the internet). However, it is the ongoing primary research that sets EBI apart from all other publication, research or consulting companies in this industry.

This brief paper explains in some detail the methods used by EBI to arrive at its industry/market size estimates, i.e. its *primary* research methodology.

2. Definitions and Classification

Before anything can be measured, the entities and units of measure must be clearly defined. In the study of markets and economics the standard unit of measure is U.S. dollars, or the currency of the particular country in question times the current exchange rate at the time, and for the particular country of interest. However, the definition of entities is not so straight forward and has been an ongoing issue in the measurement of environmental industry activity ever since EBI has been studying this business. The discussion in this section provides a current synopsis of definition and classifications of this industry.

2.1. Industry Definition

2.1.1 Current Definition of the Industry

2.1.1.1 Introduction

The following section presents a definition, segmentation and business overview of the U.S. environmental industry. EBI has been analyzing and tracking the environmental industry since 1987 and was the first to define the industry in its monthly publication, *Environmental Business Journal*. In the absence of any Standard Industry Classification (SIC) codes for environmental companies, EBI's segmentation and quantification of the environmental industry has been adopted by the U.S. Department of Commerce (USDOC) and numerous other government and private sector sources. A current best correlation between the EBI defined business sectors and the U.S. SIC code numbers is provided in Appendix 5.1.

Each segment in this review is characterized in terms of the range of products and services offered, the size of the market, including historical and projected growth and the approximate number of companies participating in the segment. Some of the revenues listed for firms are estimates based on data provided by the company and EBI's analysis. EBI has made every reasonable effort to be accurate and any errors or omissions are unintentional.

2.1.1.2 Definition of the Environmental Industry

EBI defines the environmental industry as all revenue generation associated with environmental assessment, compliance with environmental regulations, pollution control, waste management, remediation of contaminated property and the provision and delivery of environmental resources. The U.S. environmental industry represents total 1994 revenues of \$170 billion, generated by nearly 114,000 companies in the United States. The global environmental industry is in the order of \$408 billion annually. The breakdown of the number of companies (and/or public entities) in the U.S. is shown in Exhibit 2-1.

Within the scope of this definition, EBI has identified fourteen segments of business activity in the environmental industry (summarized and discussed in detail below), which it divides into three broad categories: services, equipment and resources. These segments are neither classifications of environmental problems in a media sense, such as air pollution or solid waste, nor are they market segments centered around solutions like the cleanup of contaminated sites that typically involve the contributions of many types of companies. EBI's environmental industry segments are classifications of *types of businesses* from the perspective of what the companies themselves typically offer along the lines of the SIC system, whether it be engineering services or environmental laboratory services relating to any number of environmental problems, or specific equipment manufacturers, or resource providers.

Exhibit 2-1 Environmental Industry Segments and Numbers of U.S. Companies/Public Entities

Environmental Industry Segment	Number of Companies
Services	
Analytical Services	1,400
Water Treatment Works	27,000
Solid Waste Management	5,900
Hazardous Waste Management	2,500
Remediation / Industrial Services	3,800
Environmental Consulting & Engineering	5,900
Equipment	
Water Equipment & Chemicals	2,600
Instruments & Information Systems	500
Air Pollution Control Equipment	800
Waste Management Equipment	2,000
Process & Pollution Prevention Equipment	300
Resources	
Water Utilities	58,000
Resource Recovery	2,000
Alternative & Renewable Energy	600

Source: Environmental Business International Inc. (San Diego, Calif.)

Market size numbers presented in the following analysis are in terms of revenues generated by public- and private-sector entities and not total expenditures made by buyers. As an illustration, a chemical company or municipal government may account for \$200 million in environmental expenditures, but not all of this results in revenues for vendors of environmental products and services. Whereas in some segments this portion of “outsourced” expenditures is high (such as specialized equipment or remediation of contaminated sites) in other areas it is considerably lower (water quality testing or pollution prevention design services).

It is important to note that EBI does count some public sector revenues as part of the environmental industry. Traditional municipal services like water delivery, water treatment and garbage collection are gradually being privatized in the United States, though not to the extent that these services (especially water) have been privatized in countries such as France and the United Kingdom. These basic services also represent the majority of environmental business opportunities in the developing world in the next 20 years, so it is important not to under emphasize them. Municipalities in the water utility segment (roughly 85%) and the solid waste management segment (roughly 33%) account for considerable revenues, but the remainder of industry is in the private sector.

2.1.1.3 Environmental Industry Segments

The table below briefly describes EBI's 14 environmental business segments.

Exhibit 2-2 Environmental Industry Segments

Segment	Description	Examples of Clients
Environmental Services		
Environmental Testing & Analytical Services	Provide testing of "environmental samples" (soil, water, air and some biological tissues)	Regulated industries, Gov't, Environmental consultants Hazardous waste and remediation contractors
Water Treatment Works	Management and operation of wastewater treatment plants	Households, Commercial firms and All industries
Solid Waste Management	Collection, processing and disposal of solid waste	Municipalities & All industries
Hazardous Waste Management	Manage on-going hazardous waste streams, medical waste, nuclear waste handling	Chemical companies Petroleum companies Government agencies
Remediation/Industrial Services	Physical cleanup of contaminated sites, buildings and environmental cleaning of operating facilities	Government agencies Property owners Industry
Environmental Consulting & Engineering (C&E)	Engineering, consulting, design, assessment, permitting, project management, O&M, monitoring, etc.	Industry, Government Municipalities Waste Mgmt. companies
Environmental Equipment		
Water Equipment & Chemicals	Provide equipment, supplies and maintenance in the delivery and treatment of water	Municipalities & All industries
Instrument Manufacturing	Produce instrumentation for the analysis of environmental samples	Analytical services, Gov't Regulated companies
Air Pollution Control Equipment	Produce equipment and tech. to control air pollution	Utilities, Waste-to-energy Industries
Waste Management Equipment	Equipment for handling, storing or transporting solid, liquid or haz. waste. Includes info systems.	Municipalities Generating industries Solid waste companies
Process & Prevention Technology	Equipment and technology for in-process (rather than end-of-pipe) pollution prevention and treatment	All industries
Environmental Resources		
Water Utilities	Selling water to end users	Municipalities & All industries
Resource Recovery	Selling materials recovered and converted from industrial by-products or post-consumer waste	Municipalities Generating industries Solid waste companies
Environmental Energy Sources	Selling power and systems in solar, wind, geothermal, small scale hydro, energy efficiency and DSM	Utilities All industries and consumers

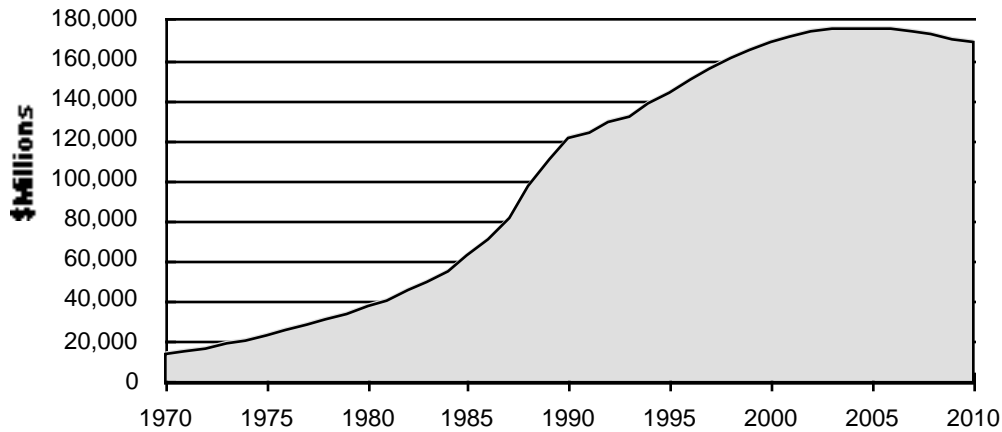
Source: Environmental Business International Inc. (San Diego, Calif.)

History of the Environmental Industry

The environmental industry has its roots in sanitary engineering and waste management, dating back to the 1800s. In 1970, with the birth of the Environmental Protection Agency as the acting arm of the National Environmental Protection Act, the environmental industry was given new coherence and impetus. During this formative era, environmental priorities tended to be those that the public could see, smell and touch, like garbage and sewage, which related to the industry's origins, but also included new areas like air pollution. These solutions usually involved large capital projects and central public sector involvement. Landmark legislation later launched a toxics or hazardous waste era that focused more on a "polluter pays" approach, stimulating more revenue contribution from industry.

From modest beginnings, the environmental industry has grown from less than \$20 billion in 1970 to \$170 billion today. It has recently been recognized as a valuable and vital part of the economy, responsible for almost 3% of GNP and employment of more than 1.2 million people in the United States in 1994.

Exhibit 2-3 Historical and Projected Size of U.S. Environmental Industry



Source: Environmental Business International Inc. (San Diego, Calif.)

Having grown in excess of 15% per year during the hazardous waste era in the late 1980s, the environmental industry slowed to 10% growth in 1990, 2% in 1991, 4% in 1992, 3% in 1993, and 6% in 1994.

Exhibit 2-4 Recent Growth in Environmental Industry Segments

Environmental Industry Segment	Revenues and Growth (\$ Billions)									
	1990	89-90 Growth	1991	90-91 Growth	1992	91-92 Growth	1993	92-93 Growth	1994	93-94 Growth
Services										
Analytical Services	1.5	6%	1.6	1%	1.6	3%	1.6	0%	1.6	2%
Water Treatment Works	19.8	8%	20.7	5%	21.7	5%	23.4	8%	25.7	10%
Solid Waste Management	26.1	8%	27.0	3%	28.2	4%	29.4	4%	31.0	5%
Hazardous Waste Management	6.3	11%	6.4	2%	6.6	4%	6.5	-2%	6.4	-1%
Remediation/Industrial Services	8.5	4%	7.9	-7%	8.2	4%	8.4	3%	8.6	2%
Consulting & Engineering	12.5	19%	13.5	8%	14.23	6%	14.6	2%	15.3	5%
Equipment										
Water Equipment and Chemicals	12.1	3%	12.5	3%	13.0	4%	13.2	2%	13.5	2%
Instrument Manufacturing	2.0	21%	2.3	15%	2.6	12%	2.7	6%	2.9	5%
Air Pollution Control Equipment	10.7	8%	10.9	3%	11.2	2%	11.5	3%	11.7	2%
Waste Management Equipment	10.4	6%	10.8	4%	11.1	3%	10.9	-2%	11.2	3%
Process & Prevention Technology	0.4	37%	0.5	22%	0.6	20%	0.7	14%	0.8	11%
Resources										
Water Utilities	19.8	5%	21.0	6%	21.9	4%	23.1	6%	24.2	5%
Resource Recovery	13.1	9%	12.0	-8%	12.2	2%	13.3	9%	15.4	16%
Environmental Energy Sources	1.8	11%	1.9	7%	2.0	5%	2.1	5%	2.2	7%
Total Industry:	145.0	8%	149.0	3%	155.1	4%	161.3	4%	170.4	6%

Source: Environmental Business International Inc. (San Diego, Calif.)

The environmental industry now certainly displays the characteristics of a maturing industry in the United States, Western Europe and Japan, such as decelerating growth, heightened competition, growing sophistication among its client base, greater emphasis on marketing, etc. Beyond facing the challenges of a maturing industry, however, environmental companies suffered a difficult stage of regulatory uncertainty in the U.S. in 1991-1993. Government sent an important direct and indirect message that environmental quality would take a back seat to economic growth. The Bush Administration established the Competitiveness Council that sought, among other things, to gut the Clean Air Act Amendments passed in 1990. It announced a "moratorium on new regulations" for the sake of improving the economy.

Ironically, the transition to the Clinton Administration was even worse for the environmental industry. Signs of uncertainty within the government only led to further postponements and cancellations of environmental projects by the regulated community. But by far the most important cause of the collapse of environmental industry growth was the recession. A bad economy exposed how truly discretionary most environmental spending was. What was once promoted by Wall Street and others as a recession-proof industry was revealed as recession prone.

Even as recession subsided and regulatory uncertainty has cleared up to some extent, the environmental industry will never again experience the boom of an emerging market in the U.S. Current EBI projections for industry growth are from \$170 billion in 1994 to over \$207 billion by 2000, reflecting average composite annual growth of 3-5%.

Exhibit 2-5 Projected Growth in the U.S. Environmental Industry

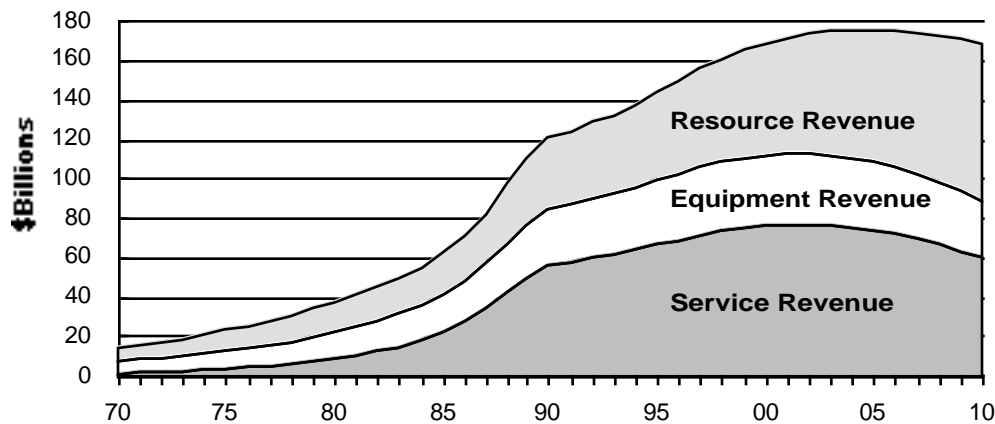
Environmental Industry Segment	Average Annual Growth '94-'99	Revenues and Growth (\$ Billions)					
		1994	1995	1996	1997	1998	1999
Environmental Services							
Analytical Services	3%	1.6	1.7	1.8	1.8	1.9	1.9
Water Treatment Works	5%	25.7	27.3	28.9	30.5	32.0	33.6
Solid Waste Management	4%	31.0	32.3	33.7	35.0	36.4	37.7
Hazardous Waste Management	-3%	6.4	6.3	6.1	5.9	5.8	5.6
Remediation/Industrial Services	3%	8.6	8.9	9.2	9.6	9.9	10.2
Consulting & Engineering	5%	15.3	16.1	17.0	17.9	18.6	19.3
Environmental Equipment							
Water Equipment and Chemicals	4%	13.5	14.2	15.0	15.7	16.4	17.1
Instruments & Information System	6%	2.9	3.0	3.2	3.3	3.5	3.6
Air Pollution Control Equipment	2%	11.7	12.0	12.2	12.5	12.7	12.9
Waste Management Equipment	-1%	11.2	11.4	11.4	11.4	11.2	10.9
Process & Prevention Technology	14%	0.8	0.9	1.0	1.2	1.3	1.5
Environmental Resources							
Water Utilities	4%	24.2	25.3	26.5	27.6	28.8	30.0
Resource Recovery	5%	15.4	16.4	17.4	18.4	19.3	20.1
Environmental Energy Sources	9%	2.2	2.4	2.6	2.8	3.0	3.2
Total United States Market		170.4	178.2	185.9	193.6	200.9	207.7

Source: Environmental Business International Inc. (San Diego, Calif.)

Soon after the turn of the century, however, environmental industry revenues, particularly in the most regulatory driven segments (pollution control, hazardous waste management and site remediation), are expected to decline. Beyond showing all the classic signs of a maturing industry as mentioned, these segments face the fundamental long-term challenge that the environmentally negligent and resource-rich environment that created much of its revenue opportunity will no longer exist. We are no longer creating Superfund sites at the rate we did; we no longer use asbestos, each new manufacturing or industrial facility is now designed with material efficiency and pollution prevention in mind.

Historical and projected growth for the entire environmental industry are presented in the graph below, divided into three major categories. Resource segments already exert a stabilizing influence on the environmental industry, with their influence no doubt increasing in the future. Delivery of clean water, recovery of used materials and alternative energy each carry the promise of sustainable growth, whereas many of the cleanup and control sectors in service and equipment categories face a soberingly finite life cycle.

Exhibit 2-6 Relative Historical and Projected Growth in the Environmental Industry



Source: Environmental Business International Inc. (San Diego, Calif.)

This more exhaustive analysis of the United States environmental industry, included in this section, highlights a number of important points that should be observed when viewing the international data contained in studies published by EBI.

- Solid waste (including recycled scrap sales) comprises *almost one-third* (~28%) of the market
- Water and wastewater (including delivery, treatment and equipment) comprises *over one-third* (~38%) of the market
- Air pollution control, analytical services, consulting services, remediation, hazardous waste management renewable energy production make up the other third.

While these conclusions don't hold precisely for all countries or regions in the world, they nevertheless form a broad outline for what can be expected to occur as an economy develops.

2.1.2 Extending the Current Definition

The discussion on the environmental industry definition continues to evolve. The areas discussed above have been the basis of all of EBI's market and industry analysis to date. However, the Organization of Economic Cooperation and Development (OECD) in cooperation with the statistical arm of the European Union (EUROSTAT) has engaged in the process of holding a series of meetings to address the issue of a global definition for the environmental industry. The OECD/EUROSTAT "Informal Working Group on the Environment Industry" recently published a working document entitled "Common Definition and Classification of the Environment Industry for Data Collection. Synthesis Report." Dan Noble, V.P. Director of Research for EBI, attended both working group meetings (October 14th & 15th, 1994 in Washington, DC and April 26th and 27th, 1995 in Luxembourg). The main extension, and changes to the definition from the industry, compared to EBI's definition are twofold:

1. the *exclusion* of water delivery and resource recovery as "environmental industries," which EBI does include in the "Resource" super-category, and
2. the *inclusion* of all construction costs related to environmental projects.

These differences will need to be resolved throughout the course of future studies.

In addition, as discussed further in Section 2.3, the environmental industry finds itself in a profound transition that should eventually lead toward an environmentally sustainable economy. This transition will fundamentally alter the way we view pollution generators and

have a deep and lasting impact on the environmental industry. This transition, which many signs indicate has already begun, is an important, recurring theme throughout any industry analysis. While the transition to sustainability will most certainly extend the current definition of the environmental industry to something much more comprehensive, EBI's work to date has not attempted to define it or include it in the market estimates. However, due to the importance and impact that this transition will have on the environmental industry and its clients, the generators, the importance of extending the definition and tracking the transition cannot be understated (see also "Bridge to a Sustainable Future," White House, April 1995, and Sections 2.3 of this monograph).

2.2. Information Consistency

The two major challenges in performing international market analyses and in drawing meaningful conclusions from the data contained in them are:

- Segment or business activity definitions, and
- Units of measure

It is clear that most published reports on the environmental industry as a whole and various subsegments are defined differently from those defined by EBI. Thus, strict comparisons between data from different studies in different countries is not currently possible. Nevertheless, the data collected can provide strong indications of relative size of industries and markets in various countries.

One of the largest definitional problems observed in studies other than EBI's is the categorization of markets by the traditional environmental media type, i.e. air, water, solid waste, etc. In many cases, aggregate values are provided that included services and products of many business activities, e.g. analytical services, consulting, various products, etc. These can often *not* be disaggregated into constituent business activities. In order to clarify this issue, the following chart (Exhibit 2-7) illustrates how the various data accumulated by EBI for the U.S. can be categorized by environmental media *in addition* to environmental business activity.

Exhibit 2-7 U.S. Environmental Markets by Media

1994-Environmental Business Sectors By Media							
<i>Business Type</i>	Air	Water/ Wastewater	Hazardous Waste	Remed- iation	Solid Waste	Other	TOTAL
Services							
Analytical Services	84	375	336	602	137	67	1,600
Wastewater Treatment Services		25,700					25,700
Solid Waste Management					31,000		31,000
Hazardous Waste Management			6,400				6,400
Remediation/Industrial Services				8,600			8,600
Consulting & Engineering	1,450	3,381	3,632	3,577	1,108	2,152	15,300
Subtotal Services:	1,534	29,456	10,367	12,779	32,244	2,219	88,600
Equipment							
Water Equipment and Chemicals		13,500					13,500
Instrument Manufacturing	725	1,073	441	661			2,900
Air Pollution Control Equipment	11,700						11,700
Waste Management Equipment			3,140	1,100	6,960		11,200
Process & Prevention Technology						800	800
Subtotal Equipment:	12,425	14,573	3,581	1,761	6,960	800	40,100
Resources							
Water Utilities		24,200					24,200
Resource Recovery				462	14,938		15,400
Environmental Energy Sources						2,200	2,200
Subtotal Equipment:	0	24,200	0	462	14,938	2,200	41,800
TOTAL ALL SEGMENTS:	13,959	68,229	14,410	14,540	54,142	5,219	170,500

Source: Environmental Business International, Inc. (San Diego, CA)

Significant variability of units of measure are found in studies other than EBI's direct primary research results. Typically the variance is due to the currency of the country in question. To solve the currency issue, every attempt is made to convert currency to U.S. dollars (USD) at the exchange rate for the year in question when EBI is performing secondary research analysis on using other international research data. Primary international research of the environmental industry has not been performed and is discussed further in Section 4.1.2.

2.3. Industry In Transition

The U.S. and European environmental industries have precipitated a transition in pollution generating companies an economic shift from end-of-pipe pollution control to more in-process pollution prevention. This transition is, in turn, making way for an even greater shift in the fundamental economic structure toward more environmentally sustainable industrial practices. The current U.S. Executive Administration defines this as a movement from pollution "measurement and assessment, " "remediation" and "control" to pollution "avoidance." To date, this transition has not been quantitatively measured. However, if the traditional environmental industry, as defined in the above section, is put into this emerging framework, the following picture results (Exhibit 2-8).

Exhibit 2-8 U.S. Environmental Markets by Process Type

1994-Environmental Sectors By Process/Solution Segments					
Environmental Business Segment	Avoidance	Monitoring & Assessment	Control	Remediation & Restoration	1994 Total
Services					
Analytical Services		1.6			1.6
Wastewater Treatment Services			25.7		25.7
Solid Waste Management			31.0		31.0
Hazardous Waste Management			6.4		6.4
Remediation/Industrial Services				8.6	8.6
Consulting & Engineering	1.5	5.2	5.0	3.5	15.3
Equipment					
Water Equipment and Chemicals			13.5		13.5
Instrument Manufacturing		2.9			2.9
Air Pollution Control Equipment			11.7		11.7
Waste Management Equipment		1.1	7.8	2.2	11.2
Process & Prevention Technology	0.8				0.8
Resources					
Water Utilities			24.2		24.2
Resource Recovery	15.4				14.7
Environmental Energy Sources	2.2				2.2
TOTAL INDUSTRY:	19.9	10.8	125.4	14.4	170.5
	11.7%	6.3%	73.5%	8.4%	

Source: Environmental Business International, Inc. (San Diego, CA)

Based on these new definitions, then, it is possible to begin to measure this transition. However, an attempt to measure this transition, makes more complex the measurement of the traditional environmental industry. While the measurement of this transition is seen as important by the authors of this paper, it is only now just beginning to occur. It is possible, however, to use EBI's preliminary work as a benchmark, a starting point, for attempting to measure the broader structural change from a predatory to a more sustainable economy. This beginning methodology is further discussed in Section 4.2. of this paper.

3. Elements of EBI's Market Research Method

Over the years, EBI has established a method for performing research on environmental companies that is both efficient and comprehensive. The cost for performing this work has been born by the private sector through the purchase of EBI's products and services. For this reason, the data, interpretation and analyses have been crafted to directly serve the needs of environmental industry executives in the private sector for their use in developing marketing and strategic plans for their individual business operations and expansions. Since businesses must rely on this data to make multi-million dollar investment decisions, EBI researchers have been very conscious and conscientious in collecting, processing and interpreting the data.

Any market can be viewed as a population of sales events between a buyer and a seller. So from that perspective, a market research analyst can either count purchases by individual buyers or, alternatively, s/he can count the revenues/sales of the seller. Since buyers typically out number sellers, and since buyers don't always keep good track of their purchases, it is usually easier to study revenue generated, rather than purchases made, in a given market. That is, it's typically less costly and more accurate to survey the sell side of a market. This has been the method employed by EBI in surveying the environmental industry. In this way, we survey actual, existing markets.

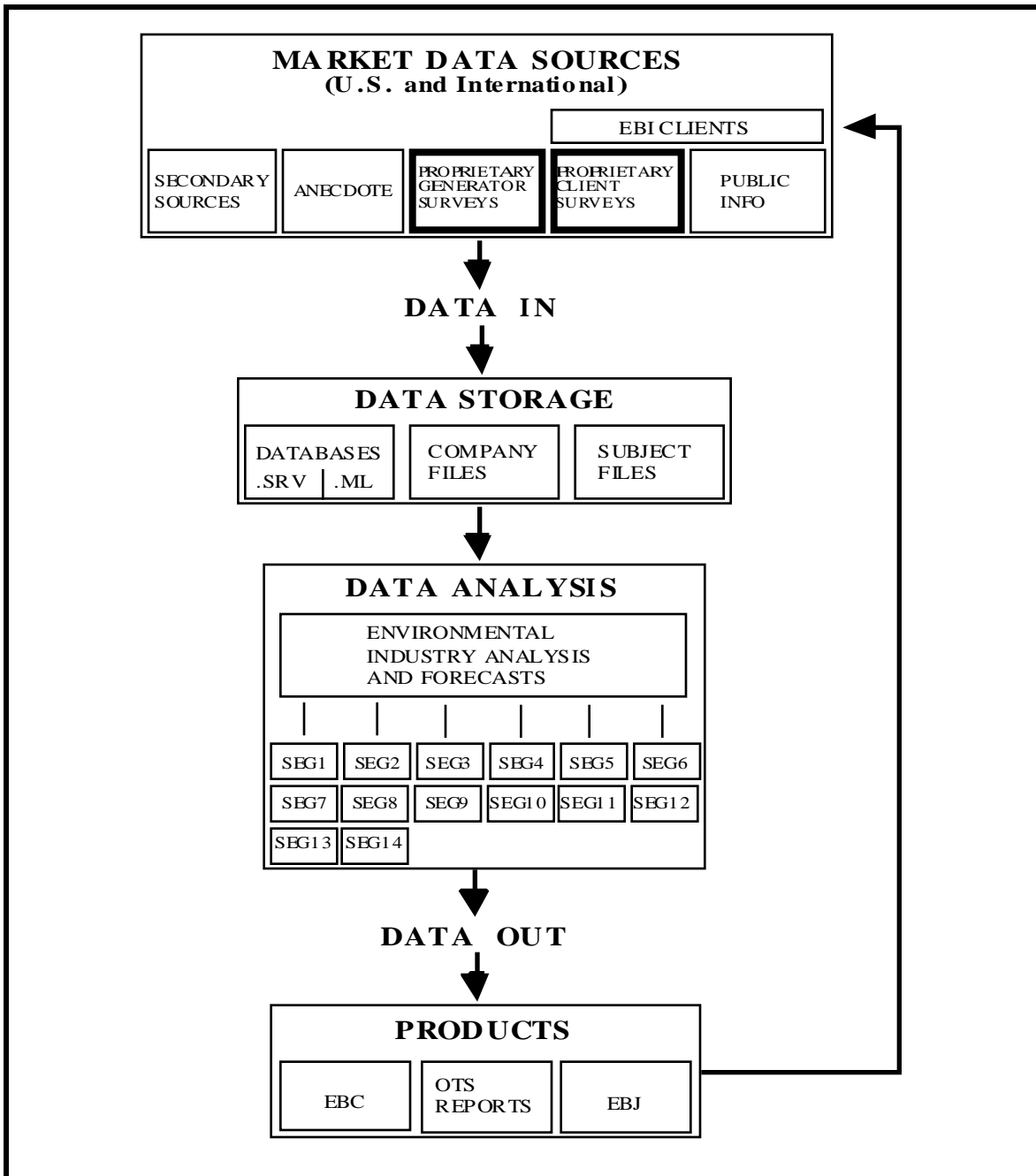
Basically, EBI "adds up" the revenues generated by companies/entities in each of the 14 environmental business sectors outlined above to determine individual segment and then total industrial size. It does this in four distinct steps:

1. Generation and Maintenance of Company Databases
2. Development of Survey Instruments
3. Response Data Compiling
4. Margin Analysis Modeling

Each of these steps are discussed in greater detail in the following four sections. The last section reviews the market and industry intelligence that is *not* captured using this method, and discusses how EBI obtains that other data.

The EBI information management system outlined in Exhibit 3-1 shows a schematic of this research method. EBI integrates information from all available sources through a computer-based data collection, storage, retrieval and analysis system designed to meet the demands and match the discipline imposed by the rapidly evolving environmental marketplace. The key to this method is that EBI continually collects *primary* data from companies, using that data to model industry size. It does not use "industry expert" opinion to derive its market numbers.

Exhibit 3-1 EBI INFORMATION MANAGEMENT MODEL



SOURCE: © 1996 Environmental Business International, Inc., San Diego, CA

3.1. Company Databases

EBI continuously collects and updates its lists of environmental product and service companies. These databases are derived from industry directories, electronic down-loads from Dun and Bradstreet databases, list trades from other information companies and exhibitor and attendee lists from environmental industry conferences.

Companies larger than \$10 million in sales are all captured, however, there are many thousands of companies or departments and divisions of companies that are smaller than \$10 million in sales in this industry. It is these companies that are the most challenging to find and to survey. However, EBI maintains these databases and there are over 50,000 records of environmental companies in the fourteen segments in the U.S. alone.

These databases are coded by company type (the fourteen segments). They are used as the source databases for performing survey mail-outs. Typically Marketing Directors or Chief Financial Officers are the ones who fill out EBI surveys. The completed surveys form the backbone of the EBI primary research data.

3.2. Survey Instruments

EBI designs and implements its own surveys on the environmental industry. Based on its years of experience in performing these surveys it has evolved a method to receive financial data from companies who are willing to fill out and return the survey instruments.

Examples of four such surveys are shown in Appendix 5.2. These surveys shown in the Appendix are designed specifically for four of the fourteen segments. They are:

- Environmental Engineering and Consulting Companies
- Water/Wastewater Equipment and Chemicals
- Environmental Analytical Instruments
- Environmental Information Products and Services

A brief review of the surveys will reveal that EBI routinely collects at least the following information from each company in the various business segments:

- Financial Information
 - Company information,
 - Gross revenues-past two years, most recent year and one year future estimate,
 - Segment specific revenues
 - Operating Income
 - International Revenues
- Product or service line revenue breakdown
 - this revenue breakdown is specific to the environmental business segment
- Market or client type revenue breakdown
 - this includes government and private client breakdowns
- Geographic revenue breakdown
- Other segment specific categories.

These surveys are sent out with a cover letter that describes the survey, why we're doing it and what they can expect to receive for filling out their survey.

The survey data is kept confidential in EBI's files. The only piece that is published is the total gross and environmental revenues. This is explained in the cover letter. The aggregate data, however, is used to form market size estimates based on the primary data collected from these surveys.

3.3. Response Data Compiling

Each returned survey is entered into an electronic database so that the data may be easily tabulated. An example of a typical database structure for one of these surveys is shown in Appendix 5.3.

As can be seen in the database structure, both quantitative and qualitative data can be stored in these databases. Total summaries, averages, highs and lows, etc. can all be easily calculated in these databases.

If cross-tabbing or other statistical manipulations need to be performed, the data can be easily moved into a statistical program like STATPAC. If more straight forward “margin analysis” is needed, then the data is moved into spreadsheet programs.

3.4. Margin Analysis Modeling

3.4.1. Gross Revenue Data

Typically revenues for the top 100, or so, companies in each sector is known. This comes from published reports on the publicly traded companies or from EBI’s surveys. We typically obtain data from all of the companies with revenues greater than \$100 million. Of the firms in the \$10 million to \$100 million range we will get up to 50%. Of the vast majority of firms in the <\$10 million revenue range, we will receive about 3-4 % response on the surveys. The revenues on these companies is then modeled. So while EBI may receive surveys on 5-6% of the total companies surveyed, through modeling the revenues of the companies that are not received, we capture about 60 to 70% of the total revenues for each industry segment that we survey.

An example for our survey results from air pollution control equipment companies demonstrates these results, shown in Exhibit 3-2. EBI received surveys from 194 firms, in this case 20% of the 665 firms believed to be in this industry segment. However, this represents—using this model—about 78% of the total revenues for this segment. Based on this analysis, EBI has developed a high degree of confidence in its models of market size.

Exhibit 3-2 Air Pollution Control Equipment Revenue Modeling (\$million)

Size Category	# of Cos.	Avg. Revs	Revs	Missing Cos.	Missing Revs	Total Cos.	Total Revs	% of Ind.
>\$100 Million	8	151.3	1,210	0	0	8	1,210	33%
\$50 Million–\$100 Million	5	61.6	308	2	123	7	431	12%
\$20 Million–\$50 Million	20	30.3	606	4	121	24	727	20%
\$10 Million–\$20 Million	21	12.7	267	15	191	36	458	12%
\$1 Million–\$10 Million	140	3.1	439	50	157	190	596	16%
<\$1 Million		0.7		400	280	400	280	8%
Total	194		2,830	471	872	665	3,702	100%

SOURCE: © 1996 Environmental Business International, Inc., San Diego, CA

3.4.2. Service/Product Analysis

Using the data from the surveys received, the product service breakdown can also be modeled. Continuing with the APC Equipment survey of 1994 revenue data, the product breakdown for revenue is shown in Exhibit 3-3.

Exhibit 3-3 Air Pollution Control Equipment Revenue by Equipment Type (\$million)

Equipment Type	Revenues Reported by Type	Percent Total Reported
FGD/Scrubbers	634.5	26%
Fabric Filters & Baghouses	504.0	21%
Electrostatic Precipitators	457.3	19%
Oxidation Systems	392.0	16%
NOx Control Systems	304.9	13%
Carbon Adsorption	87.4	4%
Others	40.7	2%
Total Revenue Reported :	2,420.8	100%

SOURCE: © 1996 Environmental Business International, Inc., San Diego, CA

The percentages in the margins, then, are used to multiply times the total revenue (see Exhibit 3-2), thus creating a model of the revenue breakdown by segment or product, for the whole industry segment.

3.4.3. Analysis by Environmental Media Type

In a similar fashion as the product or service type breakdowns, revenues can be broken down by environmental media. The environmental media in question are:

- air
- water
- hazardous waste
- soil remediation
- solid waste

In the five environmental business segments where the environmental media may be a multidisciplinary function (i.e. not a single media focus like APC equipment, or solid waste services, etc.) the revenue data is subdivided by media type. The segments where this is the case are:

- Analytical Services
- Consulting and Engineering
- Instrument Manufacturing
- Waste Management Equipment
- Resource Recovery

The overall numerical breakdown by media type was shown in Exhibit 2-7.

3.4.4. Analysis by Client Type

In addition, to the analysis of the data by the above categories, most companies want to know how the market breaks down by buyer type. This information is also included on the survey, so an analysis of the summarized revenues is straightforward from the completed survey data. This type of data is shown for the APC equipment example in Exhibit 3-4.

Exhibit 3-4 Air Pollution Control Equipment Revenue by Client Type (\$million)

Client Type	Revenues Reported by Type	Percent Total Reported
Electric Utilities	785.1	42.8%
Chemical, Pharm. & Plastics	150.7	8.2%
Pulp & Paper Manufacturing	148.9	8.1%
Independent Power Producers	120.3	6.6%
Incinerators & Waste-to-Energy	108.7	5.9%
Petroleum Refining	102.0	5.6%
Auto/Machinery Manufacturing	68.1	3.7%
Primary Metals (Steel, Copper, etc.)	53.8	2.9%
Others:		
Stone, Clay, Glass & Cement	49.1	2.7%
Paint & Coatings/Metal Finishing	46.4	2.5%
Others	39.7	2.2%
Printing & Publishing	37.8	2.1%
Electronics & Computers	35.0	1.9%
Food Processing	31.3	1.7%
Mining	23.2	1.3%
Wastewater Treatment Plants	17.7	1.0%
Remediation & Env. Cons. Firms	5.0	0.3%
Landfills	4.7	0.3%
Energy Exploration (Coal, Oil & Gas)	4.2	0.2%
Textiles & Leather	2.9	0.2%
Total Revenue Reported :	1,834.6	100.0%

SOURCE: © 1996 Environmental Business International, Inc., San Diego, CA

3.4.5. Public vs. Private Entities

As stated in Section 2 above, not all of the entities in the environmental industry are private companies (either publicly or privately owned). Some, especially solid waste, water delivery and wastewater treatment are owned and operated by incorporated municipalities, counties or special districts. However, owing to the worldwide movement to privatize these traditional “environmental infrastructure” entities, EBI tracks the entire “industry” of both public and private entities who own and operate these facilities. In the United States, EBI has estimated the approximate revenue breakdown and revenue sources of these entities. This is shown in Exhibit 3-5.

Exhibit 3-5 Environmental Industry Segments by Ownership Type

ENVIRONMENTAL INDUSTRY SEGMENT	Revenue Generator (\$bil)				
	1994	pub%	priv%	pub\$	priv\$
Services					
Analytical Services	1.6	8%	92%	0.1	1.5
Water Treatment Works	25.7	95%	5%	24.4	1.3
Solid Waste Management	31.0	33%	67%	10.2	20.8
Hazardous Waste Management	6.4	10%	90%	0.6	5.8
Remediation/Industrial Services	8.6	0%	100%	0.0	8.6
Consulting & Engineering	15.3	0%	100%	0.0	15.3
Equipment					
Water Equipment and Chemicals	13.5	0%	100%	0.0	13.5
Instruments & Information Systems	2.9	0%	100%	0.0	2.9
Air Pollution Control Equipment	11.7	0%	100%	0.0	11.7
Waste Management Equipment	11.2	0%	100%	0.0	11.2
Process & Prevention Technology	0.8	0%	100%	0.0	0.8
Resources					
Water Utilities	24.2	84%	16%	20.3	3.9
Resource Recovery	15.4	25%	75%	3.9	11.6
Environmental Energy Sources	2.2	5%	95%	0.1	2.1
Total	170.4	35%	65%	59.7	110.7

SOURCE: © 1996 Environmental Business International, Inc., San Diego, CA

What is clearly evident from this analysis is that all equipment manufacturing and distribution is private. This is typical in all western, free-market economies. However, the environmental infrastructure services are public. Although solid waste has largely been privatized in the U.S., the biggest opportunities for privatization are in the water delivery (utilities) and in the wastewater treatment segments. This, of course, represents a major opportunity for private environmental companies in these sectors. These opportunities are being actively pursued by European companies in the U.S., while U.S. solid waste companies are actively pursuing solid waste opportunities abroad.

3.5. Data Elements Not Captured in this Method

As already stated, the major data that is not captured in the method described above is the “buy-side” data, i.e. a record of environmental purchases by companies and municipalities. EBI selectively captures this data on a case-by-case basis. However, the U.S. Government (via the Department of Commerce) does capture a large amount of environmental spending data by industry.

3.5.1 Buying Pattern, or Buy Side Analysis

EBI surveys buyers of environmental products and services to determine the buying patterns of the customers of these services. Typically these studies are performed for individual clients and are therefore client private. However, EBI is currently engaged in the authoring of a report on this subject for its general readership.

While there are tens of thousands of environmental companies, there are on the order of hundreds of thousands of environmental pollution generators in the United States. This fact alone makes forming generalizations about these markets very tentative, from just the buy-side perspective.

In addition, many recent studies by EBI have shown that certain services by generators are performed more internal more frequently, while others are tend to be more frequently contracted out. This is shown for the Consulting and Engineering services in the U.S. chemical industry in Exhibit 3-6. What this points to is that aside from the *actual* market that EBI surveys in the sell-side surveys of industry companies, there is *still a larger potential market* that can be “captured” from the “Do-It-Yourself” companies in this industry.

Exhibit 3-6 Consulting and Engineering Services Used by the Chemical Industry

Service Category	Perform In-House	Outside Vendor	Service Category	Perform In-House	Outside Vendor
Testing/Analytical Services	24%	76%	Solid Waste	60%	40%
Analytical Testing	14	86	Landfill Design/Closure	24	76
Sampling-Air	27	73	Solid Waste Characterization	57	43
Sampling-Water	32	68	Solid Waste Recycling	76	24
Sampling-Soil	28	72			
Hazardous Waste	35%	65%	Water/Wastewater	72%	28%
Aquifer Remediation	14	86	Industrial Pre-Treatment	59	41
Asbestos Abatement	25	75	Operations & Maintenance	89	11
Closure/Remediation	6	94	Stormwater Management	89	11
On-Site HW Management	72	28	Sludge Management	74	26
Part-B Permitting	58	42	Water Supply	79	21
RCRA	53	47	Wastewater Treatment/Disposal	55	45
Remedial Design	21	79	General Consulting	Env'l 75%	25%
RI/FS, Site Audit/Assessment	38	62	Risk Assessment	49	51
Soil Remediation	11	89	Env. Impact Statement	56	44
Superfund PRP	24	76	Permitting	74	26
UST Compliance	41	59	Pollution Prevention	92	8
Air Compliance	51%	49%	Project Management	73	27
Air Emission Study/Control	45	55	Regulatory Assistance	67	33
Air Permitting	57	43	Strategic Env'l Management	88	12
			Waste Minimization	90	10
			Wetlands	31	69

SOURCE: Environmental Business International, Inc. San Diego, CA

3.5.2 Government Data on Cost of Environmental Expenditures

In addition to the private data collected by companies like EBI, the U.S. government collects environmental expenditure data as well. The bulk of this data is based on a comprehensive annual survey performed by the U.S. Department of Commerce. A summary of a portion of this data is shown in Exhibit 3-7. The percent of expenditures by three media categories of air, water and solid waste are also included in this data.

To date no one has funded a correlation of this buy-side, or expenditure data with the sell-side or revenue data that EBI produces. While this exercise would likely be very instructive, revealing holes and problems with definitions and data sources, this would be a major (multi-million dollar) undertaking.

**Exhibit 3-7 Total Manufacturing Industry Pollution
Abatement Expenditures (\$ Millions)**

SIC	Industry	Total 86-'92								
		1992‡		PACE+PAOC		PACE	PAOC	Air	Water	S.W.
28	Chemicals and allied products	7,177.9	26.0%	27,328.4	24.7%	30.5%	69.5%	26.3%	46.2%	27.5%
29	Petroleum and coal products	5,893.6	21.3%	18,279.5	16.5%	32.6%	67.4%	58.3%	27.8%	13.9%
26	Paper and allied products	2,918.8	10.6%	12,433.1	11.3%	36.5%	63.5%	32.3%	44.3%	23.4%
33	Primary metal industries	2,661.6	9.6%	12,176.6	11.0%	19.8%	80.2%	50.4%	28.4%	21.2%
20	Food and kindred products	1,692.1	6.1%	7,410.4	6.7%	20.5%	79.5%	15.5%	62.8%	21.7%
37	Transportation equipment	1,619.6	5.9%	6,971.4	6.3%	21.2%	78.8%	29.2%	30.5%	40.3%
34	Fabricated metal products	1,014.7	3.7%	4,824.2	4.4%	15.5%	84.5%	18.8%	40.5%	40.7%
36	Electronic and other elec. equip.	871.8	3.2%	4,547.0	4.1%	19.4%	80.6%	18.8%	43.0%	38.3%
35	Industrial machinery and equip.	698.9	2.5%	3,230.0	2.9%	19.6%	80.4%	21.9%	30.5%	47.6%
32	Stone, clay, and glass products	676.1	2.4%	3,063.8	2.8%	18.9%	81.1%	56.0%	16.9%	27.1%
38	Instruments and rel. products	516.5	1.9%	1,699.0	1.5%	23.6%	76.4%	21.4%	30.9%	47.7%
30	Rubber and misc. plastics	511.9	1.9%	2,320.4	2.1%	16.9%	83.1%	31.6%	21.6%	46.8%
24	Lumber and wood products	370.6	1.3%	1,752.1	1.6%	25.4%	74.6%	41.5%	15.7%	42.8%
27	Printing and publishing	308	1.1%	1,447.7	1.3%	17.4%	82.6%	40.1%	13.1%	46.7%
22	Textile mill products	307.3	1.1%	1,216.5	1.1%	15.2%	84.8%	19.1%	56.6%	24.4%
25	Furniture and fixtures	151.6	0.5%	753.9	0.7%	14.2%	85.8%	40.4%	14.4%	45.3%
39	Misc. manufacturing industries	107.4	0.4%	548.7	0.5%	12.5%	87.5%	21.0%	30.2%	48.8%
31	Leather and leather products	63.5	0.2%	252.4	0.2%	15.6%	84.4%	9.2%	58.1%	32.6%
21	Tobacco products	48.5	0.2%	251.5	0.2%	17.8%	82.2%	41.3%	27.4%	31.3%
Total/Average, Manufacturing		27,610.4	100%	110,506.6		26.3%	73.7%	34.9%	37.6%	27.5%

SOURCE: US Department of Commerce, Bureau of the Census

‡ 1992 figures include data for “non-media and other” expenditures as discussed previously.

*1992 and Total '88-'92 percentages represent each industry's share of the total expenditures for all manufacturers during those periods.

**Percentages of Pollution Abatement Capital Expenditures, Pollution Abatement Operating Costs Air, Water, and Solid Waste are for 1988-1992 totals.

4. Further Data Needs

“In politics [science and business], numbers beat no numbers every time.”

Jodie Allen, Former U.S. Assistant Secretary of Labor

Even though EBI has spent the last 9 years doing nothing but analyzing the environmental industry, we nevertheless feel that our job is just beginning. We need to continue to better analyze and track the traditional environmental industry. In addition, we feel that beginning to understand the transition to a sustainable economy, participated by the environmental industry, is a much larger, important and more challenging task.

4.1. More Data on the Traditional Environmental Industry Segments

4.1.1. United States Environmental Industry Data

As indicated in the previous chapter, EBI feels that it has collected sufficient data in a number of segments. However, owing to the lack of sufficient buyers for certain segment data in the United States, we believe that the following data sets could use more work using our methods.

- **Solid Waste:** The U.S. solid waste industry is dominated by three very large companies (WMX International, BFI, and Laidlaw). These companies all have very large internal market intelligence staffs (or so we have been led to believe). In addition, the remainder of the other companies are quite small and regional. For these reasons, EBI has not found a sufficient client base to fund more extensive market research in this arena. We do have plenty of publicly available data on these large companies, and have other data from the smaller ones, as well as industry associations and government data on waste production. Therefore, we believe our market estimates are sufficiently accurate without performing more primary survey research on this sector.
- **Hazardous Waste:** The U.S. hazardous waste industry is relatively small (\$8 billion) compared to the other sectors and appears to be shrinking. In addition, there is a lot of government data on this sector from the hazardous waste generation side. This sector could use more in depth research as it continues to decline. Though owing to the decline in this segment, the private sector is not likely to fund such an effort (i.e. there is an insufficient market for this information beyond the current level of effort).
- **PPT:** Prevention and Process Technologies are a “mixed bag” of company types. However, it is rapidly growing and EBI believes that it is the harbinger of the transition to an environmentally sustainable economy. EBI will likely study this segment more as it refines its definitions and uses that analysis to work toward analyzing sustainable development (see Section 4.2)
- **Construction:** EBI has not studied the straight construction side of the environmental industry. Portions of these costs are contained in the design and engineering function of the C&E firms. In addition, capital improvements are captured as expenditures and debt service within the water and solid waste industries. But the revenues generated in these sectors largely goes to the services that the entities in these sectors provide. Disaggregating just the construction costs has, to date, been beyond the scope of work performed by EBI.

- **Lawyers:** EBI estimates that lawyers in the U.S. collectively generate between \$3 to 5 billion in revenues annually on just environmental law issues. Because this sector tends not to buy strategic market data, and EBI has never had it in its charter to survey this data, this revenue data is missing from our analysis.
- **Environmentally Friendly Products:** Another important and emerging sector in the U.S. economy that appears to be environmentally driven is environmentally friendly products. These include a broad range of multiple sectors like:
 - apparel (e.g. chemical free cotton)
 - personal care products
 - natural food products and supplements
 - recycled products
 - reused products
 - energy saving products and services.Along with the industrial and prevention products, EBI is considering studying these products further once clear definitions are established.

4.1.2. Primary Environmental Industry Data-Worldwide

As is evident from the entire preceding discussion, EBI has focused almost entirely on the U.S. market for its primary research. The reason for this is that our customers have been in the U.S. and the markets for exports have not been sufficiently uniform or robust to warrant the very significant expenditures involved in international market analysis.

One study that EBI performed that was partially funded by a U.S. EPA grant is the “Global Environmental Industry: A market and needs assessment.” This study, however, was based entirely on secondary research, i.e. reports and studies performed by other researchers. As discussed at length in that study, this is *very* problematical since each study used *both* diverse definitions and diverse methods to arrive at their market figures. For this reason, EBI produced a companion “world model” that became the basis for comparing environmental markets worldwide, using the definitions and methods established for our work in the U.S. market. This data is contained in an “executive review” of the larger global study.

The real work that remains to be done is the development of a comprehensive program that studies environmental companies worldwide. While this is clearly possible given the advanced information technologies available to research companies such as EBI, it is nevertheless at least an order of magnitude more difficult (read expensive) than doing this work just for the U.S. EBI estimates that it has earned and spent in excess of \$4 million dollars to reach its current level of understanding of the U.S. environmental industry. Multiplying that times ten would likely give us an equivalent understanding of world environmental industry and markets to the same degree of detail and articulation as EBI now has for the U.S. environmental market.

4.2. Elements, Definitions and Methods for Tracking Industry Sustainability

Having a sound measurement system and accurate maps, coupled with the ability to update them regularly as new information is received is the life blood of any exploration exercise. To date, however, measuring the inevitable, yet slow march to industrial environmental sustainability has not occurred. There are at least three generic facets to this process:

1. identification of the key elements that need to be measured,
2. creating operational definitions that can yield quantitative measures, and
3. articulating sound, reproducible methods for acquiring and interpreting data.

This section will flesh out this structure.[†]

4.2.1 Elements and Definitions

The primary strategic question for developing environmentally sustainable business strategy is “where are the *un*-sustainable parts of the economy?” These will be the elements that will represent the new sustainable business opportunities as long as they are “essential” to satisfying human needs. The goal is to create a model that identifies these elements and tracks them in such a way that business strategy can be crafted using them as a reference.

The three basic material components of any economy are:

1. the raw (or virgin) resources,
2. the processes and products produced from those resources, and,
3. the waste generated from the extraction, production, distribution, use and discard of manufactured goods.

Traditional economic analysis has often ignored one or more of these elements, sometimes treating resources and generally regarding waste (and its effects) as *external* to economic consideration. Environmental regulations and the resultant environmental industry has changed that forever. As a result of the “internalization of environmental costs” brought on by these regulations, new economic analysis is only now emerging. The elements of this analysis must necessarily center around resources—the “stuff” of an economy—for it is only the resources as used and dispersed that matter with respect to environmental sustainability, i.e. resource depletion and waste production.

Resources can be broadly categorized into three main groups:

1. Non-renewable: can only be used once in the product and can not be directly replaced once used, e.g. fossil fuels.
2. Renewable: can be used but there is a practicable basis for replenishing the resource, e.g. agriculture and silvaculture.
3. Recyclable: can be used and re-used indefinitely with minor losses due to friction and dust, e.g. aluminum, steel, water, etc.

Given these general considerations, then, we can come to the following definition:

An environmentally sustainable economy is one that both depends on renewable and recyclable resources and, ultimately, produces no waste.

[†] The contents of this sub-section draw from concepts and notions contained in “Industrial Metabolism: Restructuring for Sustainable Development” Edited by Robert U. Ayres and Udo E. Simonis United Nations University Press, 1994. and “Industrial Ecology: Metrics, Systems, and Technologic Choices” by David Rejeski, Future Studies Unit, Office of Policy, Planning and Evaluation U.S. EPA, 1994.

As any chemist will tell you however, there is a problem of entropy. An important but not entirely intuitive concept that tells us that every bit of work (energy output—common to all natural and economic systems) creates a degree of randomness in the environment. The major unanswered question for ours—and likely many succeeding—generations is “what degree of randomness is sustainable on this planet?” This, while extremely important, is yet beyond the scope of EBI’s research capabilities.

Identifying the unsustainable elements and extracting them from existing data is the task at hand, however. A number of government and non-government organizations have been making it their task to collect such data. On the most generic level, this includes the following list of resource, construction, primary and secondary manufacturing industries (Standard Industrial Classification Codes—two digit SIC—01 to 39, see Appendix 5-4). The approximate number of facilities involved in these activities and their approximate current “environmental spending” is also shown. This Appendix chart shows the most general level of the material (and therefore economic) interrelationships between all of these key industries. This is the bare beginnings of a macro-industrial metabolism analysis. What is not shown are the mass transfer, and waste production and recycling between all of these elements and the end-users (i.e. commercial, residential/municipal sectors of the economy). These elements must be included as part of any rigorous strategic quantification of the market—this is the contents of a separate study.

For the purposes of this analysis it is sufficient to outline the statistics that need to be gathered for each industry. These are shown in following table of industrial sustainability accounts.

Exhibit 4-1 - Basic Accounts for Industrial Sustainability

Resource Account	Product Account	Waste Account
<u>Solid, Liquid, Gas (Tons each)</u>	<u>Solid, Liquid, Gas (Tons each)</u>	<u>Solid, Liquid, Gas (Tons each)</u>
Non-renewable	Non-renewable	Non-renewable
Renewable	Renewable	Renewable
Recyclable	Recyclable	Recyclable
<u>Energy Consumed (BTU total)</u>	<u>Energy (BTU Consumed in production)</u>	<u>Energy (BTU lost, wasted)</u>
Non-renewable	Non-renewable	Non-renewable
Renewable	Renewable	Renewable

A mass balance/energy balance for each industry holds—owing to the laws of conservation of mass and energy—such that the total resource input should equal the sum of the product and waste outputs.

Again, the goal is to identify those industries that have high non-renewable inputs and high waste outputs. These represent clear resource/product substitution and pollution prevention opportunities for environmental businesses.

4.2.2 Methods for Data Gathering

Much of the data elements described above are available from current sources. However, they have never been consistently gathered for the purposes of guiding sustainable business strategy or government policy. While the comprehensive gathering of such data is well beyond the scope of EBI’s current efforts, some direction in compiling this intelligence will

provide the reader with a framework for analysis. Alternatively, an outside research service (like EBI) could produce this work on an industrywide basis, thus distributing the cost for the entire environmental industry.

The following data elements can be found at the sources listed:

Resource Usage:

Department of the Interior
World Resources Institute

Product Production by Industry:

Industrial Census

Waste Production:

EPA TRI
EPA Bi-annual Reports
Solid Waste Production Data
DOC Environmental Expenditures by Industry

Clearly, primary research by any one company to gather this data would be too expensive for them to undertake. A need to collect this data on an ongoing basis is definitely warranted in order to support the movement to environmentally sustainable economic development.

5. Appendix

5.1. Environmental Industry Segments and SIC Code Correlations

Environmental Industry Segment	SIC Code	Description
Environmental Services		
Analytical Services	8734	Testing Laboratories
	873401	Radiation Laboratories
	873403	Pollution Testing
Solid Waste Management	4953	Refuse Systems
	495302	Refuse Collection & Disposal Svcs
	495303	Nonhazardous Waste Disposal Sites
Hazardous Waste Management	4953	Refuse Systems
	495301	Hazardous Waste Collection & Distribution
Remediation/Industrial Services	4959	Sanitary Services
	495903	Toxic or Hazardous Waste Cleanup
Consulting & Engineering	8711	Engineering Services
	738902	Inspection & Testing Services
	871101	Sanitary Engineers
	871102	Industrial Engineers
	874800	Urban Planning & Consulting Services
Wastewater Treatment	4952	Sewerage Systems
	495200	Sewerage Systems
Environmental Equipment		
Water Equipment and Chemicals	3589	Service Industry Machinery, nec
	3494	Valves and Pipe Fittings
	3498	Fabricated Pipe and Fittings
	3561	Pumps and Pumping Equipment
	358903	Sewage and Water Treatment Equipment
Instrument Manufacturing	3826	Analytical Instruments
	382601	Spectroscopic & Other Optical Parts
	382602	Analytical Optical Instruments
	382603	Liquid Testing Apparatus
	382605	Gas Testing Apparatus
	382999	Measuring & Controlling Devices, nec
Air Pollution Control Equipment	No Single SIC	No Single SIC
	3564	Purification & Dust Collection Equipment
	356901	Filters
	358999	Service Industry Machinery, nec

Environmental Equipment

Waste Management Equipment

3448	Prefabricated Metal Bldgs
3535	Conveyors and Conveying Equipment
3564	Blowers and Fans
358902	Commercial Cleaning Equipment
382299	Environmental Controls, nec
384201	Personal Safety Equipment
504901	Scientific & Engineering Equipment

No Single SIC

Process & Prevention Technology

3823	Process Control Instruments
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No Single SIC

Environmental Resources

Water Utilities

4941	Water Supply
494100	Water Supply

Water Supply

Resource Recovery

5093	Scrap & Waste Materials
509301	Waste Paper and Cloth Material
509302	Metal Scrap and Waste Material
509399	Scrap and Waste Material, nec

Scrap & Waste Materials

Environmental Energy Sources

No Single SIC

5.2. Example Survey Instruments

The following four survey instruments are included in order to provide an example of EBI's survey's.

- Environmental Engineering and Consulting Companies
- Water/Wastewater Equipment and Chemicals
- Environmental Analytical Instruments
- Air Pollution Control Equipment