

# Assessment of the 1999 Environmental Management Industry

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## ACRONYMS AND ABBREVIATIONS

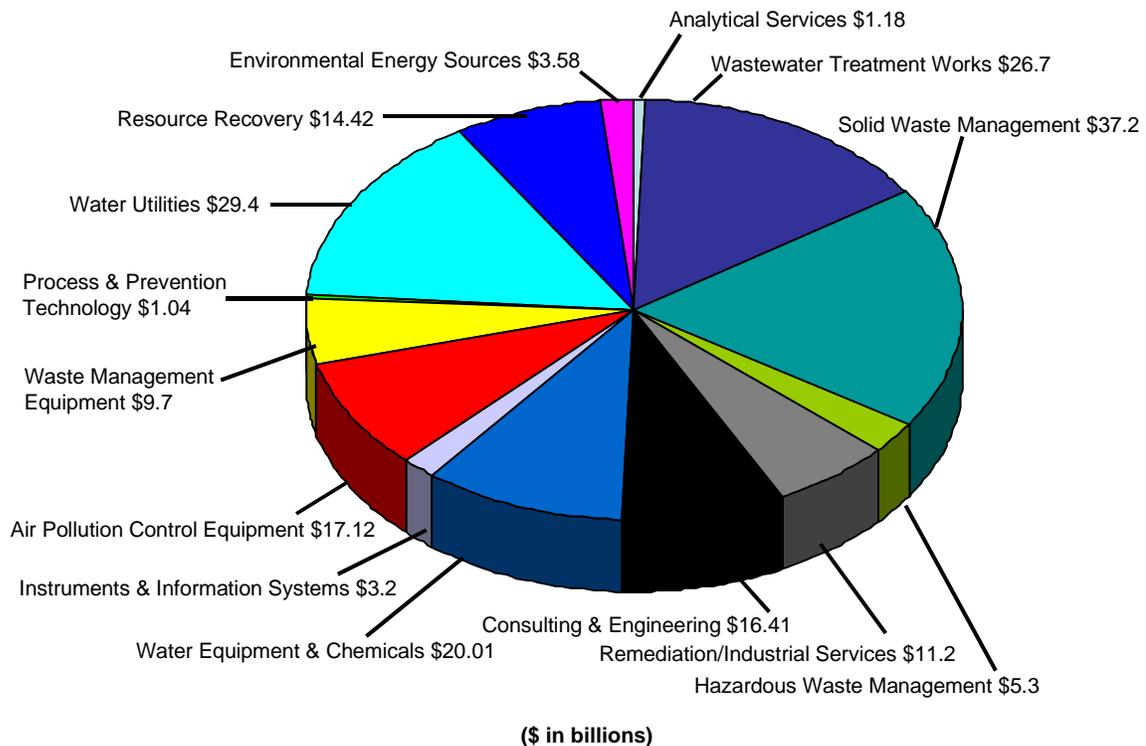
BNI	Bechtel National, Inc.
BRAC	base realignment and closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPI	consumer price index
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EBI	Environmental Business International, Inc.
<i>EBJ</i>	<i>Environmental Business Journal</i>
EI	Environmental Information Limited
EM	Environmental Management
EMISs	Environmental management information systems
<i>ENR</i>	<i>Engineering News Record</i>
EPA	U.S. Environmental Protection Agency
GDP	gross domestic product
HDPE	high-density polyethylene
M&O	managing and operating
O&M	operation and maintenance
PCB	polychlorinated biphenyl
PETE	polyethylene terephthalate
POTWs	publicly owned treatment works
RBCA	risk-based corrective action
RCRA	Resource Conservation and Recovery Act
WMI	Waste Management, Inc.

## EXECUTIVE SUMMARY

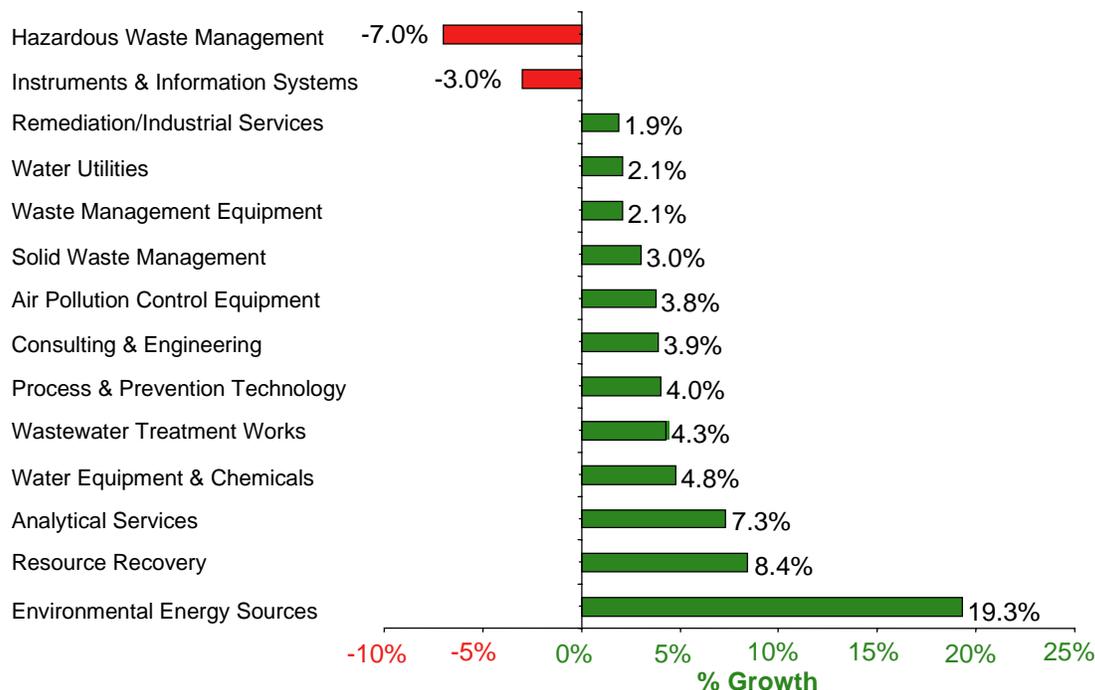
In 1999, U.S. companies generated \$196.5 billion in environmental industry revenue worldwide (Fig. E.1). This represents a growth of 3.5% during a year in which the current dollar gross domestic product (GDP) increased 5.8% (Bureau of Economic Analysis) and the inflation rate was 2.7% (Bureau of Labor Statistics). Nonetheless, this represents a considerable improvement over the 2.0% growth realized during the preceding year. Growth exceeding the GDP increase was seen in 3 of 14 industry segments, and reductions were seen in 2 segments (Fig. E.2). Growth in only 9 of the 14 industry segments exceeded the rate of inflation. Of the total goods and services that it produced in 1999, the U.S. environmental industry exported almost 11% (\$21.3 billion), more than double 1993 levels (\$9.6 billion). The number of jobs in the

environmental industry increased by 44,815 between 1998 and 1999, to 1,389,638.

The three best-performing industry segments were environmental energy sources (+19.3%), resource recovery (+8.4%), and analytical services (+7.3%). The U.S. water industry—made up of water equipment and chemicals (\$20.0 billion), water utilities (\$29.4 billion), and wastewater treatment works (\$26.7 billion)—accounts for almost 39% of total environmental industry revenues and showed a 3.6% growth over 1998. Three segments—solid waste management (\$37.2 billion), waste water treatment works, and water equipment and chemicals—accounted for nearly 46% of the overall market growth in dollars. Solid waste management, air pollution control equipment (\$17.1 billion), consulting and



**Fig. E.1. The \$196.5 billion 1999 environmental industry (revenues generated by U.S. companies worldwide).** *Source:* U.S. Department of Commerce, International Trade Administration.



**Fig. E.2. U.S. environmental industry revenue growth in 1999 by environmental industry segment.** *Source:* U.S. Department of Commerce, International Trade Administration.

engineering (\$16.4 billion), process and prevention technology (\$1.04 billion), wastewater treatment works (\$26.7 billion), water equipment and chemicals (\$20.0 billion), analytical services (\$1.18 billion), resource recovery (\$14.4 billion), and environmental energy sources (\$3.58 billion) all grew faster than the 2.7% rate of inflation.

Two market segments—hazardous waste management, and instruments and information systems—showed negative growth in 1999. Instruments and information systems posted a 3.0% decline to 1999 revenues of \$3.2 billion. The decline in the hazardous waste management segment, which began in 1993, continues: this segment posted a 7.0% decline to 1999 revenues of \$5.3 billion. Hazardous waste management continued to fall below expectations with returns that are inconsistent with the significant capital investments made in hazardous waste infrastructure during the early 1990s. Meanwhile, the remediation/industrial services segment continued its disappointing performance with 1999 revenues of \$11.2 billion, 1.9% higher than 1998.

Although this report focuses on 1999, the authors have included data from later periods where such

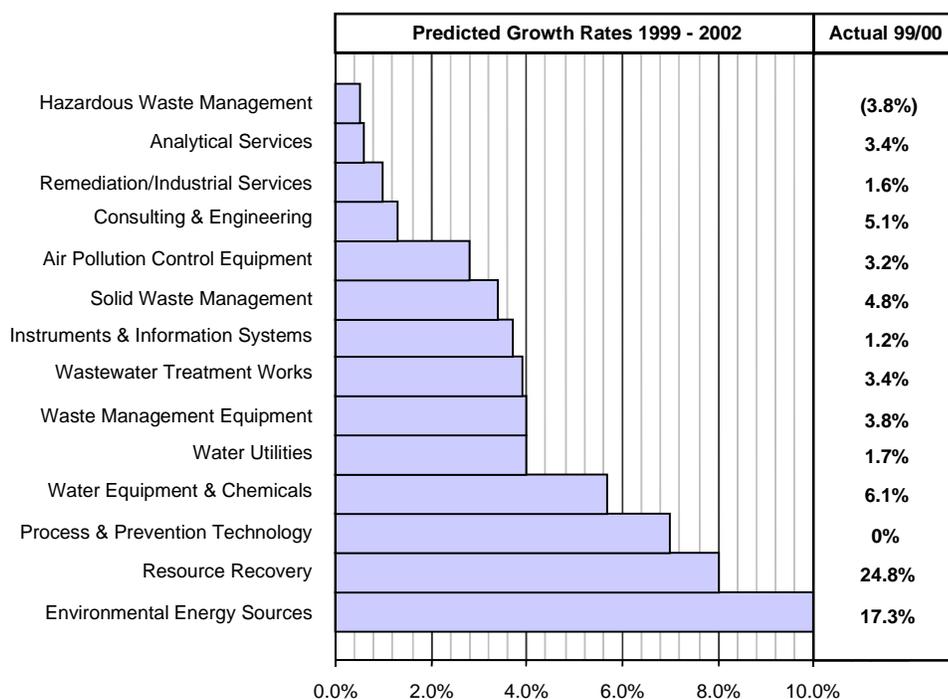
data were available. Table E.1 tabulates available data for 1999 and 2000 for each of the environmental segments.

Projections for future growth of the U.S. environmental industry continue to reflect the lackluster performance expected of mature markets. Environmental Business International, Inc.'s (EBI's) 1999 projection of U.S. environmental industry growth from 1999 to 2002 predicted an average annual growth rate across all environmental sectors of 3.7%. Projected annual growth (1999–2002) for the 14 U.S. environmental industry segments is illustrated in Fig. E.3, along with actual market segment performance data for 1999 to 2000. Those data indicate that the market is performing better than projected, the difference being more likely due to overall U.S. economic growth, particularly in 2000, than to traditionally important regulatory drivers; for example, enforcement has tended to slack off as a driver. Two segments showed particularly strong 1999/2000 growth: the volatile resource recovery market (+24.8%) and the environmental energy sources market (+17.3%). Meanwhile, the process and prevention technology market has fallen off sharply from projected levels.

**Table E.1. The environmental services market performance, 1998–2000**

Industry segment	Growth (billion \$)			% Growth	
	1998	1999	2000	98/99	99/00
<b>Environmental services</b>					
Solid waste management	36.1	37.20	39.00	3.0	4.8
Wastewater treatment works	25.6	26.70	27.60	4.3	3.4
Consulting and engineering	15.8	16.41	17.43	3.9	5.1
Remediation/industrial services	11.0	11.20	11.38	1.9	1.6
Hazardous waste management	5.7	5.30	5.10	-7.0	-3.8
Analytical services	1.1	1.18	1.22	7.3	3.4
<b>Environmental equipment</b>					
Water equipment and chemicals	19.1	20.01	21.23	4.8	6.1
Air pollution control equipment	16.5	17.12	17.67	3.8	3.2
Waste management equipment	9.5	9.70	9.85	2.1	3.8
Instruments and information systems	3.3	3.20	3.40	-3.0	1.2
Process and prevention technology	1.0	1.04	1.04	4.0	0.0
<b>Resource management</b>					
Water utilities	28.8	29.40	29.90	2.1	1.7
Resource recovery	13.3	14.42	17.00	8.4	24.8
Environmental energy sources	3.0	3.58	4.20	19.3	17.3
Efficiency technology	NA	NA	1.20	NA	15.4
<b>All segments</b>	<b>189.8</b>	<b>196.5</b>	<b>207.2</b>	<b>3.5</b>	<b>5.3</b>

Sources: *Environmental Business Journal* 12, nos. 5–6 (1999); U.S. Department of Commerce International Trade Administration; and republication information from Grant Ferrier, March 2001.

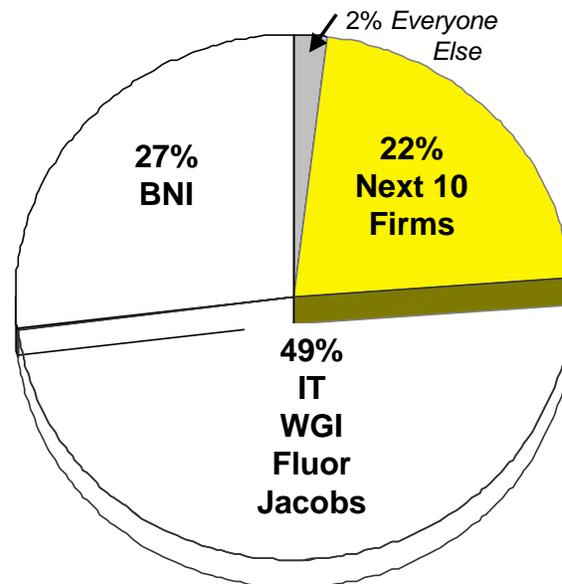


**Fig. E.3. Projected environmental industry growth, 1999–2002, updated with actual growth data.** Source: *Environmental Business Journal* 12, nos. 5–6 (1999), updated with republication information from Grant Ferrier, March 2001.

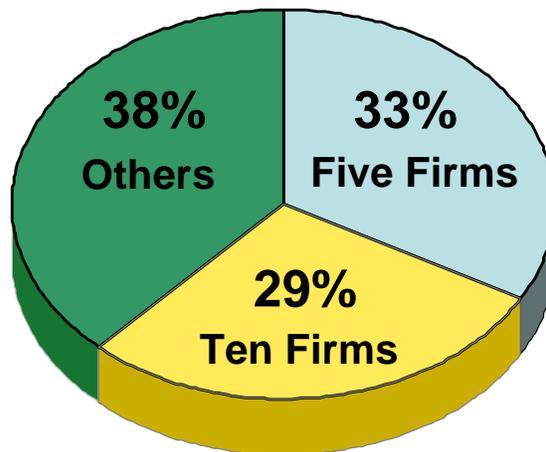
The U.S. site remediation market continues to fall behind the extraordinary growth expectations set a decade ago. Farkas Berkowitz and Company reports that the U.S. market for remediation services, including both consulting/engineering and construction, declined 3% in 1999 to \$7.2 billion. This decline follows a decline of 5% in 1998. The U.S. remediation consulting and engineering market remained constant in 1999 at \$3.7 billion following a modest 1% growth in 1998. The U.S. remediation construction market, on the other hand, declined 5% from \$3.7 billion in 1998<sup>1</sup> to \$3.5 billion in 1999, following a 10% decrease in 1998.

The U.S. Department of Energy (DOE) continues to represent the major component of the U.S. site remediation market. The nature of the remediation market and the major players continue to change significantly as a result of a combination of consolidation effected through mergers and acquisitions, marketing success, and the procurement trend for large DOE projects. The Washington Group International and the IT Group exemplify growth through consolidation while Bechtel National, Inc. (BNI), exemplifies growth through marketing success.

Fig. E.4 illustrates the distribution of worldwide remediation construction revenues among competing firms. The distribution of worldwide gross 1999 revenues in the remediation consulting and engineering market among U.S. firms shows a higher degree of fragmentation, as illustrated in Fig. E.5. While consolidation has also taken place in that market, it has not had the profound effect it has on the remediation construction market. The top five firms in the remediation consulting and engineering market share 33% of the market, while the top five firms in the remediation construction market share 76% of the market with the top firm, BNI, having 27% of the market by itself. BNI has emerged from a minor environmental



**Fig. E.4. Competition among remediation construction firms is diminishing.** Source: Farkas Berkowitz and Co., *Twelfth Annual State-of-the-Industry Report*.



**Fig. E.5. Distribution of 1999 worldwide gross revenues for remediation consulting and engineering among U.S. firms.** Source: Farkas Berkowitz and Co., *Twelfth Annual State-of-the-Industry Report*.

player a decade ago to capturing 27% of the environmental remediation construction market in 1999. A nearly perfect win record by BNI that has continued through 2000 on DOE projects will dramatically increase this already commanding market share. What is good news for BNI may be more disturbing news in general, however.

A recent DOE study (DOE 2001) reported that the number of potential bidders for major DOE

<sup>1</sup>EBI reported the U.S. remediation construction market to be \$3.5 billion for 1998. There is a significant degree of judgment exercised in determining which market sector funds fall into, particularly with DOE funds, thus leading to differences between market analysts, even on historical spending.

contracts has diminished from 20 to 30 companies of a decade ago to about 10 companies today, with recent major procurements receiving only two proposals. The reluctance of contractors to bid on major DOE procurements suggests no-bid decisions based upon a combination of low profit margins and futility—i.e., consistent contractor preferences.

One of the few areas of growth in the remediation market has occurred in the consulting area as a result of the shift toward risk-based corrective action (RBCA) in many states. The broad emergence of RBCA programs has driven gains in both the assessment and the private/nonregulatory portions of the remediation market. In the private market and the related brownfields area, the number of sites being addressed has tripled from five years ago as the economy has expanded and risk-based and reuse standards have opened a redevelopment window.

Environmental Information Limited's (EI's) Cary Perket (Perket 1998) suggests that, while consulting firms may have seen a revenue boost due to the Environmental Protection Agency's (EPA's) RBCA programs, there may be a longer-term impact:

The net impact of RBCA implementation is that contamination at many sites did not have to be actively remediated. Now many sites are candidates for natural attenuation—the remedial equivalent of letting nature take its course. EI estimates that RBCA will save taxpayers about \$6 billion dollars by reducing by about 30% the number of leaking underground storage tank sites that have to be actively remediated.

Given the 2000/2001 economic downturn and changes in priorities from the new Administration, it is reasonable to anticipate that the relative stability in the remediation market over the past several years will cease as funds from both government and the private sector diminish.

If we look at the environmental industry as a whole, several trends are apparent, as follows. First, environmental companies continue to

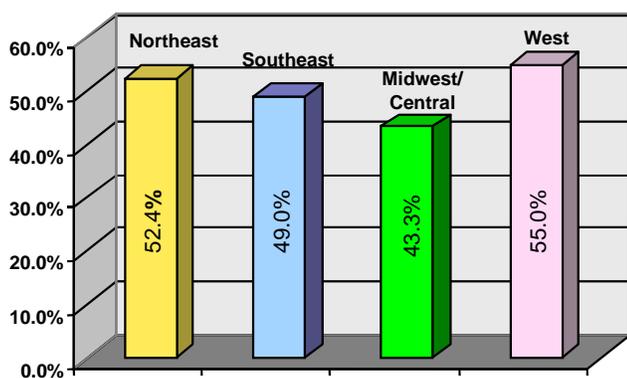
struggle to sort out their roles, if any, within a now mature market whose growth is ruled by economics rather than regulations. Pricing pressures, diversification, and a decreasing focus on regulations are shaping the environmental industry's future. The U.S. Department of Commerce report *Meeting the Challenge: U.S. Industry Faces the 21st Century: The U.S. Environmental Industry* (Berg and Ferrier 1998) characterizes the industry as maturing, marked by slowing growth, heightened competition, pricing pressures, and reduced profitability. According to Standard and Poor's environmental industry survey, remediation, air pollution control, hazardous and nonhazardous solid waste disposal, and treatment services are environmental subsectors that are approaching or are already in the mature phase of the business cycle. In such a mature market, companies have little to differentiate themselves from each other and thus compete on price, typically bringing down profit margins.

Second, companies are willing to try new and risky ventures, such as lump sum design-build and privatization, as a means to enhance dwindling profit margins. These high-risk steps have frequently led to major cost overruns, failed projects, and companies on the auction block at bargain prices.

Third, federal customers in particular continue to demand higher levels of performance and accountability through contract reform measures such as performance penalties and rewards. The ability to extract higher performance, however, is a function of aggressive competition, and may become affected by the next trend.

Fourth, consolidation and diversification continue to be major trends as a means to deal with market maturity. Consolidation has been rampant in the environmental industry. In the remediation market, for example, the share of market claimed by the top 10 companies was 38% in 1994. In 1999, the top 15 companies claimed a 98% share in the remediation construction market and a 62% share in the remediation consulting and engineering market!

Data on attrition is equally striking. Industry survey information published over the past year by EI, a privately held research firm that monitors environmental business markets and trends, indicates that approximately half of the environmental service firms doing business in the 1993–1994 time frame had gone out of business or been acquired by 2000. Fig. E.6 depicts this trend by geographic region in the United States. As this figure indicates, while the midwestern and central states have been the least affected by this trend, all regions have seen between 43% and 55% of their environmental service firms close their doors. EI’s research indicates that the majority of closures are for firms with fewer than 25 employees.



**Fig. E.6. Percentage of environmental firms closing from 1994 to 2000.** *Source:* Environmental Information Limited, compiled from survey information published at [www.envirobiz.com/reports](http://www.envirobiz.com/reports) on Feb. 15 and Aug. 9, 2000, and Jan. 19 and Mar. 14, 2001.

Fifth, the combination of aggressive downsizing and baby boomers’ reaching retirement has many CEOs worried about workforce adequacy. Those factors coupled with lackluster performance make the environmental industry less attractive to the best and brightest in the emerging U.S. talent pool, thereby compounding the problem.

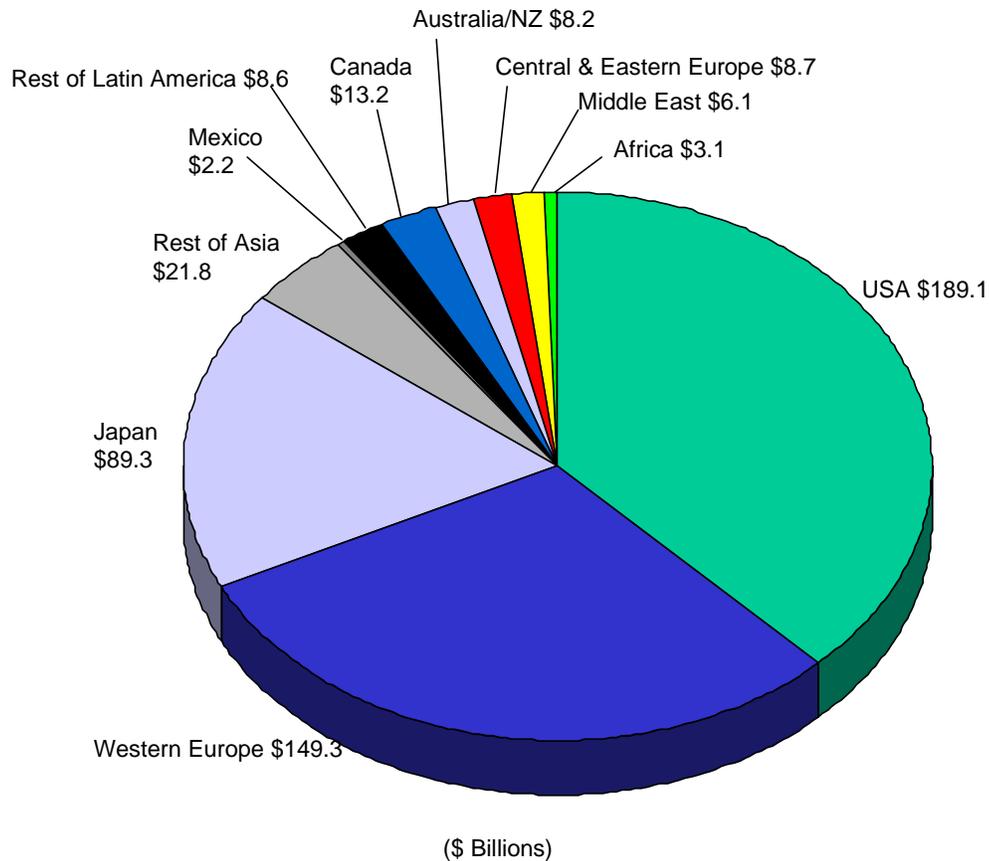
Sixth, we expect that the combination of information technology and the Internet will redefine how customers deal with many of their environmental matters and how environmental companies will approach selling services to those customers. A market for environmental services, products, and

expertise will continue to exist, but sellers must integrate their wares with the cost-reduction opportunities available through information technologies, high-speed data transfer, and the Internet.

Seventh, environmental exports are growing and will continue to grow as international environmental market customers search for the best deals on products and services. Overall, the global environmental market totaled \$499 billion in revenues in 1999, representing 2.9% growth over 1998. The global environmental market is projected to grow to \$562 billion by the year 2004.

According to the U.S. Department of Commerce, International Trade Administration, the U.S. environmental industry exported almost 11% of all environmental goods and services that it produced in 1999, and export activity continued its historically healthy growth in 1999. U.S. environmental exports have more than doubled since 1993, rising from \$9.6 billion to \$21.3 billion in 1999, and showed a 13% increase in 1999 alone. The United States both exports and imports equipment to a far greater degree than services. While U.S. equipment segments make up only 26% of the industry, they account for 59% of exports. Conversely, while service segments account for 50% of industry revenues, they are only 18% of exports. The regional distribution of the global environmental market shows the dominant role played by the United States, followed by Western Europe and Japan. As illustrated in Fig. E.7, the United States is the largest single market for environmental technologies and services in the world.

While U.S. environmental companies increased exports in 1999, other nations successfully stepped up efforts to penetrate the U.S. environmental market through partnerships, acquisitions, and direct sales. As a result, the trade surplus declined, from \$8.0 billion in 1998 to \$7.3 billion in 1999. While the United States is the leading producer of environmental technologies and services, it exports only about 11% of its environmental output while its key competitors (Japan, Germany, and Great Britain) export over 20%.



**Fig. E.7. Regional distribution of the \$499 billion 1999 global environmental market.** *Source:* U.S. Department of Commerce, International Trade Administration.

Looking ahead to the future of the industry, the maturity of the market in no way implies that major global problems have been solved. Resource depletion, global climate change, ozone depletion, declining water quality, poor air quality, and rising cancer rates remain major issues and, when economic conditions allow, should ultimately stimulate growth in the industry. Over time, a transition of the environmental industry to address new priorities is inevitable, provided that the economic flywheel exists to fuel its needs. Also over time, the industry is shifting from performing in a manner appropriate to a regulatory-driven industry

to behavior determined by stewardship and sustainability. Sustainable development of renewable resources and protection of those resources are being more heavily supported. Increasingly, companies are willing to invest money now to improve environmental and economic performance in the future. The *U.S. Industry and Trade Outlook 2000* concludes that sustainable development principles as well as performance-based flexible requirements for compliance (along with higher standards of accountability in fulfilling them) are essential to the health of the environmental industry in the future.

# 1. OVERVIEW OF THE U.S. ENVIRONMENTAL INDUSTRY

The U.S. Department of Energy's (DOE's) Environmental Management (EM) Office of Science and Technology sponsors this annual overview of the environmental management industry to inform DOE decision makers about the state of the U.S. environmental industry. The information in this report was produced using market studies and information resources that reflect industry views.

Section 1 reviews the state of the environmental industry in the United States in 1999 and includes separate subsections on each of the major industry segments. A market overview in each subsection is followed by discussion of trends and outlook. Section 2 provides more in-depth discussion of key trends in the industry.

Definitions of the environmental industry and its segments vary widely among analysts. Historically, as a means of maintaining consistency and to present a coherent picture throughout this report, all revenue estimates were derived from a single source: Environmental Business International, Inc. (EBI). EBI publications remain a vitally important source of market status information to environmental business managers throughout the industry, providing a valuable source of market size, trend, and state information. The authors of this document have relied extensively upon EBI, its management, and its staff for information used in this report. The authors have also reviewed numerous other references, many of which provide additional industry perspectives based upon the primary sources of the publication's source data. The authors have endeavored to identify and explain any differences in market projects or surveys where they have occurred.

It should be noted, however, that each information source uses its own prescription for slicing the

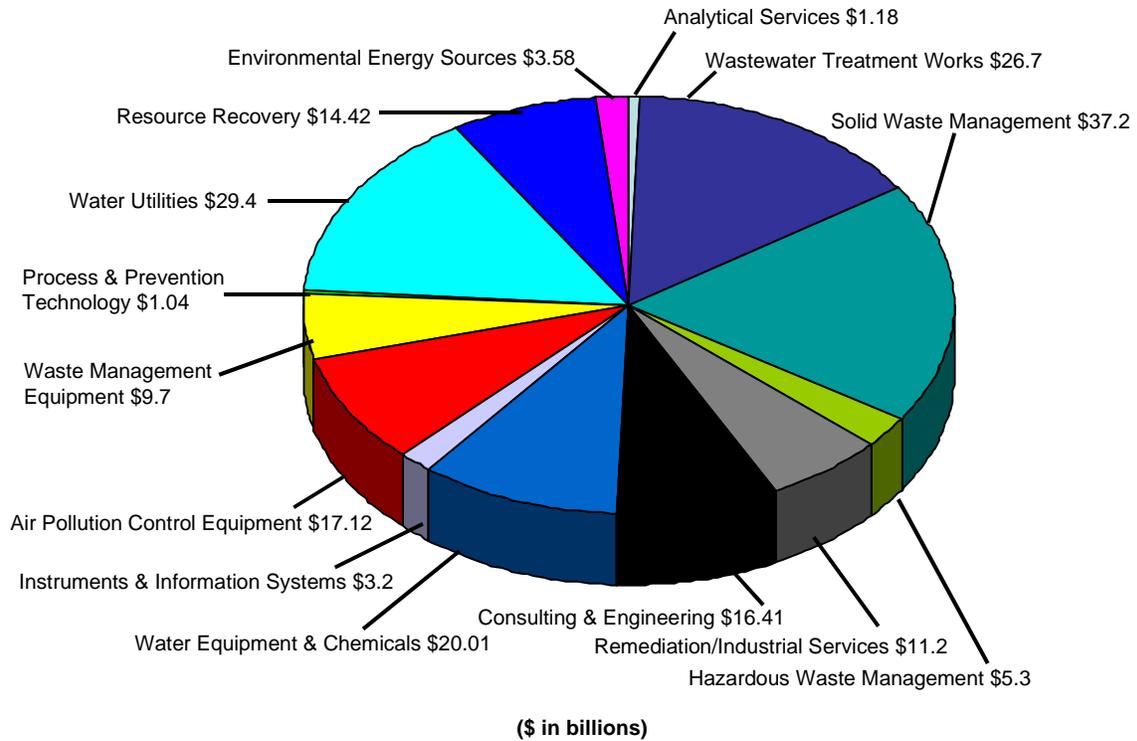
environmental market, which, for the most part, are not fully compatible with other information sources. One of EBI's major contributions has been consistency in approach across the market.

## 1.1 1999 Market Overview

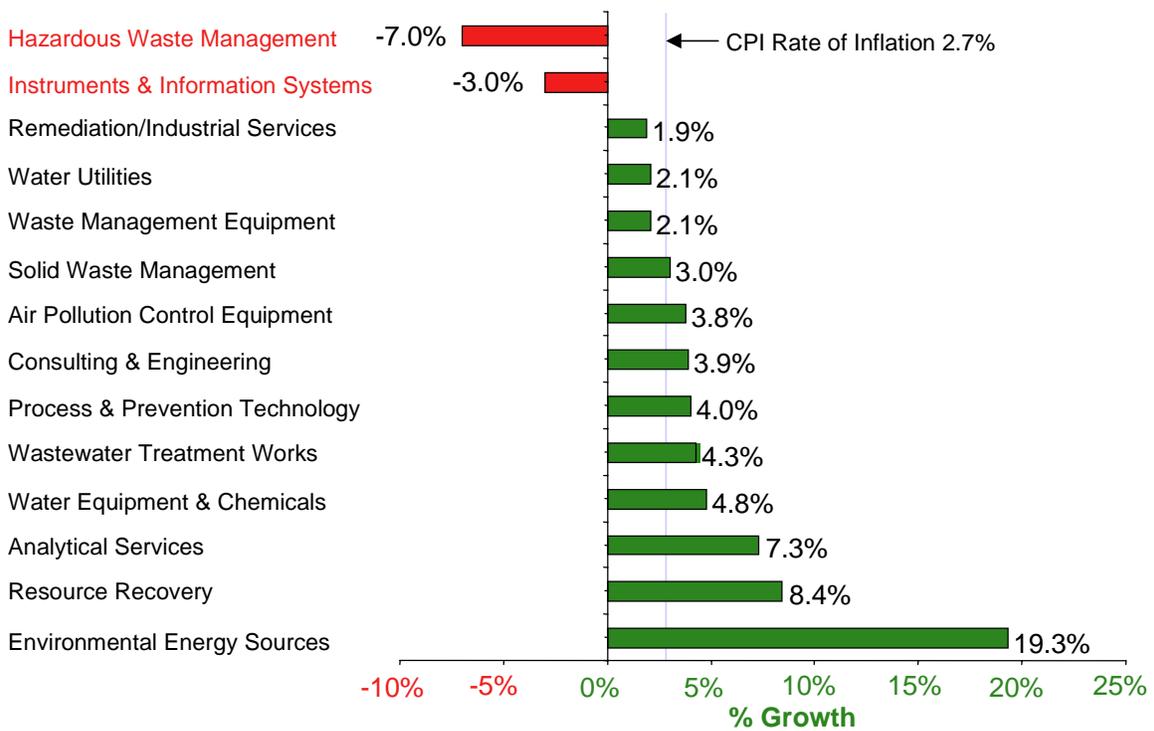
In 1999, U.S. companies generated approximately \$196.5 billion in environmental industry revenues worldwide (Fig. 1.1). This represents a growth of 3.5% during a year in which the current dollar gross domestic product (GDP) increased 5.8% and the inflation rate was 2.7%. Nonetheless, this represents a significant improvement over the 2.0% growth realized during the preceding year. Growth exceeding the GDP increase was seen in 3 of 14 industry segments.

As Fig. 1.2 shows, 9 of the 14 segments grew faster than the 2.7% consumer price index (CPI) rate of inflation while two segments declined from 1998 to 1999, hazardous waste management (-7.0%) and instruments and information systems (-3.0%).

The three best performers were environmental energy sources (+19.3%), resource recovery (+8.4%), and analytical services (+7.3%). Resource recovery, which posted a 13.2% decline (more than \$2 billion) in 1998 due to commodity pricing depressing the value of recyclables, bounced back with an 8.4% gain in 1999. Hazardous waste management (\$5.30 billion) continued the decline it began in 1993 and showed a 7.0% loss, by far the largest in any industry category. The remediation/industrial services segment (\$11.2 billion) ended its 2-year decline with a small 1.9% gain in 1999, up from \$11.01 billion in 1998.



**Fig. 1.1. The \$196.5 billion 1999 environmental industry (revenues generated by U.S. companies worldwide).** *Source:* U.S. Department of Commerce, International Trade Administration.



**Fig. 1.2. U.S. environmental industry revenue growth in 1999 by environmental industry segment.** *Source:* U.S. Department of Commerce, International Trade Administration.

The U.S. water industry—made up of water equipment and chemicals (\$20.0 billion), water utilities (\$29.4 billion), and wastewater treatment works (\$26.7 billion)—accounts for almost 39% of total environmental industry revenues and showed a 3.6% growth over 1998.

Solid waste management (\$37.2 billion), wastewater treatment works (\$26.7 billion), and water equipment and chemicals (\$20.0 billion) accounted for nearly 46% of the overall market growth in dollars as indicated in Table 1.1.

Projected annual growth (1999–2002) for the 14 U.S. environmental industry segments defined by EBI is illustrated in Fig. 1.3. The figure also includes actual growth data for 1999 to 2000. Those data indicate that the market is performing better than projected, the difference being more likely due to overall U.S. economic growth,

particularly in 2000, than to traditionally important regulatory drivers; for example, enforcement has tended to slack off as a driver.

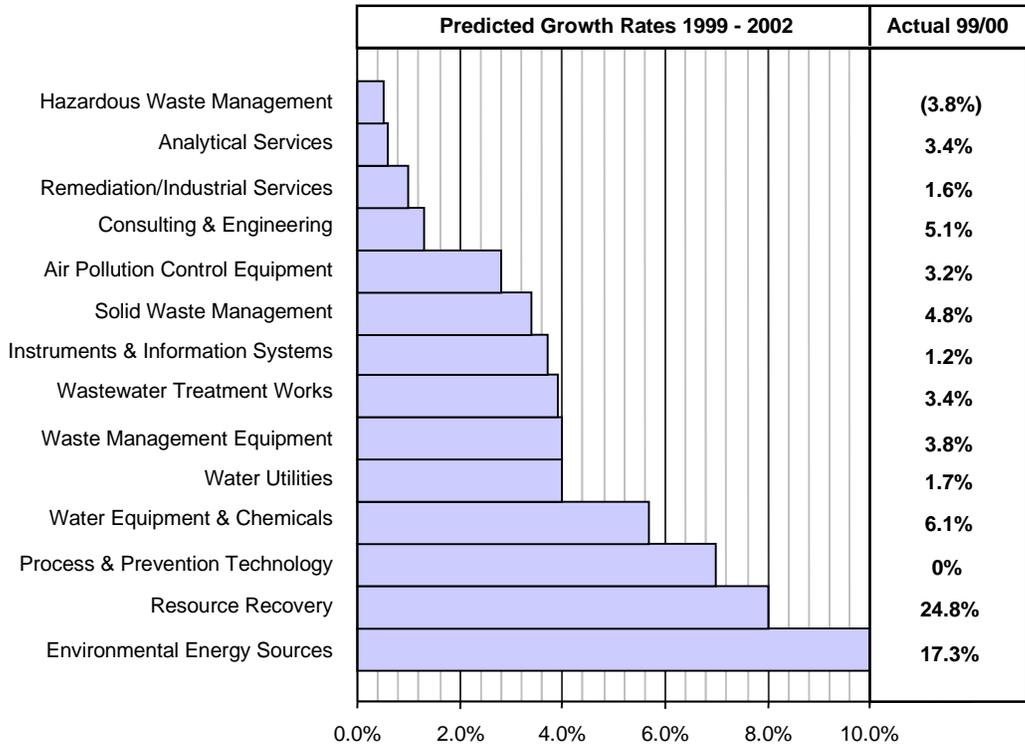
The most significant differences in growth occurred in the environmental energy sources, resource recovery, consulting and engineering, and analytical services segments. Each of these four sectors grew at double or more the anticipated rate. Hazardous waste management continues to fall below expectations, with returns that are inconsistent with the significant capital investments made in hazardous waste infrastructure during the early 1990s.

U.S. environmental market trends between 1998 and 2000 are shown in Fig. 1.4. The following sections provide more detailed market overviews, identify key trends, and provide outlooks for the major environmental industry segments.

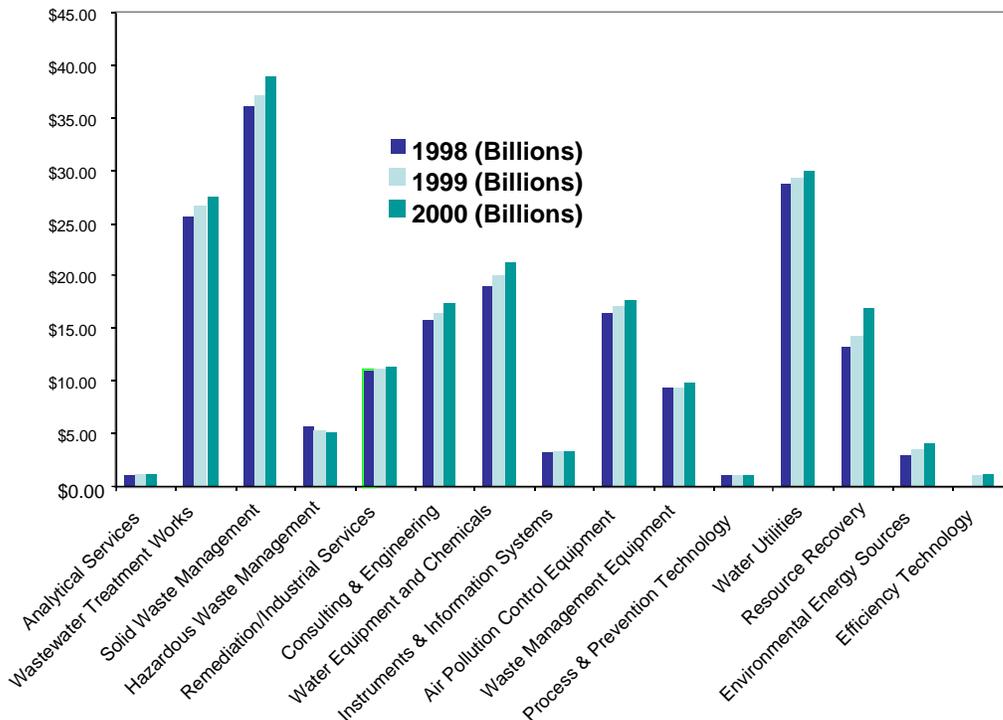
**Table 1.1. Environmental industry segment growth, 1998–1999**  
(billions of dollars)

Industry segment	1998	1999	Growth 98/99
<b>Environmental services</b>			
Solid waste management	36.1	37.20	1.1
Wastewater treatment works	25.6	26.70	1.1
Consulting and engineering	15.8	16.41	0.6
Remediation/industrial services	11.0	11.20	0.2
Hazardous waste management	5.7	5.30	-0.4
Analytical services	1.1	1.18	0.08
<b>Environmental equipment</b>			
Water equipment and chemicals	19.1	20.01	0.9
Air pollution control equipment	16.5	17.12	0.6
Waste management equipment	9.5	9.70	0.2
Instruments and information systems	3.3	3.20	-0.1
Process and prevention technology	1.0	1.04	0.04
<b>Resource management</b>			
Water utilities	28.8	29.40	0.6
Resource recovery	13.3	14.42	1.1
Environmental energy sources	3.0	3.58	0.58
<b>All segments</b>	<b>189.8</b>	<b>196.5</b>	<b>6.7</b>

Sources: *Environmental Business Journal* 12, nos. 5–6 (1999) and U.S. Department of Commerce International Trade Administration.



**Fig. 1.3. Projected environmental industry growth, 1999–2002, updated with actual growth data.** Source: *Environmental Business Journal* 12, nos. 5–6 (1999), updated with prepublication information from Grant Ferrier, March 2001.



**Fig. 1.4. Environmental market trends, 1998 through 2000.** Sources: *Environmental Business Journal* 12, nos. 5–6 (1999), U.S. Department of Commerce, International Trade Administration; updated with prepublication information from Grant Ferrier, March 2001.

## 1.2 Remediation/Industrial Services

### Market Overview

EBI combines remediation and industrial services into a single market segment, and this combined segment started to increase at a modest rate in 1998/1999, reversing a decline in 1997/1998. The \$11.2 billion remediation/industrial services segment posted a 0.1% decline in 1998, a 1.9% increase in 1999, and a 1.6% increase in 2000. The remediation/industrial services market trend between 1989 and 2000 is depicted in Fig. 1.5. As illustrated in the figure, this market has been essentially flat on an absolute basis for more than a decade and has lost ground because of inflation over that time.

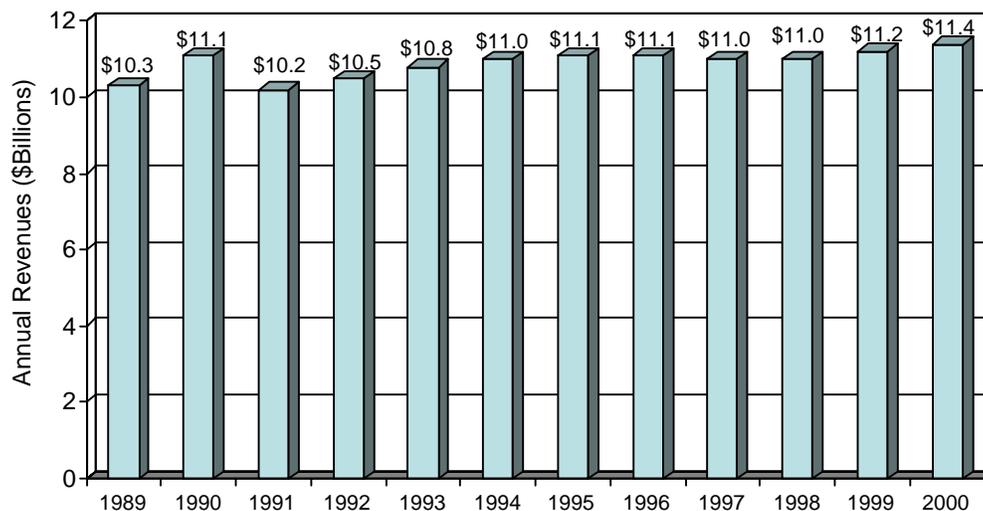
The remediation/industrial services segment consists of two major subsegments:

- *Site remediation* involves construction work performed at contaminated sites by remediation contractors.
- *Industrial services* include facility cleaning services (refinery turnaround; cleaning, repair, and maintenance of above-ground storage tanks; and cleaning services for containers, manufacturing facilities, and industrial or

commercial sites like airports) and abatement services for ridding buildings of hazardous materials (such as asbestos and lead paint) and for radon mitigation.

Farkas Berkowitz, a Washington, D.C., consulting firm that specializes in the environmental industry, provides information on the remediation construction and remediation consulting and engineering markets. According to Farkas Berkowitz, the U.S. market for remediation services, including both consulting/engineering and construction, declined 3% in 1999, to \$7.2 billion, following a 5% decline in 1998. The U.S. remediation consulting and engineering market remained constant in 1999 at \$3.70 billion following a modest 1% growth over the previous three years. The U.S. remediation construction market, on the other hand, declined 5% in 1999, following a 10% decrease in 1998.

Uncertainty regarding the handling of DOE EM revenues has resulted in historical differences in projected market performance and size. For example, *Engineering News Record (ENR)* indicates a 15% increase in remediation construction spending in 1999; EBI combines remediation with industrial services and reports a 1.9% increase for 1999; and Farkas Berkowitz indicates a 5% drop in remediation construction spending.



**Fig. 1.5. Trend in U.S. environmental remediation/industrial services market revenue generation.** Sources: *Environmental Business Journal* 11, no. 7 (1998), and 12, nos. 5–6 (1999), and republication information from Grant Ferrier, March 2001.

Part of the reason for the difference is the difficulty in ascribing DOE EM revenues to remediation versus managing and operating (M&O) contract management: many M&O contractors report only their fee as revenue, not the overall volume of money managed under the contract. Another factor involves participation in surveys.

*ENR* conducts annual surveys of engineering and construction companies to determine the sources of revenues to such companies from the overall market. Since it was not an engineering or construction company, Westinghouse was not included in *ENR* surveys and had never participated in *ENR*'s Top 400 Contractors survey. Therefore, when Morrison Knudsen, a company that does participate in the surveys, purchased Westinghouse, the Westinghouse remediation revenues appeared in the *ENR* survey as growth rather than revenue previously reported by an acquired company.

To its credit, Farkas Berkowitz has normalized the *ENR* numbers to account for such occurrences. The results are indicated in Fig. 1.6, which tells a different story than does *ENR* or EBI.

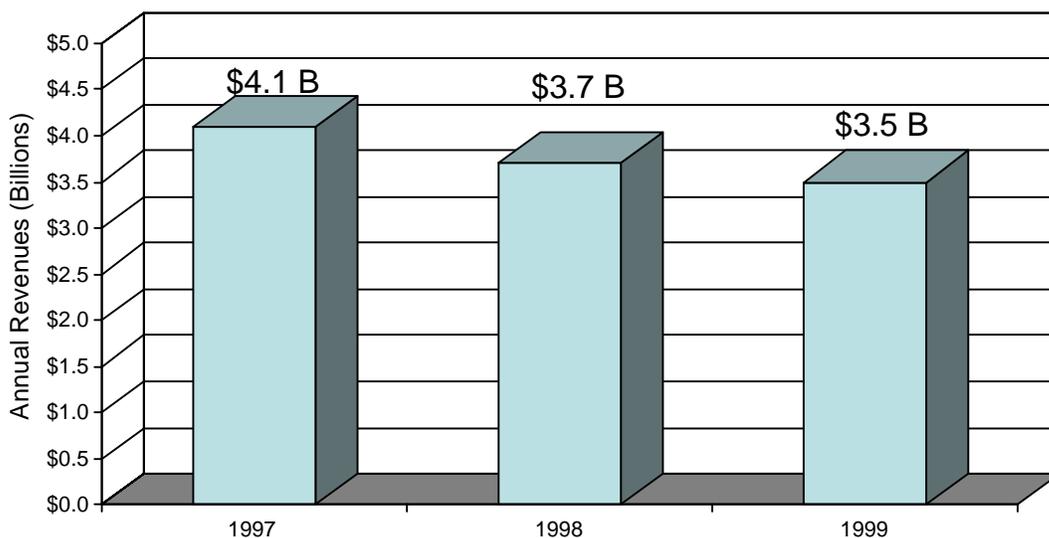
### Trends

Although the size of the U.S. remediation market has not changed much over the past several years,

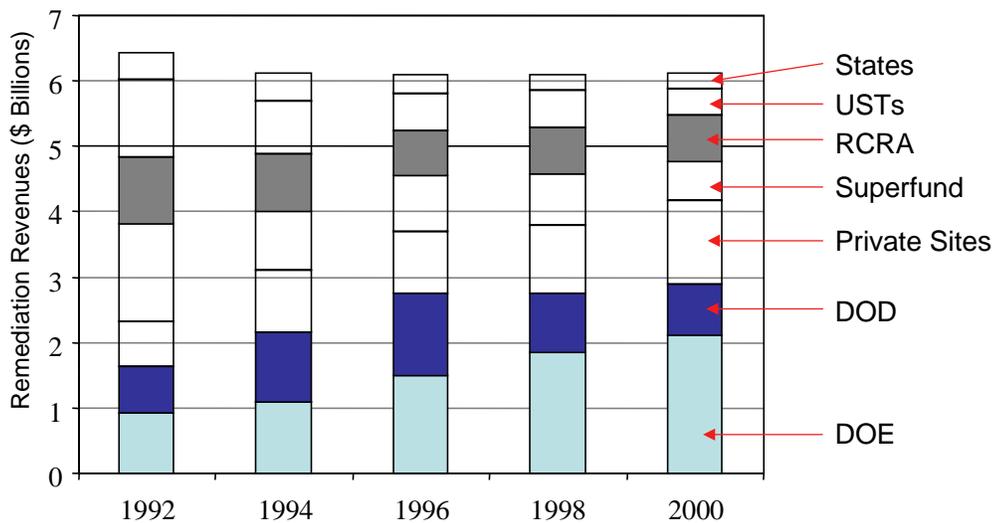
the nature of the market and the major players have changed significantly. DOE spending has increased, Superfund and underground storage tank markets have declined, the Department of Defense (DOD) has reduced remediation spending to pay for military readiness, and private markets are expanding to support property transfer (Fig. 1.7) [Paterson 2000b].

DOE continues to represent the largest customer within the U.S. site remediation market. Estimates have placed DOE as providing approximately 30–40% of the total U.S. remediation market. However, as noted by Farkas Berkowitz in the *Twelfth Annual State of the Industry Report* (Farkas Berkowitz and Co. 2000), “Estimating the size of the remediation market is particularly difficult because of the uncertainty surrounding how to account for revenues generated from DOE’s Environmental Management Program. . . . How firms report DOE-related revenues to *ENR* undoubtedly varies. In addition, not all firms participate in *ENR* surveys.”

The remediation construction market, and DOE in particular, continues to evolve into a few large contractors monopolizing the field, with Bechtel National, Inc. (BNI), far in the lead. This trend—already pronounced in 1999, as indicated in



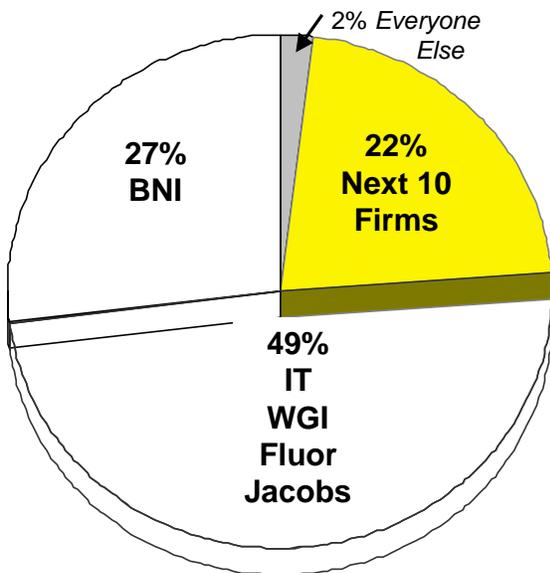
**Fig. 1.6. Trend in U.S. environmental remediation construction market revenue generation.**  
Source: Farkas Berkowitz and Co. 2000.



**Fig. 1.7. Remediation funding source trends from 1992 through 2000.** *Source:* Paterson 2000b.

Fig. 1.8—continued strongly in 2000 with BNI scoring major wins at DOE sites across the country. To understand the extent of consolidation, Farkas Berkowitz compared market shares among remediation market competitors in 1994 and 1999. In 1994 the share of the market claimed by the top 10 companies was 38%. In 1999 the top 15 companies claimed 98% of the market.

DOE has continued to become increasingly project-oriented and continues to use novel



**Fig. 1.8. Competition among remediation construction firms is diminishing.** *Source:* Farkas Berkowitz and Co. 2000.

procurement mechanisms and performance-based approaches to increase the value received from its contracts. The use of stretch goals, found to be an important inducement at Rocky Flats, is continuing throughout the DOE complex. With the new Administration's focus on contract reform, this trend can be expected to become increasingly pronounced and to flow down to lower-level contractors.

Another large contributor to the site remediation market is DOD. Farkas Berkowitz reports that DOD remediation funding was approximately \$1.86 billion in FY 1999 but dropped 16% to 1.6 billion in FY 2000 because of an adjustment in the base realignment and closure (BRAC) approach, intended to better align appropriations with commitments. DOD remediation funds are distributed primarily among its existing contractors, with little new contracting opportunity for outsiders. The lack of remediation opportunities within DOD has resulted in remediation service and consulting firms' focusing on privatization activities at DOD bases under the A-76 program. Such opportunities relate to purchasing and operating energy, water, and wastewater utilities at DOD bases.

The underground storage tank market continues to see major reductions as it has over the past several years. This reduction is due mainly to considerably

fewer state-funded programs and to risk-based corrective action (RBCA) standards.

The largest area of growth in remediation services is in the private market and the related brownfields area. The number of sites being addressed in these areas has tripled from 5 years ago as the economy has expanded and risk-based and reuse standards have opened a redevelopment window.

Within the industrial market sector, market opportunities are more strongly related to the economy than to enforcement activities by the EPA and the states. Reports from Environmental Information Limited (EI) indicate that both the EPA and state agencies, to whom EPA has delegated much of its former responsibilities, suffer from budget constraints that have an impact on their ability to implement their regulatory responsibilities effectively. This has resulted in a drop in the number of inspections such that even some permitted disposal facilities were not being inspected at least annually. Some states are allowing regulated facilities to audit themselves.

An important trend in the remediation market is the use of RBCA, which has contributed to growth in the consulting area. The broad emergence of RBCA programs has driven strong gains in both the assessment and the private/nonregulatory portions of the remediation market. Cary Perket of EI characterizes the overall impact of RBCA as "letting nature take its course" and predicts that \$6 billion in cleanup revenues will be lost to U.S. firms as a result (Perket 1998). RBCA opens an interesting dynamic between remediation construction companies and remediation consulting and engineering companies. The consulting and engineering companies that once focused on setting the stage for remediation construction now have the added ability to eliminate the need for some field construction work by showing the viability of natural attenuation.

### **Outlook**

The projected growth in the remediation/industrial services sector is uncertain. The *Environmental Business Journal (EBJ)* projects growth to average

0.9% per annum through 2002 for the overall sector but indicates that the prospects for site remediation are better. *EBJ* notes that growth in private markets, which is due mostly to the health of the economy and the advent of low-cost remediation, is forecast to keep the remediation market growing through at least 2000 (EBI 1999b). Meanwhile, Farkas Berkowitz's analyses astutely indicate that data used to estimate remediation market sizes is influenced by (a) which companies respond to analyst surveys, and (b) how DOE contract spending is attributed by individual companies responding to surveys, i.e., not all companies report essentially equivalent projects in the same category.

Internationally, the market for remediating groundwater and soil in Europe and Africa is projected to rise from \$6.9 billion in 1997 to just under \$9 billion in 2002. Landfill remediation is projected to account for \$2.2 billion in 2002. Spending in Europe for contaminated military sites is anticipated to be approximately \$940 million in 2002. Brownfield cleanup in Europe is reported to be growing rapidly, with both Germany and Spain very active in this area. Active remediation of U.S. military bases in Germany has started to move ahead. The Hungarian Environmental Ministry indicated that as much as \$14 billion may be required to clean up 10,000 contaminated sites to European Union environmental standards (McIlvaine Co. 1999).

The slowdown in the U.S. economy in 2001 and the new Administration's focus suggests further belt tightening rather than growth spurred by economic or regulatory enforcement. Factors that would be expected to influence the growth rate, for good or ill, include the health of the U.S. economy; budgetary constraints on DOE, DOD, and EPA; regulatory uncertainty related to reauthorization of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA); and the impact of waiting for improved technologies in hopes of a cheaper or more effective solutions. It should also be noted that the Price-Anderson Act of 1957, which

amended the Atomic Energy Act of 1954 to provide for payment of liability claims in the event of a nuclear incident at commercial nuclear power plants and DOE facilities, is scheduled to expire on August 1, 2002. Failure to renew the act would further deter private-sector participation in nuclear activities.

The 1990s demonstrated that companies receive more financial benefit by deferring environmental cleanup, because of a continual relaxing of regulations and enforcement policies, than by timely compliance. It is still too soon to know how this trend will play out during the new millennium and new Administration.

### 1.3 Hazardous Waste Management

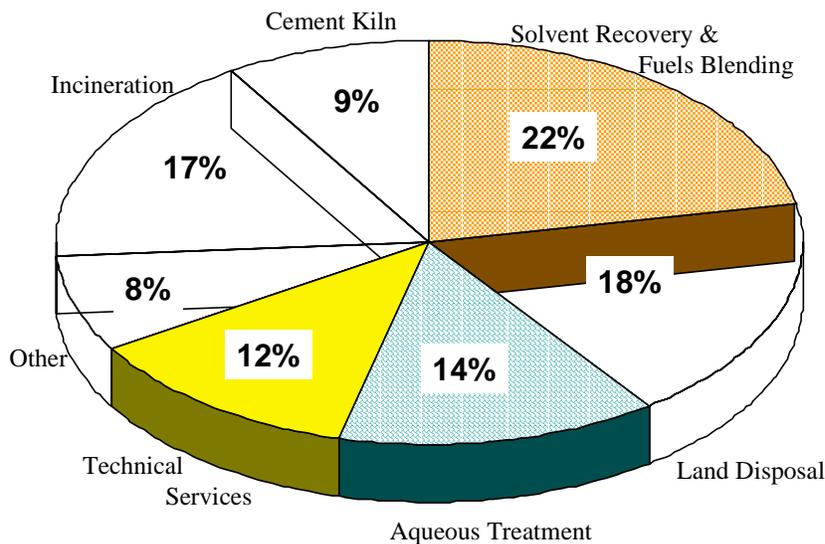
#### Market Overview

As is the case with the remediation market, market analysts also differ on market sizes and trends for the hazardous waste management market. *EBJ* reports that the hazardous waste management market dropped 7% in 1999, from \$5.67 billion in 1998 to \$5.3 billion in 1999. *EBJ* characterizes this segment as including industrial hazardous waste, medical waste, and nuclear waste. Industrial hazardous waste is the largest component in this sector.

Farkas Berkowitz focuses on the industrial hazardous waste component in the sector and estimates that the industrial hazardous waste sector grew about 6% between 1998 and 1999, with the revenue distribution as shown in Fig. 1.9. Farkas Berkowitz indicates that this market has begun to stabilize from overcapacity issues (the number of companies competing for work) and that pricing recovered somewhat during 1999. But while waste volumes have stabilized, high investments in capacity and low investor interest have continued to plague the industry. For example, Waste Management, repurchased and moved to Houston from Oak Brook, Illinois, brought its legacy of financial difficulties to Texas with it. The financial challenges of this sector led Waste Management to sell the major portion of its hazardous waste business line to Onyx, a subsidiary of Vivendi.

#### Trends

Farkas Berkowitz projects that pricing for hazardous waste treatment and disposal services will improve with consolidation but that overall waste volumes will be flat or decline due to constant or declining projected waste volumes generated from site remediation activities. Supply is still stronger than demand but is anticipated to come into balance over the next four to five years.



**Fig. 1.9. Distribution of revenues in industrial hazardous waste market.** Source: Farkas Berkowitz and Co. 2000.

Consolidation remains prevalent in the industry; however, it is not without pitfalls. Following a series of mergers, market leader Safety-Kleen posted revenues of \$1.7 billion in 1999—more than \$1 billion of which is directly related to industrial hazardous waste. Safety-Kleen, which last year was thought to be emerging as the pricing leader, filed for Chapter 11 protection in June 2000.

Nuclear waste management is anticipated to be a flat or declining business. Increases in waste volumes brought about by decontaminating and decommissioning the nation's commercial nuclear reactors has been offset by highly competitive pricing spurred by the ability to cheaply dispose of some nuclear waste in Tennessee landfills. Tennessee is the only state to have below-regulatory-concern regulations that provide for unregulated disposal of very-low-activity wastes. Moreover, decontaminating and decommissioning has been slower than initially projected because of a trend towards the consolidation of the ownership of existing nuclear plants by a few large nuclear utilities who have a greater capability to file for life extensions. The only subsegment experiencing growth is the volume-reduction business.

Although the nuclear power industry is stagnant, a significant opportunity for the nuclear waste management industry is presented by the prospect of decommissioning plants over the next 30 years.

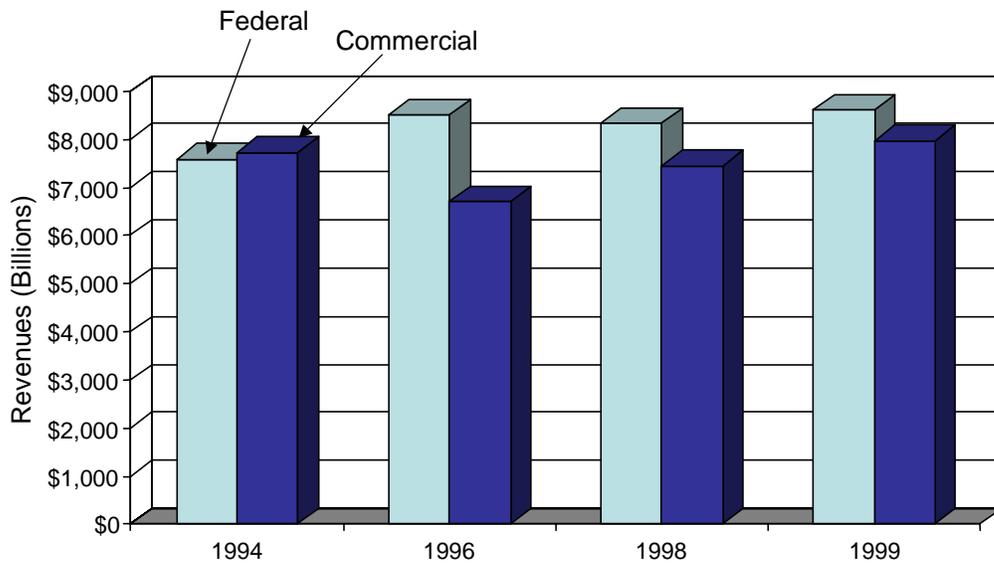
### Outlook

The Hazardous Waste Management segment is anticipated to remain in a slow decline until it self-corrects its overcapacity problems through attrition and/or consolidation.

## 1.4 Consulting and Engineering

### Market Overview

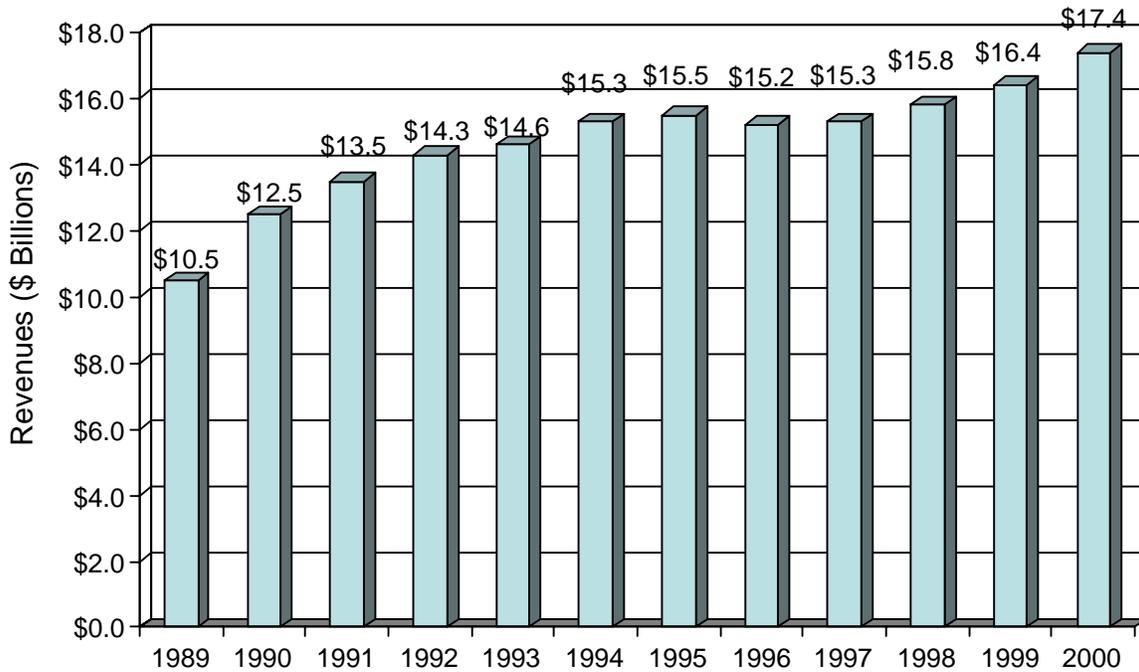
This discussion of the consulting and engineering segment is based on *EBJ's* analysis of the sector (EBI 2000c). The data differ slightly from the U.S. Department of Commerce data provided elsewhere in this report. The \$16.6 billion consulting and engineering segment continued its recovery from the mid-nineties with a 5% revenue growth from 1998 to 1999. Federal government revenues grew from \$8.3 billion to \$8.6 billion from 1998 to 1999, and growth in the awakening commercial sector was even greater, as illustrated in Fig. 1.10.



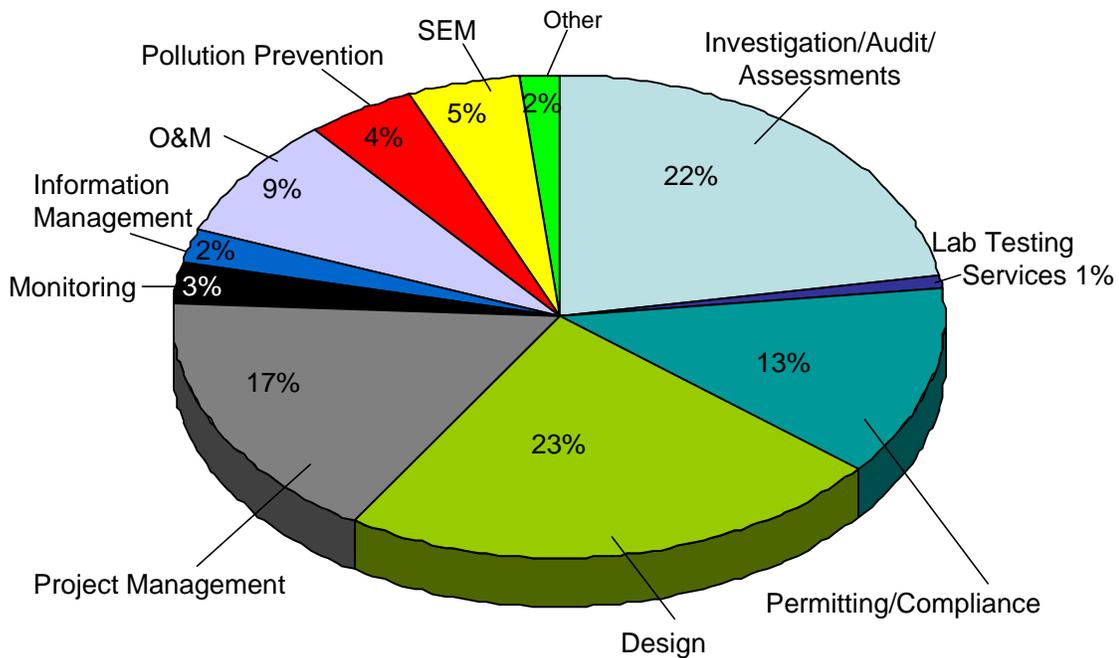
**Fig. 1.10. Distribution between federal and commercial revenues in consulting and engineering sector.** Source: *Environmental Business Journal* 13, nos. 1–2 (2000).

Forty-six percent of the consulting and engineering revenues were associated with hazardous waste and remediation, down from 49% in 1998 and 57% five years earlier. The fastest-growing media sector is water/wastewater, which grew from \$4.31 billion to \$5.04 billion. Water and

wastewater together made up nearly one-third of the overall market in 1999. Fig. 1.11 shows the growth in the overall consulting and engineering market from 1989 through 2000. Fig. 1.12 provides a breakdown of the consulting and engineering segment by service line.



**Fig. 1.11. The environmental consulting and engineering business from 1989 to 2000.** Sources: *Environmental Business Journal* 11, no. 7 (1998), 12, nos. 5–6 (1999), and 13, nos. 1–2 (2000).



**Fig. 1.12. Consulting and engineering 1999 breakdown by service line.** Source: *Environmental Business Journal* 13, nos. 1–2 (2000).

Substantial 1999 growth was seen in information management (55%), operation and maintenance (O&M) (26%), pollution prevention (20%), and permitting and compliance (11%). Investigations, assessments, and audits continued to fall off, dropping 1% from 1998 to 1999 and nearly 15% over the past 5 years. The emergence of risk assessment as a practice and of risk-based standards for site cleanup and redevelopment has led to an increase in assessment work. Risk assessment is increasing in the private sector because of its ability to negotiate away site problems and cost on behalf of clients. Customers use consultants to plead their case to regulators to get cleanup standards and remediation requirements reduced. This trend is increasing the consulting business as it reduces the cost of remediation.

### **Trends**

Consolidation and diversification continue to be the leading trends as firms struggle to redefine themselves. In part, the growth in this segment is due to the broadening and diversification of services offered by these firms. Environmental consulting and engineering companies are positioning themselves as more integrated professional services providers engaged in operations, systems management, and outsourcing. URS became one of the industry's largest players through the acquisition of Greiner, Dames & Moore, and Woodward-Clyde. The IT Group has acquired over a dozen firms during the past half-dozen years. On a smaller scale, Emcon, Tetra Tech, Earth Tech, and Mactec have successfully played the consolidation game.

One analyst indicates that most of the consolidation is driven by one of two factors. First, consolidation provides the ability to buy revenues, profits, and customers at a price below what it might cost to develop them organically. Second, consolidation is an attempt to quickly and more cheaply diversify into an end market or geographic region which is deemed to be strategically desirable (Maxwell 2000a).

Diversification, another strategy for dealing with the transition from a regulation-driven market, has

had success with some companies. The consulting and engineering segment has the greatest potential within the environmental industry for success in diversification because of the wide range of applicability of the typical consultant/engineer's basic skills. Many firms are working to broaden their identity from environmental problem solvers to business solution providers. Services such as outsourcing, information management, property portfolio management, and operations and maintenance are all increasing as a logical extension of core competencies.

### **Outlook**

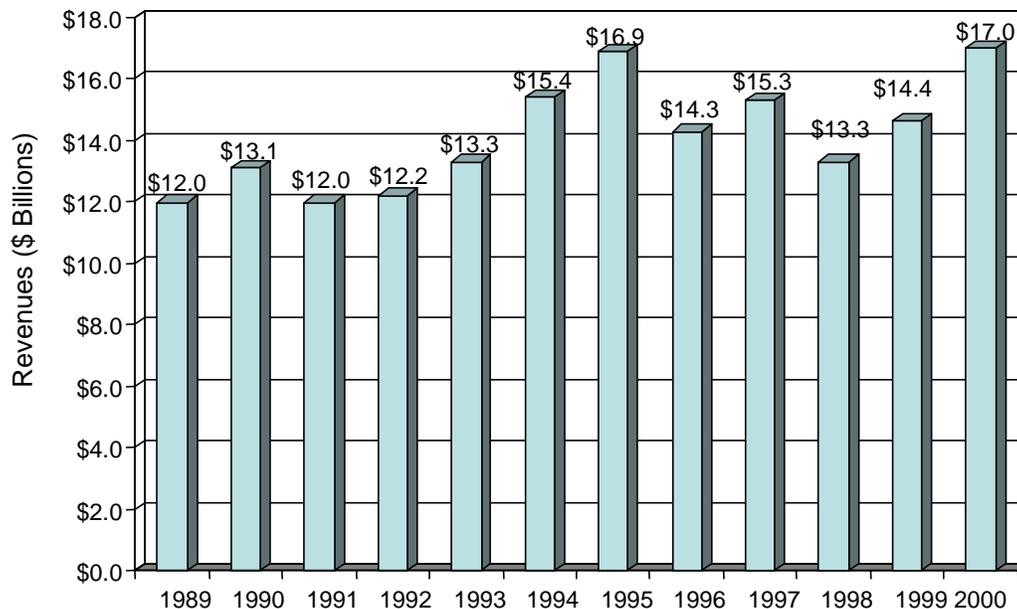
The absence of regulatory drivers continues to lead to projections of declines in this segment. In recent times, the lack of regulatory drivers has been offset by economic prosperity, which produced more work for all types of consulting and engineering firms.

The water and wastewater subsegments continue to be projected to have the best outlooks because of economic growth, municipal budget surpluses, and efforts to upgrade infrastructure. Revenue growth in non-U.S. markets is forecast to far outstrip growth in U.S. markets.

## **1.5 Resource Recovery**

### **Market Overview**

The resource recovery business grew 8.4% in 1999 to \$14.4 billion from \$13.3 billion in 1998 and leaped ahead to \$17 billion in 2000, a 25% gain. As indicated in Fig. 1.13, the resource recovery market is erratic. Although numerous materials are included in resource recovery, revenue generation is essentially a factor of spot market prices for metals. Scrap metal prices fluctuate widely with commodities prices. In general, the market will increase when Asian economies are strong because of large metal exports for automobiles. To a lesser extent, recycled packaging material markets become stronger with the world economy due to larger shipments.



**Fig. 1.13. Trend in U.S. resource recovery market, 1989–2000.** Sources: *Environmental Business Journal* 11, no. 7 (1998), and 12, nos. 5–6 (1999); U.S. Department of Commerce, International Trade Administration, and prepublication information from Grant Ferrier, March 2001.

When steel imports flood the United States, prices drop, domestic production slows, the demand for scrap decreases, and revenues drop. The same is true for other metals, such as aluminum. The demand for copper is also affected by overcapacity in metal mining and smelting.

Good news came in 1999, however, with significant increases in prices for aluminum cans, high-density polyethylene (HDPE) plastic, old corrugated cardboard, old newspaper, and white ledger paper. Overall in 1999, prices are up in every commodity except polyethylene terephthalate (PETE) plastic.

### Trends

Recycling has become a social priority in the United States over the past 25 years. Nonetheless, recycling fluctuates with economies that use the recycled materials. Factors that affect the resource recovery market include the lack of a sufficient and stable market demand, extreme price volatility, and collection costs and difficulties.

Recycling rates in the solid waste management segment have shown a steady increase over the

past decade, and the recycled content of paper products has risen gradually over the past decade to just over 40%. But some analysts question whether growth can continue because of the high cost of curbside pickup. The volatility of prices for the recovered materials (which heavily impacts the profitability of recycling components of household trash) results in a good deal of uncertainty in the resource recovery business. Further, rising transportation costs, which increase with inflation and energy costs, significantly impact the economics of recycling, particularly for less dense materials with relatively low market prices.

The National Recycling Coalition expresses great optimism for the future of this market segment, citing several major trends that are contributing to the positive outlook for resource recovery. These trends include

- considerable merger and acquisition activity driving consolidation and integration,
- improved efficiency in collecting and processing recycled materials,

- greater use of full-cost accounting, user fees, and pay-as-you-throw systems to ensure adequate cost recovery for municipal recycling and solid waste services and to create incentives for waste reduction,
- increased vertical integration among suppliers and end users,
- renewed focus on producing quality recycled material feedstocks to increase revenue, and
- improved risk management to address issues of market volatility for recycled materials prices (EBI 1998).

### Outlook

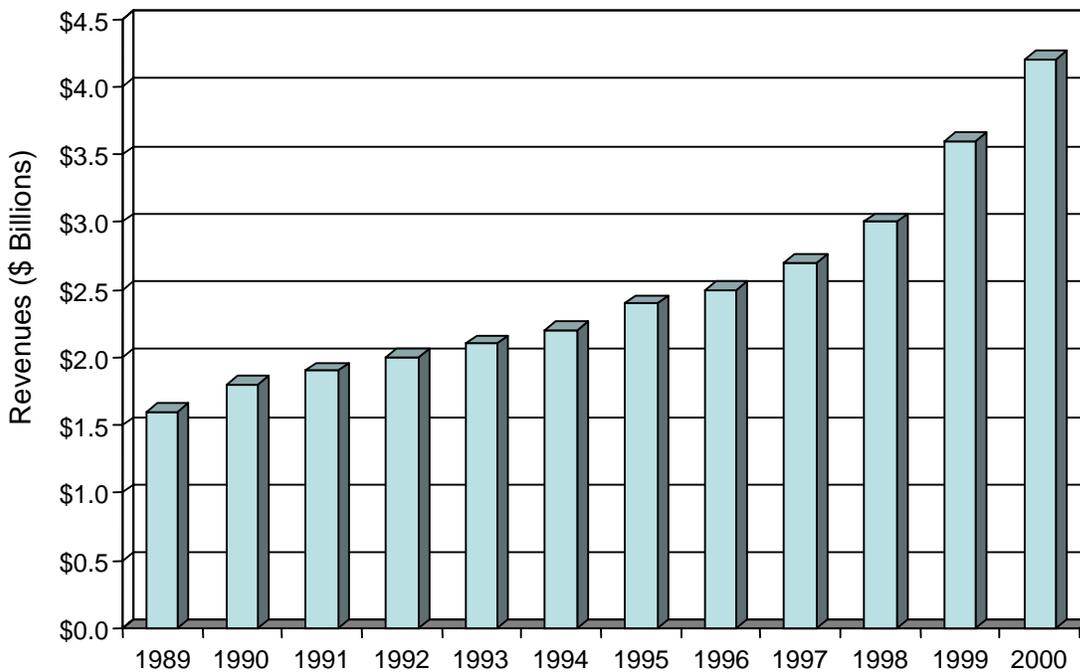
Market volatility and supply/demand fluctuations will continue to make recyclables unpredictable. EBI predicts growth in the resource recovery sector to 2002 to be around 8% per annum (EBI 1999c).

## 1.6 Environmental Energy Sources

### Market Overview

The environmental energy sources sector continued in its position as the fastest-growing environmental industry segment, with 19.3% growth in 1999 to reach \$3.58 billion, up from \$3.04 billion in 1998, as illustrated in Fig. 1.14. Performance data for 2000 indicate an additional 17.3% growth, to \$4.2 billion, fueled by strong gains in fuel cells and the solar and wind energy businesses.

Sales of photovoltaic solar energy modules and materials increased 20–25% in 1999 and 2000 to well over \$1 billion, and forecasts are for photovoltaic to exceed \$2 billion in 2003. The fuel cell market is estimated as \$220 million, with average annual growth forecast at 60%; it too is forecast to exceed \$2 billion by 2005 (EBI 2001).



**Fig. 1.14. Trend in U.S. environmental energy sources market, 1989–1999.** Sources: *Environmental Business Journal* 11, no. 7 (1998), and 12, nos. 5–6 (1999); U.S. Department of Commerce, International Trade Administration, and prepublication information from Grant Ferrier, March 2001.

## Trends

The dramatic growth in wind and solar businesses has been mainly a function of government programs such as rooftop programs for photovoltaics, requirements for renewables in certain states, and incentives in the form of federal or state tax credits. In addition, declining costs resulting from technology advances have made wind and solar considerably more cost-effective in many more applications. Another trend with a positive effect has been the emergence of retail power with the advent of deregulation and the restructuring of the utility business. At least 36 power retailers now offer a “green power” alternative, and there is evidence of strong “clean power” demand from consumers. A final driver is the increasing demand for more power autonomy, particularly from small businesses and industries; distributed power systems now offer reliability and autonomy at affordable costs.

After a slump of several years in the United States, wind power grew rapidly in 1998 and 1999. The growth in the U.S. market is due to three factors: developers rushed to execute projects before the expiration of the federal energy investment tax credit for wind in June 1999; consumers have responded favorably to offers of nonpolluting energy from electricity suppliers; and the cost of wind power has fallen, from about \$0.07/kWh in 1990 to \$0.04 to \$0.05/kWh. Analysts predict these trends of tax credits, consumer support, and cost reductions will continue.

Although wind power generates ten times as much electricity as solar, sales of solar technology have been growing faster. In 1999, an estimated 200 MW of solar modules were produced worldwide, up from 153 MW in 1998. Grid-connected residential solar power constitutes the largest part of the market and has experienced the most rapid growth because of major programs to install roof solar systems in Japan, Germany, and the United States.

Foreign markets are expected to continue growing as the result of population pressures. The domestic market is also expected to do well as homes, small

businesses, and industries turn to distributed power systems to back up and supplement commercial electric power for computers, telecommunications equipment, and production machinery.

## Outlook

Electricity is essential for improving standards of living and for global economic development. A significant amount of this demand that will not be met with large conventional power plants will be available to renewable energy and distributed power—solar and wind generation, in particular.

From 1993 to 1998, U.S. company revenues from photovoltaic and wind power systems more than doubled (from \$700 million to \$1,750 million). This trend seems likely to continue or increase because rising fossil fuel prices and blackouts will increase pressure for greater generation capacity. For example, whereas utilities have turned to natural gas for additional and replacement power, natural gas prices have risen to the point of breaking major utilities, who are unable to recoup full energy costs. These factors are likely to spur investment in any promising alternative source. Further, regulatory changes favoring distributed power in the United States are good news in principle for renewable energy and will also help increase domestic demand.

According to EBI, energy scarcity, preference for clean alternatives, and rising prices for oil and gas lead to positive forecasts for renewable and clean energy, in the 15–25% growth range, when slower-growth geothermal, biomass, and demand-side management revenues are included.

Growth in renewable energy exports is driven by several factors, including (1) population pressures in Asia and Latin America, (2) shifts from fossil fuels in Europe, (3) privatization of electric utilities with consequent improvements in generating capacity and promotion of off-grid electrification, (4) increasing use of environmental criteria by funding agencies, and (5) much lower unit generating costs for renewables because of better technologies and increased sales volumes since the 1986 oil price collapse. The robust growth in

renewables worldwide is expected to continue as a result of these pressures. Wind and solar electric generation should continue to lead the way.

## 1.7 Analytical Services

### Market Overview

The analytical services segment is continuing to emerge from its long recession. Revenues increased 7.3%, from \$1.1 billion in 1998 to \$1.18 billion, in 1999, and rose again in 2000 to \$1.22 billion, a 3.4% rise (Fig. 1.15).

### Trends

The primary cause of revenue loss in the analytical services market was not sample volume, which has remained fairly steady and even grown somewhat, but price reductions of around 10% annually. This trend seems to have ended, though, with most firms reporting profits and positive cash flow.

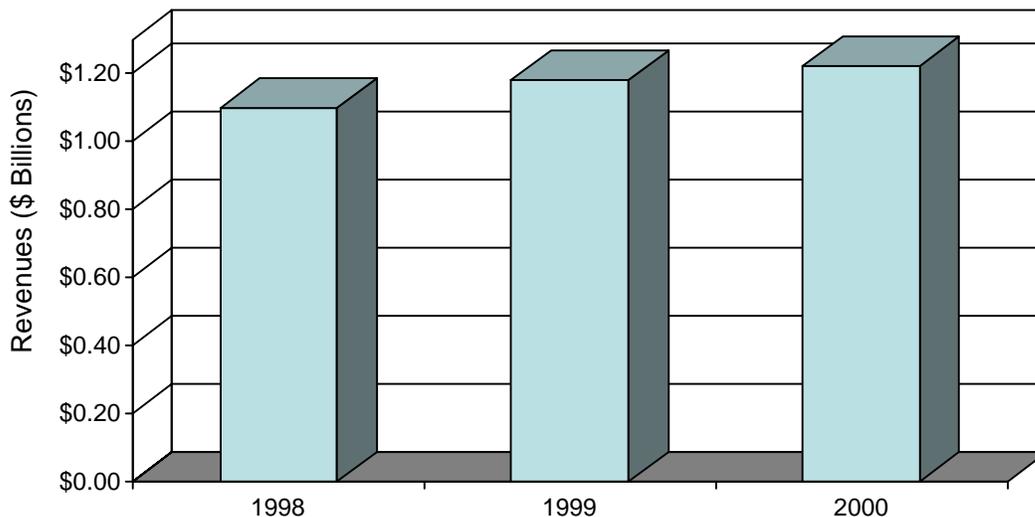
Reduced capacity has resulted from bankruptcies in early 1998 of Nytest Environmental, American Environmental Network, and VOC Analytical (EBI 1998c). Mergers and acquisitions and business closures have been rampant in the analytical services segment for the last several years. Together, closures and consolidation have reduced the number of laboratories to approximately 40%

of the 1993 number. Diminished capacity and flat demand is anticipated to result in price and margin increases for those able to withstand market pressures.

One new element that EBI believes is changing the analytical services segment is the Internet and the improvements it affords for data management. The Internet is expected to have a major impact on laboratories, some of which are already posting data on the web. Another trend in this market segment is the shift away from in-laboratory testing toward field analysis. Both of these trends are also playing important roles in changing the instruments and information systems segment (EBI 1999c).

### Outlook

EBI believes a measurable reduction in capacity and increased demand in water-related testing provides hope that the supply/demand imbalance that has plagued this analytical service for years will end in 1999 and 2000. Nonetheless, more closures are expected, and although pricing in general is improving, prices cannot yet be characterized as stable. International sales amounting to 3% of revenues are also an improvement; these sales probably will increase, although prospects for growth are limited and international sales probably will not approach 10%. The average annual



**Fig. 1.15. Recent trend in U.S. analytical services market.** Sources: *Environmental Business Journal* 11, no. 7 (1998), and 12, nos. 5–6 (1999), and prepublication information from Grant Ferrier, March 2001.

growth of this market segment through 2002 is forecast to be around 0.6%, with improved growth and profits for individual companies (EBI 1998c, 1999c).

## 1.8 Solid Waste Management

### Market Overview

The U.S. solid waste management business, which represents the largest segment within the U.S. environmental industry, grew 3.0% to \$37.2 billion in 1999 (Fig. 1.16). Collection (about \$21 billion) and landfill disposal (about \$14 billion) account for over 90% of the market, with the remainder being recycling and incineration.

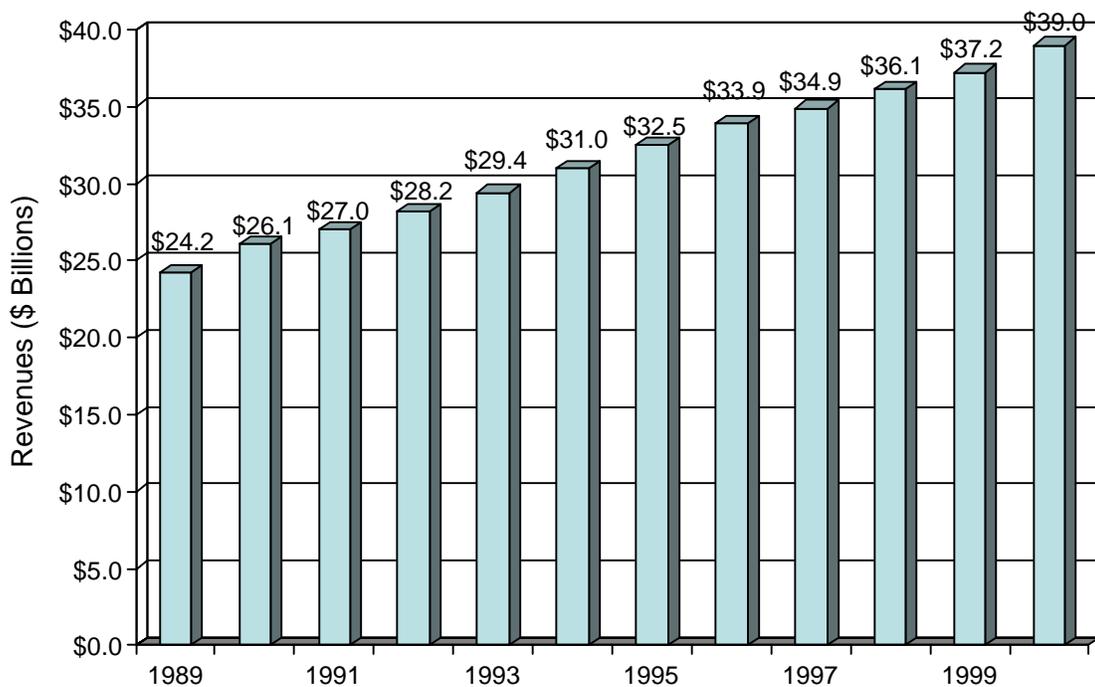
The collection subsegment is highly fragmented, including thousands of small haulers that transport wastes to landfills or other points of waste consolidation, which are owned and operated by others. The landfill subsegment is more consolidated, with the number of solid waste landfills

declining from over 20,000 in 1970 to fewer than 2,500 in 1999.

The collection and landfill disposal market sub-segments are made up of publicly traded companies (eight companies representing 57% of collection and landfill revenues), private companies (15% of revenues), and municipalities (28%). Three companies—Waste Management, Inc. (WMI), Allied Waste, and Republic Services—account for almost one-half of the industry.

### Trends

Farkas Berkowitz reports that organic growth of the solid waste market as a whole is on the order of 3–4% annually. Population growth accounts for 1–2%, and inflation accounts for the remainder. Individual companies have traditionally achieved growth rates in excess of the market as a whole by acquisition of private hauling and disposal operations and privatization of municipally controlled solid waste operations. However, the pool of acquisition candidates is shrinking, and



**Fig. 1.16. Trend in U.S. solid waste management services market, 1989–2000.** Sources: *Environmental Business Journal* 11, no. 7 (1998), and 12, nos. 5–6 (1999); U.S. Department of Commerce, International Trade Administration, and prepublication information from Grant Ferrier, March 2001.

municipalities have become more reluctant to privatize.

WMI is the largest solid waste management firm in North America, with 1999 revenues of \$13 billion. WMI has been selling off previously acquired U.S. operations outside of its core business, reversing its earlier diversification strategy. WMI is also divesting its operations outside of North America. Allied Waste, with 1999 revenues of \$3.3 billion, became the number two firm in the industry in 1999 by acquiring BFI. It, too, is divesting certain noncore operations.

While U.S. solid waste leaders are focusing domestically, the market is becoming increasingly global. The French are expanding at the same time that leading U.S. firms are retracting from the global market. In 1999, the \$35 billion French firm Vivendi bought \$400 million Superior, and more acquisitions are anticipated.

Recycling rates have shown a steady increase over the past decade, with about one-third of the U.S. solid waste stream now disposed of by recycling. Analysts continue to be concerned about the volatility of commodity prices for recyclable materials. As noted in Sect. 1.5, some analysts question whether the growth trend in recycling rates will continue because of the high cost of curbside collection and separation and the fact that promised environmental benefits depend upon completing the cycle by converting the recyclable materials to products. Other analysts predict growth for recycling, citing the fact that the proportion of communities served by recycling programs is still under 50%.

### Outlook

According to Farkas Berkowitz, the near-term outlook is for rationalization of solid waste operations, including asset swapping to promote vertical integration (integration of collection, transfer, recycling, and disposal systems). While the two major firms, WMI and Allied, are not expected to be major acquirers over the next three to five years, the smaller publicly traded firms are

expected to continue to pursue an acquisition strategy.

The collection and disposal sectors are expected to remain strong in a healthy U.S. economy. Although recycling has been growing steadily over the past decade, some analysts believe it will begin to level off because of the expense of operating curbside recycling programs. EBI predicts that growth overall in the solid waste management segment will be 3.2% per annum through 2002 (EBI 1999c).

## 1.9 U.S. Water Industry

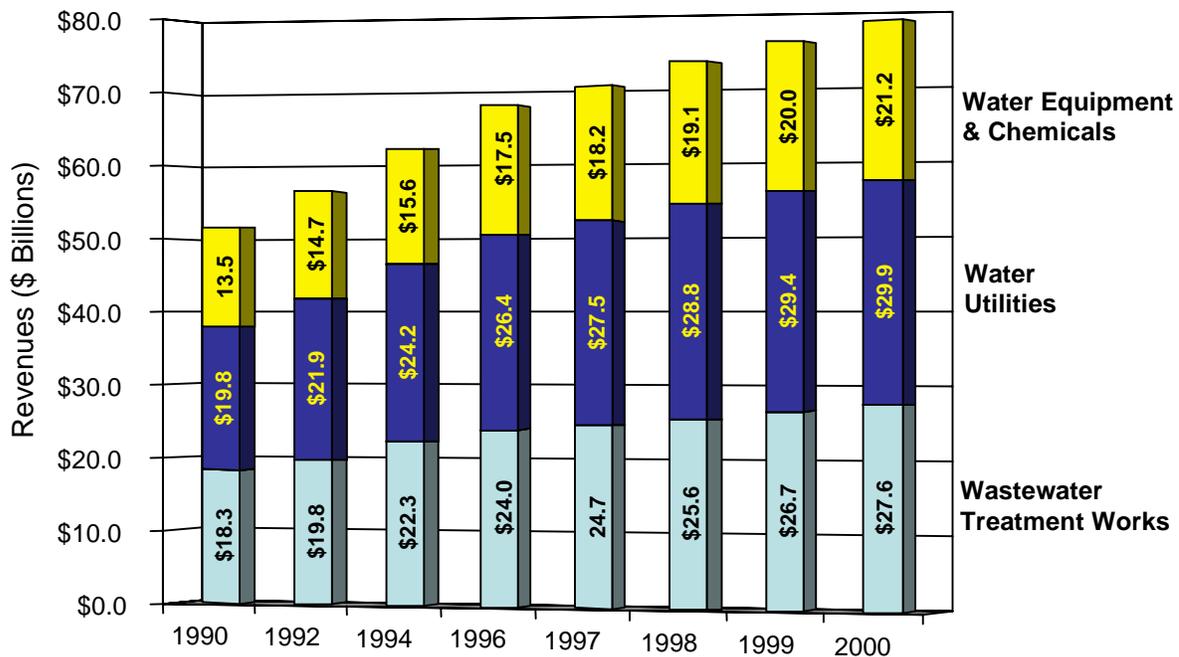
### Market Overview

The U.S. water industry consists of three EBI market segments: water utilities, wastewater treatment works, and water equipment and chemicals. Together, these segments account for 1999 revenues of \$76.1 billion and saw overall growth of 3.6% over 1998 (Fig. 1.17). In addition, water and wastewater revenues generated by the analytical services, consulting and engineering, and instruments and information systems segments bring the total U.S. water industry market revenues to approximately \$79 billion, or 40% of the \$196.5 billion environmental industry total.

The performance of the individual segments was as follows:

- **Water equipment and chemicals:** Revenues in 1999 of \$20.0 billion translate into 4.8% growth from 1998.
- **Wastewater treatment works:** Revenues in 1999 were \$26.7 billion, a 4.3% increase over 1998. Virtually all of these revenues (95%) are in publicly owned treatment works (POTWs).
- **Water utilities:** This segment generated \$29.4 billion in 1999, which represents a 2.1% growth over 1998 revenues.

Farkas Berkowitz defines the water market a little differently from EBI, estimating 1999 U.S. water



**Fig. 1.17. Trend in U.S. water equipment and chemicals, water utilities, and wastewater treatment works, 1990–2000.** Sources: *Environmental Business Journal* 11, no. 7 (1998), and 12, nos. 5–6 (1999); U.S. Department of Commerce, International Trade Administration, and prepublication information from Grant Ferrier, March 2001.

quality systems market revenues as \$86 billion. Its breakdown by types of products and services is presented in Fig. 1.18. Farkas Berkowitz reports that private sector firms control 37% of the market, regulated utilities account for 6% of the market, unregulated water quality systems firms for 31%, and municipalities control 63% of the wastewater quality systems market.

### Trends

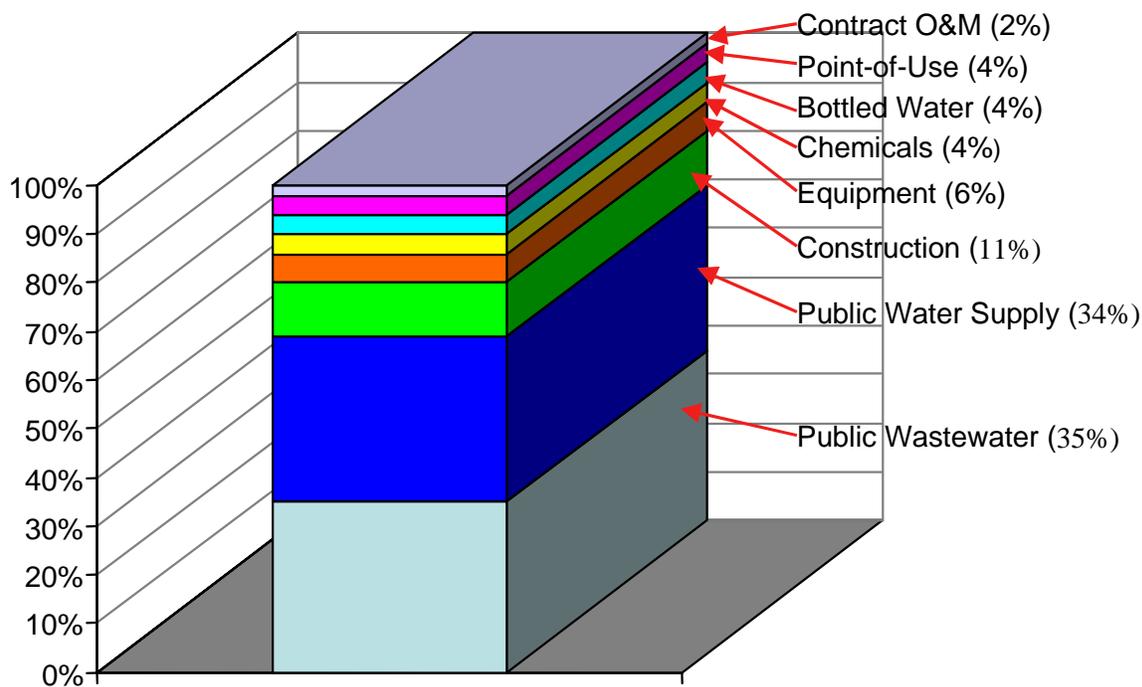
Farkas Berkowitz reports that a major transformation is occurring in the industry. Segment boundaries are breaking down as firms diversify into new areas and the larger companies offer more integrated product and service contracts. The ownership structure is also changing: U.S. firms are consolidating through mergers and acquisitions to form larger entities. French and British water quality systems firms are penetrating the U.S. market. For example, Vivendi acquired U.S. Filter, combining the largest water firm in France with the largest water firm in the United States to create the largest water firm in the world. Indeed, Vivendi is now by far the world’s largest environmental company. Although e-commerce is in

its infancy in the water industry, the Internet and information technology generally are expected to have a profound impact on the future of the water industry.

Privatization in the government sector and outsourcing in the industrial sector are driving growth in the water industry. Privatization, in the form of design-build, is growing most rapidly. This represents a major break with the traditional design-bid-build model that municipalities have followed for the past century. Longer-term, impending water shortages will drive growth in markets related to water conservation, reuse, and reclamation.

### Outlook

The water industry has a fundamental market driver both domestically and internationally because of the basic requirement for water resources and increasing “water stress.” The latter refers to the growing stress on water resources caused by increased demand resulting from population growth and the diminishing availability



**Fig. 1.18. Distribution of revenues in \$86 billion water quality systems market in 1999.** Source: Farkas Berkowitz & Co., *Twelfth Annual State-of-the-Industry Report*.

of water suitable for an intended use, due primarily to pollution from industrial activities (particularly in developing countries). Indeed, Farkas Berkowitz goes so far as to assert that water supply is the next global crisis.

Between 1998 and 2003, the U.S. water industry is expected to grow from \$76.1 billion to \$96.4 billion. In terms of individual industry market segments, EBI predicts annual growth of the water equipment and chemicals segment at a healthy 5.6% from 1998 to 2002. During the same period, the wastewater treatment works segment is projected to grow at an average annual growth rate of 3.7%. EBI forecasts average annual growth of 3.8% for the water utilities segment through 2002.

Tremendous changes are occurring in the industry, greater than would be suggested from the modest growth numbers. Farkas Berkowitz reports that the market characteristics are different today from they were even a year ago, and they will continue to change over the next few years. The most important changes are the internationalization of the U.S. market, consolidation, and new modes of delivery of products and services.

EBI's vision of the water industry's future (EBI 1999d)] is as follows:

- Water and wastewater prices will continue to increase and by the year 2010 will stabilize between 1 and 1.5% of the median annual household income—about double current prices (adjusted for inflation).
- Water prices will be better rationalized to water quality, quantity, and specific end-use values.
- Water markets and water privatization will continue to grow to the point where at least
- 80% privatization is achieved by 2050 in the United States; privatization will be even higher globally. This will be driven by (1) price stabilization (through technologies and economies of scale), (2) providing private capital to create and maintain rational water markets, (3) providing higher quality of water and service from expanded expertise, (4) freer markets brought on by the Internet, and (5) more consistent environmental compliance.

- The price of water desalination will come to within the range of raw water transport and treatment prices by 2010, thus making water availability virtually unlimited within 1000 vertical feet of the world's oceans.

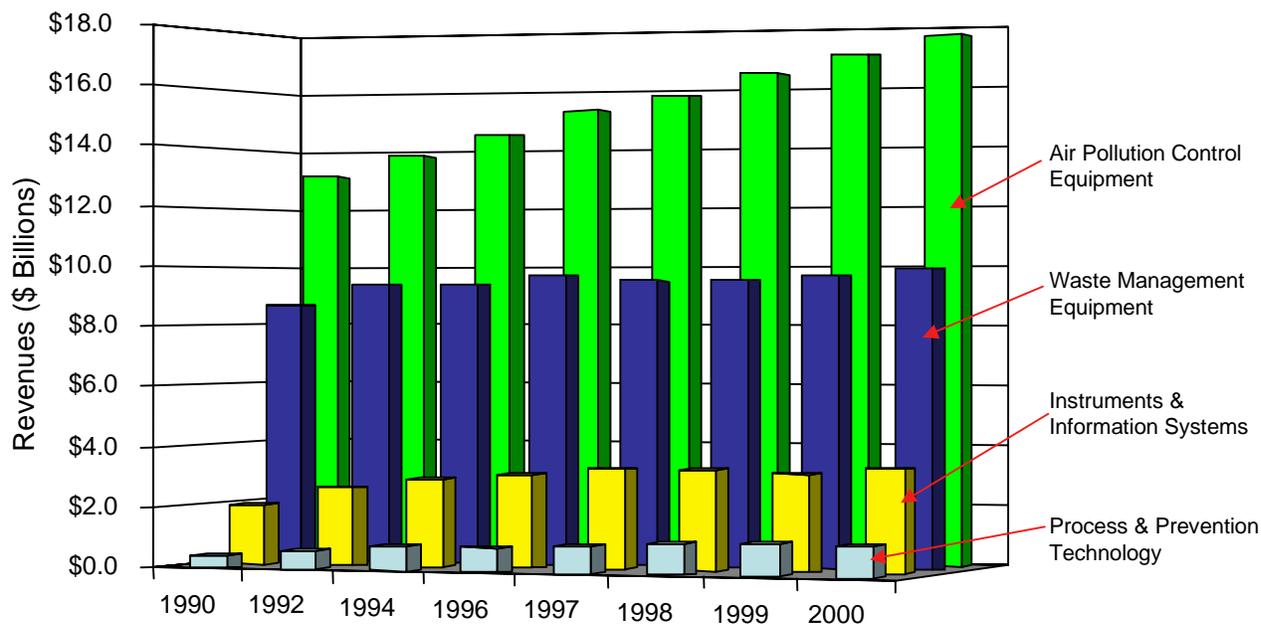
## 1.10 Equipment

### Market Overview

The equipment industry consists of four EBI market segments: process and prevention technology, air pollution control equipment, instruments and information systems, and waste management equipment. Together, these segments account for 1999 revenues of \$31.1 billion, an increase of 2.4% over 1998 revenues of \$30.3 billion. The fastest growth (4.0%) was in process and prevention technology, also the smallest market segment, at \$1.04 billion. The air pollution control equipment segment (\$17.1 billion) showed a 3.8% growth, while waste management equipment (\$9.70 billion) showed growth of 2.1%. Instruments and information systems (\$3.20 billion) showed a 3.0% decline (Fig. 1.19).

Sales of air pollution control equipment by U.S. companies are dominated by mobile emissions control devices. Mobile markets are tied closely to automotive markets; vehicle manufacturers buy catalytic converters and related technologies. The remainder of this segment is the \$3 billion U.S. market for stationary-source air pollution control equipment. Major customers include electric utilities; incinerators and waste-to-energy processors; various manufacturing sectors such as pulp and paper, plastic, mining, and metal finishing; cement; chemicals; pharmaceuticals; petroleum refining; printing; and electronics.

The process and prevention technology segment (also sometimes referred to as pollution prevention) works at reducing pollution at its source and includes equipment or processes designed to achieve waste minimization and resource efficiency rather than end-of-pipe control. The focus is on technologies that improve the environmental and economic efficiency of a manufacturing process, whether through more efficient use of material and energy resources, redesign of



**Fig. 1.19. Trend in U.S. process and prevention technology, instruments and information systems, waste management equipment, and air pollution control equipment markets, 1990–2000.** Sources: *Environmental Business Journal* 11, no. 7 (1998), and 12, nos. 5–6 (1999); U.S. Department of Commerce, International Trade Administration, and prepublication information from Grant Ferrier, March 2001.

processes, recycling, novel uses of chemistry, or material and process substitutions.

Overall, the waste management equipment segment suffered through the end of a down cycle in 1998, but it showed growth in 1999 and 2000, particularly in the solid waste and recycling areas. About 60% of waste management equipment sales is devoted to solid waste and recycling. The remainder consists of drums, tanks, and other storage units for hazardous, nuclear, and medical waste, as well as incinerators, protective gear, and other equipment related to hazardous waste and remediation. Overall, the hazardous waste equipment subsegments have been flat or declining since the early 1990s because of decreases in volumes of waste generated and the number of sites under construction and the relatively poor financial condition of contractors in hazardous waste and remediation.

In the instruments and information systems segment, exports represent about 55% of sales of U.S. environmental instrument manufacturers. U.S. manufacturers of environmental instrumentation, led by three U.S. firms with a strong global presence (Thermo Instruments, Hewlett-Packard, and Perkin-Elmer), make up about two-thirds of global sales. Global sales of environmental instrumentation were \$2.9 billion in 1998; of this, the United States represents \$1.3 billion, over 40% of the market. Environmental management information systems (EMISs) constitute the other part of the instruments and information systems market segment.

### **Trends**

The U.S. air pollution control industry is driven by government regulations and enforcement. In the stationary-source market, ozone standards in combination with deregulation of utilities are generating demand. Regulation of nitrogen oxides is expected to drive the stationary source market for the next few years. Tighter limits on ozone concentrations have resulted in increased market demand for controlling nitrogen oxides and volatile organic compounds.

According to the *U.S. Industry and Trade Outlook* (DOC 2000), the trend toward deregulation of utilities is another driver for air pollution control equipment. Deregulation is forcing sales of utility plants and equipment. When a new owner takes over an old asset, the trend is to retrofit it with air pollution control equipment to bring it up to more modern environmental standards. Increases in coal-fired power plant capacity and emissions trading are also expected to contribute to market growth.

Analysts predict strong growth in demand for motor vehicle pollution control technologies, as a result of an increase in the number of new motor vehicles in Asia and Latin America and in the number of countries using pollution control equipment. In the United States, even though vehicle miles traveled and the GDP have doubled since 1970, U.S. emissions of almost all pollutants are down significantly. Now the rest of the world is following this pattern (DOC 2000). Thus, U.S. air pollution control companies see opportunities in international expansion to fuel growth.

An ongoing shift from regulation to market factors as the primary means of achieving environmental improvements is anticipated to bring a shift in focus from cleanup and pollution control to process and prevention. Many analysts believe that factors emerging from the economy itself are becoming increasingly important drivers of the environmental industry; these include cost escalation in raw materials and waste disposal, cleanups based on the economic value of land, economic return for waste minimization, and increased profits and better comparative advantage from increased efficiency. This trend is expected to providing new and expanded markets for the process and prevention technology segment (DOC 2000).

In the waste management equipment segment, prices for nonvehicle waste management equipment started growing in early 1999 following 2 years of decline. Prices and demand had been depressed because of low commodity prices and poor performance in the resource recovery segment as well as because of "preconsolidation"

effects at the major solid waste companies. The mergers and acquisitions that have been prevalent in the solid waste management segment also have an impact on the equipment market (1) because of equipment purchase delays by companies involved in mergers and acquisitions activity and (2) as a consequence of having fewer landfills. The solid waste business went into an almost 2-year slump as companies positioned themselves to be sold and buyers refrained from spending on equipment. Now the equipment market is recovering because of the release of pent-up demand from the intentional delay of capital expenditures by the major waste companies. Also fueling the growth are the strong 1999 economy and the increase in construction starts (EBI 1999c).

In the instruments and information systems segment, the EMIS market is projected to show significant growth, owing in part to the trend of EMISs' becoming less geared to regulatory compliance and more integrated with business management systems. EBI comments that EMISs remain a volatile field characterized by exits and entrants, new partnerships, and consolidation, with firms caught up in the acquisition and restructuring trend that is gripping the entire environmental industry. Another important trend is the growth of the Internet, which is expected to have a strong impact on this segment. Although it is impossible to foresee all the changes the Internet will bring, one change is clear: companies are working on Internet-enabled instrumentation for remote testing, and the future could bring banks of

instruments accessible over the Internet by multiple users.

## **Outlook**

In the air pollution control equipment market, increased demand for nitrogen oxides and volatile organic compound control systems is expected to continue for the next several years within the utility community. Automotive pollution control systems are also expected to perform well in a strong economy with good automobile sales. EBI predicts a small but steady average annual growth of 2.7% through 2002.

The process and prevention technology segment has shown rapid growth and has more than doubled from its 1990 size of \$0.4 billion; this growth is expected to continue. EBI forecasts show continued strong growth of about 7% annually through 2002.

The outlook for the waste management equipment segment is healthy, with EBI projecting 3.8% annual growth through 2002.

EBI predicts continued growth in environmental instruments and information systems at around 3.6% annually through 2002. According to the BTI Consulting Group's *Strategic Review and Outlook for the U.S. Environmental Services Industry 2000*, the EMIS market is poised to become one of the fastest growing segments in the entire environmental industry.

## 2. INDUSTRY TRENDS

Section 2.1 provides a look at industry trends that are shaping the environmental industry as seen from both the demand and supply-side perspectives. Current trends are driven by private-sector perspectives because, with the demise of significant regulatory drivers, the environmental market is being shaped by economics, profit, loss, investment, and financing.

Following the overview, key trends are further discussed in Sections 2.2 through 2.7. Those trends include increasing numbers of design-build contracts; contract reform; consolidation, diversification, and market maturation; concerns over workforce adequacy; the appropriate use of information technology; and an increase in focus on exports (i.e., selling US environmental services abroad).

### 2.1 Overview of Industry Trends

#### An Industry in Motion

The environmental industry, both on the buying and the selling side, has reached maturity over the two decades since CERCLA and RCRA sounded wakeup calls to companies with bad past practices. Instead of polluters' paying huge sums to environmental saviors who could fix their past mistakes, we now have leaner, more humble environmental providers selling services at commodity rates and assuming large risks through privatization and design-build contracts in hopes of receiving fees that used to be commonplace on a cost-plus basis. On the demand side, customers are seeking smarter ways to do business and have taken up sustainable development as a way of creating their products in harmony with the environment. On the supply side, providers are evolving through a process of widespread consolidation and diversification as a means of increasing market share, reducing cost, and stabilizing pricing. In parallel, cottage industry specialists,

operating below the threshold of attention of the environmental giants, are endeavoring to create their own niches through targeted expert advice, innovation, and service.

#### More Money, Not Laws

Perhaps the biggest change over the past decade has been the increased knowledge and sophistication of the customers for environmental services and products. This is a customer group that is focused on making money and that has been operating under successive Administrations that are emphasizing the economy rather than continuing the proliferation of environmental laws. Slowing down the promulgation of new environmental laws and regulations has two important demand side effects. First, it reduces the need for customers to spend money to fix things that were fine yesterday. Second, it allows customers to better understand the existing requirements and find better ways to address them through innovation rather than temporary solutions.

For example, in the '80s the environmental market entered a boom phase on the heels of CERCLA and RCRA. Environmental customers read the headlines and, uncertain what liabilities they might face, turned to environmental companies for assistance with and protection from a bewildering and growing set of laws and regulations filled with undecipherable acronyms. An early shortfall in environmental expertise, coupled with highly aggressive enforcement by the EPA (sometimes helped by the FBI), drove all areas of the environmental market upward. Early technologies, stemming from state and federal regulations, initially focused on end-of-pipe solutions—treatment and remediation.

In the early '90s, expertise in environmental matters became much more widespread among the sellers and the buyers as the process of hiring each others' employees gained momentum. The process

continues today, with customers' becoming the primary benefactors as they gain the knowledge required to make perceptive buying decisions and to leverage competition. Customers have come to know much more about their suppliers and have suppressed traditional customer-seller loyalties, independently determined how much they should pay, held out for the best deals, and got them.

On the supply side, more and more sellers bid for the same work in a market where the seller's technical capabilities, historically a differentiator, were taken for granted. The combination of savvy customers and an oversupply of qualified vendors turned the market towards price and service. It became a commodity market readjusting for maturity, as illustrated in Fig. 2.1.

**Some Risks Are Real**

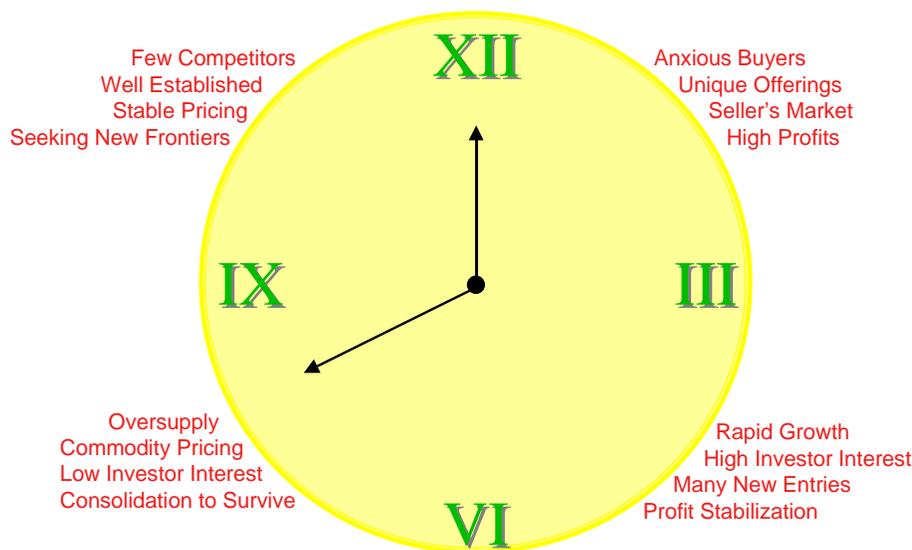
Meanwhile, customers found that the reduced cost of environmental services had created new opportunities for bottom-line enhancements: they could outsource environmental activities and refocus their resources on their core competencies. In addition, some companies and agencies (DOE included) learned that a prevailing general sense of supply-side hunger made sellers sufficiently

desperate to try new risks as the era of privatization and design-build came in.

While the concept of making vendors assume higher accountability is a sound idea, in many cases neither the buyer nor the seller knew exactly how to put the idea into practice. This led to some serious mistakes on both sides. On the one hand, buyers created contracts that went well beyond their expertise, leaving them open to claims and change notices. On the other hand, vendors lost sight of Murphy's Law and assumed unreasonable risks because of the lure of high margins if everything went according to plan.

The results of ignoring risks to date include lawsuits, bankruptcies, failed projects and companies, and missed compliance milestones. Examples include the following:

- Lockheed-Martin's monumental failure on Pit 9 resulting from a major fixed-price bid to perform work that was well outside the company's core competency;
- BNFL's wildly escalating costs on the Hanford Vitrification Plant, caused in part by the use of private financing for a long-term, first-of-a-kind, high-risk project;



**Fig. 2.1. The U.S. environmental industry adjusts for the long-haul of market maturity.** Source: YAHSGS LLC.

- Foster Wheeler's stock tumble following overruns on fixed-price power plant projects;
- ICF Kaiser's partial sell-off of its business lines in an attempt to regain solvency, only to later seek Chapter 11 protection, caused largely by overhead rates that got out of control;
- Raytheon Engineers and Constructors' overruns on international projects, resulting in the sale of the company to the Washington Group International, which bought Raytheon cheaply and then paid dearly because of escalating acquired liabilities;
- the filing in 2000 for Chapter 11 protection by Stone and Webster, a 100-year-old mainline engineering construction firm, due to a series of cost overruns and pending difficulties with a highly aggressive fixed-price bid to decommission Maine Yankee Nuclear Station; and
- the \$120 million in cost overruns by Fluor Corporation and Duke Engineering and Environmental Services (a subsidiary of Duke Power) on overseas design-build coal-fired power plants.

Hunger leads to desperation, and desperation frequently leads to risks, mistakes, and losses, as indicated by the examples above. In most of these cases, failure occurred because the company bid on work with risks that it did not properly factor into its bids and/or manage. In most of the cases, the projects and/or companies failed because the companies were overconfident about their abilities to deliver fixed-price results in market areas where their expertise was limited in fatally flawed ways.

### **Economics and Sustainable Development**

Meanwhile, federal and state enforcement and new regulation development slowed to a standstill as the American public turned its focus to the economy, assuming that low press coverage meant that the environment was well in hand. Relaxed regulatory conditions allowed the now-smarter customers to change their focus from rote compliance to laying out environmental strategies that could

also enhance their bottom lines through smarter environmental planning and management.

Pollution prevention, an important trend, gained in sophistication by requiring not just treatment-abatement equipment, but also better process and product designs. For example, ISO 14000 requires life cycle assessment of products as a means of preventing environmental issues before they can begin. President Clinton signed an executive order requiring federal agencies to perform life cycle analysis of new projects and programs.

### **Bigger Seems Better**

The emergence of too many hungry and capable competitors and savvy bottom-line-oriented customers caused belt tightening and rethinking among the equipment and service providers throughout the environmental industry. With profits and revenues down, investors nonexistent, and lenders suspicious, vendors had no choice but to change or die. An overriding theme for the industry is the challenge of functioning in a mature marketplace with intense competition and low profit margins.

Environmental vendors, faced with customers motivated by profits, needed to respond with lower costs, better ideas, and better service. Those are difficult hurdles to jump at once, as the last two typically require more, not less, money.

The environmental industry's nearly uniform answer to the challenge has been consolidation and diversification. The combination, if properly orchestrated, is thought to be the solution to producing higher revenues and better margins. The resulting acquisitions and mergers have redefined the industry into a few very large companies (assets >\$2 billion) and resulted in half of the environmental companies in business a half-dozen years ago either closing their doors or selling out. Size and financial strength can be important in some environmental fields where the sellers must back their products and services with performance bonds or other forms of guarantee, provide high levels of liability coverage, or serve customers who operate at global levels and seek global service providers.

Is the day of the small company gone? Probably not, but small companies, just like their large counterparts, need to adapt to their customers by providing specialized service and expertise that better targets each customer's needs. The reason that is possible is that the best and brightest in the large environmental companies must ultimately focus on feeding the company's appetite for growth. The best and brightest of the small companies can focus on building trust and rapport with customers who see benefit from their specialized offerings delivered with care and attention.

Ironically, when the small companies are acquired, the customer focus that was the basis for their successful niche is frequently lost as they are forced to adopt the business culture of the acquiring company. A large number of acquisitions fail because the combination of incompatible business cultures results in a whole that is less than the sum of the parts from the customers' perspective.

### **It All Comes Back to Money**

Many environmental companies were started by entrepreneurs with an end-game strategy of either going public or selling to a larger company to cash out. Growing a company requires more money than is typically available through cash flow, particularly in a commodity market. Financing difficulties and an inability to raise equity financing through a public offering in today's market have many small to mid-sized companies willing to sell.

Making acquisitions in a time of depressed environmental stock prices, uninterested Wall Street and venture capitalist investors, and bankers skeptical of anyone needing to borrow is a difficult proposition, however.

Depressed stock prices tend to result in the acquiring company's investing debt-based cash in the acquisition. The purchasing company is reluctant to use excessive amounts of its own stock, which it typically believes to be "undervalued," to make the acquisition. Meanwhile, the seller typically wants to further discount the buyer's stock, both because of its decline in value and the inability to accept much risk when cashing in what is

usually the seller's retirement nest egg. Because banks generally offer high interest charges to companies with depressed stock prices, debt-based acquisitions tend to build bow waves of expensive debt, much of which is for goodwill. The heady thrill of doubling or tripling in size through acquisition is soon replaced with the stark reality of high-interest debts and a tough, mature market.

This trend has generated new creative financing alternatives in which investors take greater-than-normal risks in exchange for equity through warrants and coupons. One-sided equity propositions become acceptable in an industry wrestling with high interest charges, environmental liability, demand uncertainty, uncertain regulatory drivers, and relatively small transaction sizes and profits (DOC 2000). This strategy has resulted in major investors' becoming company owners and operators by default, as occurred in the case of ICF Kaiser.

Steve Maxwell, of TechKNOWLEDGEy Strategic Group, takes measure of the environmental industry as it stands in the year 2000:

In looking back over the decade of the 1990s, one would pretty much have to say that the environmental business has been a disappointment—and a big disappointment for investors. After the frenzied, heady days of the mid and late 1980s, the 1990s have turned out to be a period of very tough economic times for most sectors of the business. In a nutshell, here is what happened: the profitability and high growth expectations of the 1980s could not be sustained forever: industry growth rates began to decline at the same time as considerable new capacity entered the business, and excessive capacity began to develop by the early 1990s. By the 1994 elections, when the anti-regulation and privatization-minded Republicans gained a majority in the House, public opinion was beginning to distinctly shift away from environmental concerns towards other issues. As public awareness—and hence legislative activity and regulatory scrutiny—waned, spending levels dropped, allowing over-capacity to intensify even further, and creating dire circumstances in many sectors of the environmental business. The story of the 1990s is essentially focused on the working off of this excess supply, either through firms exiting the industry or going out of business, diversifying away from

environmental and into other businesses, and capacity-reducing mergers and acquisitions. Throughout all of this, equity values have continued to slide downwards, much further than any of us thought likely even just a few years ago. (Maxwell 2000).

Maxwell goes on to identify key trends and developments likely to unfold over the next several years:

- The environmental business is gradually shedding its historical definition—changing in nature or slowly merging into other sectors. For example, as environmental consultants have diversified and as many have merged into larger, more diversified firms, the environmental consulting business is gradually losing its definition and is now considered just one part of the broader engineering services business.
- There is a continuing shift from a pollution control mindset to a pollution prevention mindset. Businesses which are driven by the economic potential of pollution prevention rather than simply regulatory compliance are positioned for much better growth. According to Maxwell, viewing environmental improvements and issues as ways of making money, not losing money, is the most important trend in the overall industry—and is the driver behind the rapid decline of the hazardous waste management and remediation business.
- The potential for outsourcing and privatization of various environmental operations—hazardous waste, solid waste, water and wastewater treatment—has created a broad new set of opportunities in the industry. Particularly in the water/wastewater and solid waste sectors, this has the potential to be a strong source of new revenue.
- Environmental work is increasingly being driven by business transactions—mergers and acquisitions, real estate transactions, legal disputes, etc. Such transactions often turn on environmental questions or concerns, and those companies that can guarantee a thorough

and rapid response will see more work from this quarter.

- Consolidation and diversification continues. Almost all firms have found themselves in either the role of buyer or seller, and often in both roles. In addition, as the traditional environmental business has weakened, most firms have looked to diversify themselves away from complete reliance on environmentally based opportunities.
- The environmental business is global by nature. Particularly in terms of the air pollution control and surface water quality businesses, environmental problems do not recognize national boundaries; issues in these areas can take on international political significance. In the future, Maxwell predicts, the environmental management business will become even more global.

Major trends of importance to the DOE are discussed in the following sections.

## 2.2 More Design-Build Contracts

Farkas Berkowitz perceives the increase in design-build contracts as a trend that presents both opportunities and threats. Farkas Berkowitz predicts that the combined forces of information technology and design-build will accelerate the transformation of engineering from a business that sells hours to a business that sells completed projects. Buyers benefit by transferring performance risks to the sellers. Sellers benefit because of opportunities for higher-margin lump-sum sales. Everyone wins with well-formed deals and everyone can lose when poor deals are struck. For lump-sum deals to work well, the buyer needs to know exactly how the job needs to be done and the seller needs to know exactly how to price and perform the job. Ill-prepared buyers will face large claims and change orders. Overly hungry sellers will face overruns or seek to cut corners.

Privatization and design-build are likely to continue, and as in other areas in the industry, both

buyers and sellers will learn and acclimate to each other's knowledge and experience. In the interim, some buyers, such as the DOE Office of River Protection, have abandoned privatization for the present in favor of contract reform approaches to gain contractor accountability—i.e., strong incentive and penalty clauses tied to performance milestones.

### **2.3 Contract Reform**

Contract reform is a demand-side phenomenon that has been primarily, but not totally, driven by federal customers. The objective is the same as with design-build: to make suppliers more accountable for their services and products. The carrot is the availability of greater profit margins if key performance requirements are met or exceeded, with penalties, such as sharing cost overruns, if scheduled milestones or budgets are missed.

For DOE, contract reform began nearly a decade ago with environmental projects moving from the old-form M&O contract format (where the contractor enjoyed total indemnification) towards less indemnification and fewer performance risks. DOE's first attempts at contract reform occurred with the Fernald and Hanford environmental restoration management contracts in 1992, followed by INEEL, DOE's first performance-based M&O contract, in 1994.

An analogous form of environmental contract reform occurred in DOD, which adopted its own version of DOE's EMRC-type contracting shortly after the Fernald award. Large private companies, such as Tenneco, applied the same approach for very large projects such as the \$250 million cleanup of Tenneco's PCB-contaminated natural gas transmission network.

Although environmental contract reform is now an integral part of DOE's contracting approach, it is not without problems. Problems that are generally identified include

- a tendency by the customer to seek ways of reducing performance incentives that climb to high levels and/or to increase the next year's hurdle;
- attempts by sellers to trace failures back to the customer on the basis either of undisclosed information or of customer-directed actions that changed the performance basis;
- funding fluctuations that invalidate performance goals.

Of the three, the third is the most difficult to overcome. The first two will always occur but can be reasonably addressed through learning and negotiations. The funding issue, however, is typically outside the control of the customer or the seller. Funding fluctuations due to changes in national funding priorities result in the invalidation of sound field-office level performance-based contracting vehicles. Despite this troublesome issue, environmental contract reform has caused customers to think through their needs more carefully and sellers to try harder to meet or beat their performance targets. Both are very positive trends.

### **2.4 Consolidation, Diversification, and Market Maturation**

Market maturity has brought financial problems to two groups in particular: (1) small to mid-size companies that are unable to undertake or survive high-risk bids or to prevail through long lean periods and (2) publicly traded environmental companies that are no longer prominent on Wall Street screens. The former have sold out or gone out of business. The latter, usually larger, have primarily turned towards consolidation.

The Environmental Financial Consulting Group reports that while the industry reports an average internal growth rate of 4%, the growth expected to come from acquisition is 10%. They conclude that most of the growth for environmental firms is coming from acquisitions, not internal growth. (Zofnass and Avelini 2000).

Consolidation and diversification typically come about for the same reasons and use the same mechanisms: acquisitions and mergers. The difference is that diversification typically expands the customer base through greater service lines or geographic presence, while consolidation combines former competitors. Both are driven by a quest for higher revenues, lower costs, and stabilizing (or setting) pricing.

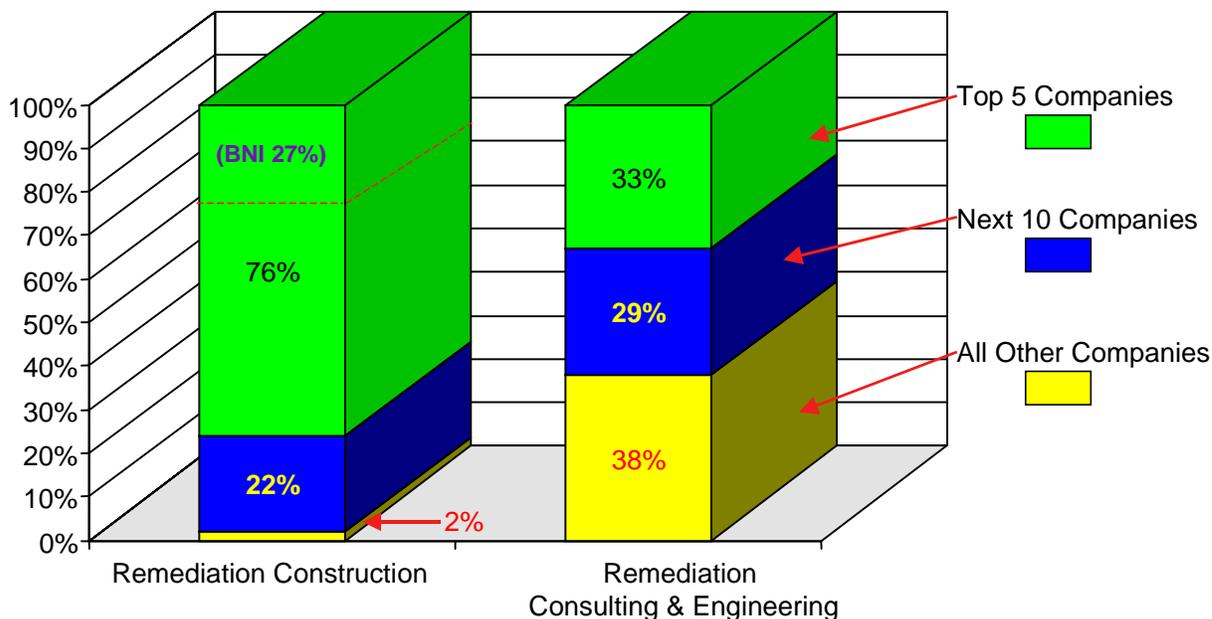
Many of the leading remediation services firms have already significantly diversified into other infrastructure engineering markets. This group includes Earth Tech, TetraTech, ARCADIS Geraghty and Miller, the IT Group, and Dames and Moore.

Fig. 2.2 illustrates the effects that consolidation has had on U.S. firms in the remediation construction and remediation consulting and engineering markets, based on their 1999 market share. Awards in 2000, particularly by DOE, led to even more market share to the top few firms. The uneven distribution of market share among firms is influenced by many factors. The most important factors for higher-risk jobs, such as construction remediation, are the seller's project management

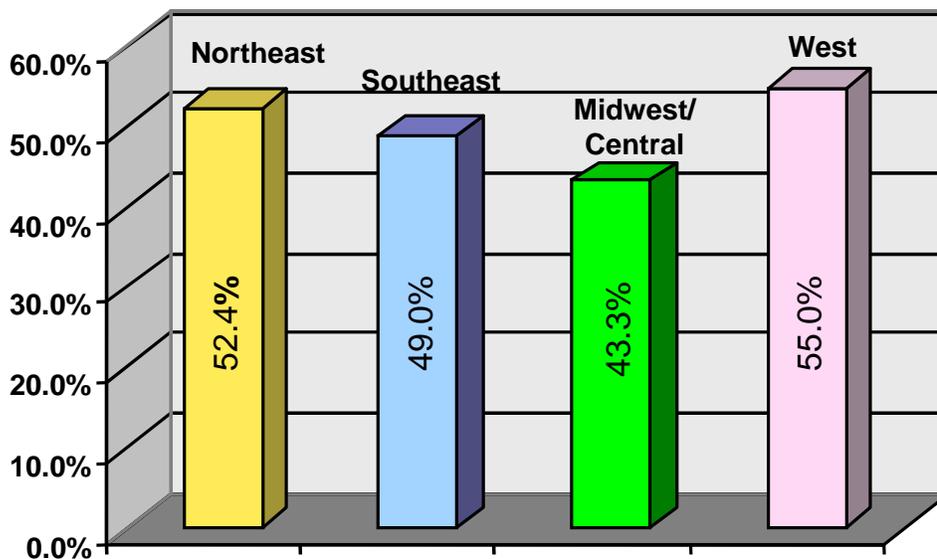
capabilities, track record, and financial ability to back its performance.

Interestingly, BNI, the top firm for remediation construction, is not the result of consolidation through acquisition but rather of strong organic growth, strong financial backing, and strong positioning. Alone among its competitors, BNI frequently wins its work without being low bidder, presumably because of its successful record of delivering on its promises.

Industry survey information published over the past year by EI, a privately held research firm that monitors environmental business markets and trends, indicates that approximately half of the environmental service firms doing business in 1993–1994 had gone out of business or had been acquired by 2000. As indicated by Fig. 2.3, all regions of the United States have seen between 43 and 55% of environmental service firms close their doors. EI's research indicates that the majority of closures are for firms with fewer than 25 employees. According to EI's Jeremy Yogerst, "The closure among smaller firms is what one would expect of a maturing market. The larger firms have a competitive advantage in the current



**Fig. 2.2. Consolidation among remediation companies in 1999.** Source: Farkas Berkowitz and Co., *Twelfth Annual State-of-the-Industry Report*.



**Fig. 2.3. Percentage of environmental firms closing from 1994 to 2000.** *Source:* Environmental Information Limited, compiled from survey information published at [www.envirobiz.com/reports](http://www.envirobiz.com/reports) on Feb. 15 and Aug. 9, 2000, and Jan. 19 and Mar. 14, 2001.

market and the potential to diversify into other markets such as infrastructure and communications.” EI’s Cary Perket notes that “the overall likely passed from a mature to a declining market” and comments that, at larger firms, professionals have been reassigned from environmental services to growth areas like infrastructure and communications. Perket summarizes the data by commenting: “I would personally interpret the trends as indicating continuing environmental market contraction” (as reported by EI 2000a,b; 2001a,b).

## 2.5 Workforce Adequacy Issues

Many people have expressed concern about the difficulty of maintaining a workforce with the necessary skill mix. Farkas Berkowitz reports that many CEOs see attraction and retention of talented professionals as their most important challenge, in large part because their growth is constrained by an inadequate workforce of qualified professionals to adequately serve customer needs.

According to a survey conducted of 173 firms by the Environmental Financial Consulting Group, personnel issues have tripled as a concern among respondents, and now rank as number one on a list of what worries CEOs. “Our best project man-

agers are being sucked away,” said William L. Robertson, CEO of Roy F. Weston, Inc., pointing particularly to clients and new competitors such as financial management firms (Rubin et al. 2000).

The same is true on the federal side, particularly for agencies with specialized needs and knowledge. DOE faces losing a substantial fraction of its managers and skilled professionals to retirement and does not appear to yet have adequate programs to make up for any resulting deficits.

## 2.6 Information Technology

As the demand for many traditional environmental services flattened during the mid-nineties, analysts such as EBI urged environmental companies to embrace information technology as the new environmental frontier. The use of information technology is one of the greatest challenges facing companies today. As with many other business fields, information technology is expected to transform the environmental industry. *EBJ* (EI 2000b) predicts that with its complex transactions and heavy regulatory reporting burdens, the environmental industry may prove to be one of the industries most changed by Internet technology.

Information technology and the Internet offer environmental customers the ability to consolidate, integrate, protect from loss, and better use the wealth of environmental information they have obtained. How this is accomplished will vary widely, but some commonalities include the following:

- better understanding and control over environmental spending;
- ability to recognize and address process trends and company practices before they become environmental liabilities;
- improved quality assurance for records keeping and management;
- improved regulatory management, compliance, and reporting; and
- improved control over plant operations, maintenance, raw materials and products control and tracking, and workforce logistics.

Coupled with the power of the Internet, information management tools have made many things possible in real time, even from remote locations, that formerly took weeks or months and required expensive travel. For example:

- With versatile new Internet protocols such as XML and very high data-transfer rates, companies have the ability to generate real-time reports as data are uploaded from field or process monitors, regardless of their geographical locations.
- Reviews and reports that traditionally required extended travel by highly paid professionals can be quickly and inexpensively developed using e-mailed data and information and subject matter experts located around the globe working in unison.
- Data from remote field instruments can be uploaded and utilized, and in some cases, instrument verifications and calibrations can be carried out from remote locations.

The application of information management integrated with the Internet has an immense potential to cut costs and increase productivity. The potential to do so opens several doors to environmental companies. One door opened to these companies certainly is to use these technologies to reduce their own costs and enhance their competitive positions. A second is to assist their customers in applying information technology within environmental market areas where specialized knowledge of environmental matters could provide an advantage over companies selling such information technology on a broader basis. The trend towards these services is still evolving as both buyers and sellers try to envision how such systems can enhance their positions. Early applications of information management/Internet applications include

- Clear Air Act reporting (Farkas Berkowitz, 2000),
- Internet-enabled instrumentation allowing remote testing,
- Internet-based laboratory reporting and data sharing (Kreuzer 2001), and
- EMIS, including downloading products over the Internet and hosting software applications online. Ultimately, business-to-business (B2B) platforms for EMIS may lead to a new wave of outsourcing of environmental safety and health (ES&H) data management responsibilities (EBI 2000b).

Taking full advantage of the Internet requires time and investment, however, and is prone to risk because of the high rate of change. Many environmental companies lack the financial backing and internal expertise required to take more than hesitant steps into Internet land, as evidenced by a survey by EBI and KMPG LLP of environmental consulting and engineering firms. They found that many firms are still in an uncertain, wait-and-see mode. Although virtually all firms have web pages and many have sound content, the Internet's value

as an integration and on-line processing tool is still in its infancy in the environmental fields.

Farkas Berkowitz expects leading engineering firms or others to develop expert systems that they may use to streamline their own engineering processes or as a basis for providing standard engineering designs, along with customization, on the Internet. *EBJ* predicts that consulting and engineering firms will be impacted by the disintermediation brought on by B2B web sites. According to EBI's Dan Noble, "C&E firms and other intermediaries have no choice but to integrate all their solutions with the web to make themselves more efficient, lower costs and become more profitable" (EBI 2000b).

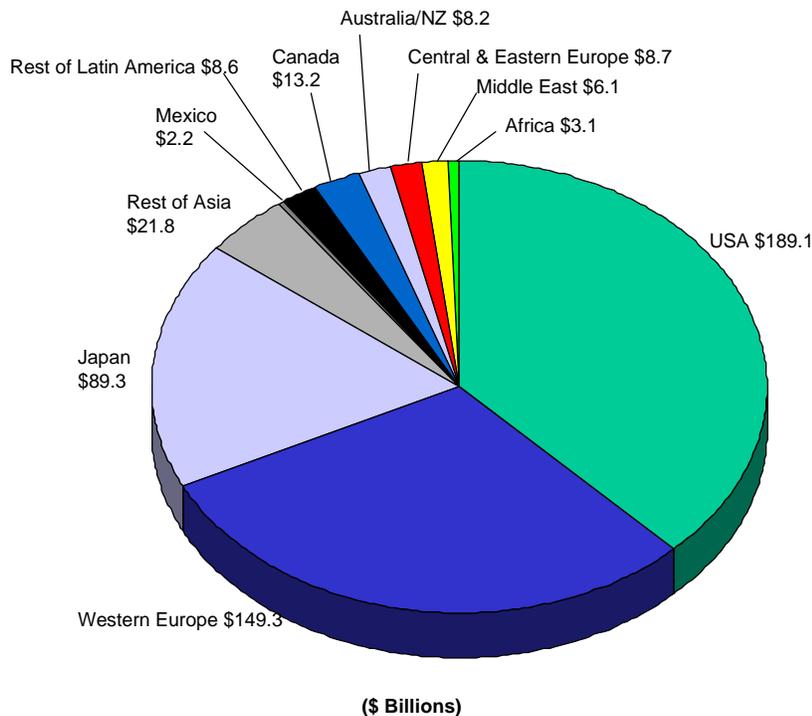
## 2.7 Increasing Focus on Exports

### Growth Opportunity for U.S. Companies

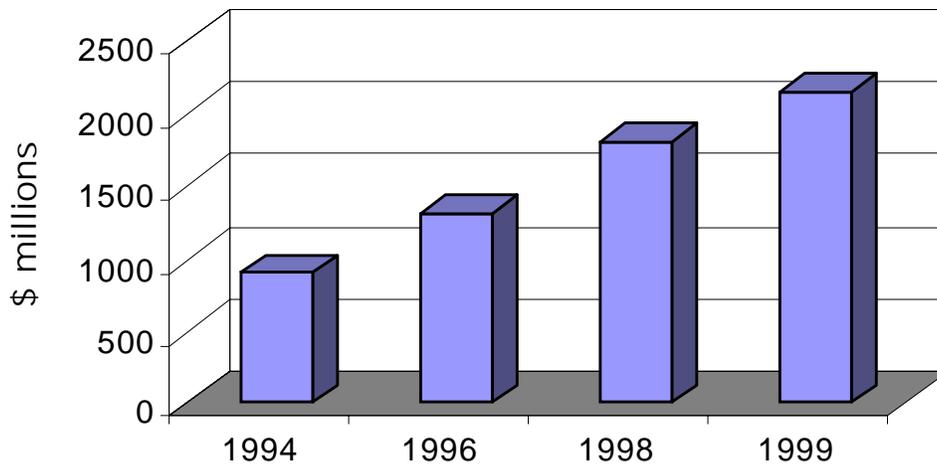
The slowdown in U.S. environmental opportunities caused many companies to more aggressively—and successfully—market their products and

services internationally in the global environmental marketplace. U.S. environmental exports have more than doubled since 1993, rising from \$9.6 billion to \$21.3 billion in 1999, according to the U.S. Department of Commerce, International Trade Administration (DOC 2001b). The geographic distribution of the global environmental market is illustrated in Fig. 2.4. In 1999, U.S. environmental industry exports accounted for almost 11% of the total goods and services the U.S. environmental industry produced and represented a 13% increase over 1998 export revenues.

A strong segment of international market growth is consulting and engineering, for which the total revenue generated from overseas contracts is increasing (Fig. 2.5). While growth has not kept up with the strong projections, it has outpaced growth in the domestic markets. *EBJ* reports substantial growth in non-U.S. revenues by U.S. consulting and engineering firms. These revenues grew from \$910 million in 1994 to \$2.15 billion in 1999. The 1999 figure for non-U.S. revenues represented a 19% increase over the previous year



**Fig. 2.4. Regional distribution of the \$499 billion 1999 global environmental market.** *Source:* U.S. Department of Commerce, International Trade Administration, at <http://www.ita.doc.gov>.



**Fig. 2.5. Growth in exports by U.S. consulting and engineering firms, 1994–2002.**  
*Source: Environmental Business Journal 13, nos. 1–2 (2000).*

(compared with a 3% increase in U.S. revenue). As a percentage of total U.S. consulting and engineering firm revenues, non-U.S. revenues grew from 6% in 1994 to 13% in 1999 (EBI 2000c).

Sales of alternative energy technologies also grew in 1999, both domestically and abroad, as the result of electricity market restructuring in both the United States and Europe. A number of other drivers point to a healthy renewable energy market, particularly overseas (EBI 1998b). These include population pressures in the developing countries of Asia and South America; European economic policies that encourage energy conservation and decreasing reliance on fossil fuels; and significantly lower cost-per-unit-output from renewable energy systems, stimulated by technology advances and increases in manufacturing volume.

The McIlvaine Company projects strong growth in the European remediation market. It predicts that the market for remediating contaminated groundwater and soil in the European and African region will rise from \$6.9 billion in 1997 to just under \$9 billion in 2002. Landfill remediation alone will account for \$2.2 billion in 2002, whereas cleanup of petroleum-contaminated sites is expected to account for just under \$2 billion in revenues. Contaminated military sites are projected to account for \$941 million.

There are several driving forces behind this growth. For example, environment ministers in the European Union have approved a long-term plan to clean up contaminated rivers, lakes, and coastal waters throughout member nations. Another driving force is the European Bank for Reconstruction and Development, which is increasing its support of environmental projects. Accession into the European Union is a driving force for remediation in Poland, Hungary, the Czech Republic, and other countries of Central and Eastern Europe (McIlvaine 1999).

Opportunities in overseas water and wastewater industry segments may have the greatest potential of all. Water is unique in that it is an absolutely essential resource, and the demand for clean water and wastewater treatment is increasing rapidly in developing countries. Parts of Asia and Southeast Asia (excluding Japan, Australia, and New Zealand) are among the fastest growing (15% per annum, or greater) global water/wastewater quality equipment markets. EBI estimates that the water/wastewater market in these countries was around \$9 billion in 1996, and the World Bank projects growth of this market to \$153 billion by 2004. About one-half of the \$9 billion generated in 1996 was from public-sector water utilities, and these are being privatized to some extent, generating some of the world's largest management contracts. France and the United Kingdom have so

far been the most successful players in this arena (U.S. Water News 1997).

The U.S., Western Europe, and Japanese markets represent 86% of the global market and over 70% of the revenue gain from 1998 to 1999. In 1998, East Asia became engulfed in a deep financial crisis that caused a corresponding collapse of the environmental market, but export markets in Asia as well as in Latin America bounced back from their financial crises of 1998. The outlook for environmental markets in Asia looks more promising in 2000 than in the previous three years. EBI's *Asian Environmental Business Summary* (EBI 1999a) concludes that while a return to the sky-high growth of the last decade may still be far in the future for many of Asia's markets, these economies will bounce back and the environmental markets will emerge even stronger than ever. The focus now is on essential infrastructure, such as energy, water supply, sanitation, and waste management. With external assistance, public-sector agencies have long-range, multimillion-dollar spending programs and are encouraging private-sector investments. Growth is also fueled by multinational companies' pursuit of their own internal environmental compliance agendas and by the efforts of Asia's global exporters to meet ISO requirements (EBI 1999a).

Latin America bounced back from its disappointing 1998 performance, and positive economic growth of 3 to 4% is projected for 2000. Despite economic pressures, the region continues to be a strong importer of products from industrialized countries. Among Latin America's individual environmental market segments, water and wastewater represents the largest market segment and the most significant business opportunity for U.S. environmental companies. Political opposition and regulatory uncertainty are impeding the development of large third-party hazardous waste facilities in Latin America. Solid waste provides an ongoing opportunity for U.S. environmental companies; however, European firms are aggressively pursuing this sector. Finally, comprehensive air pollution programs are under way in many major Latin American cities and provide another market opportunity (CG/LA Infrastructure 1999).

The downside of overseas markets for U.S. companies is that profit margins are substantially lower for international contracts than for domestic contracts. This is attributable to the greater necessity for management oversight, delayed payment schedules, and greater capital investments.

### **The U.S. Environmental Market as a Foreign Target**

The United States remains the largest single market for environmental technologies and services in the world. While the United States is the leading producer of environmental technologies and services, it exports only about 11% of its environmental output; in contrast, our key competitors (Japan, Germany, and Great Britain) export over 20%. Those nations have stepped up their efforts to penetrate the large U.S. environmental market through partnerships, acquisitions, and direct sales. Data on U.S. environmental export performance and the trade balance are summarized in Table 2.1.

Water equipment and chemicals, wastewater treatment works, and air pollution control equipment represented the most successful import categories. Table 2.2 summarizes the distribution of the 1999 U.S. environmental industry trade balance by market segment. U.S. companies are more successful in exporting equipment (particularly water and wastewater equipment and instrumentation) than services. While U.S. equipment segments make up only 26% of the industry, they account for 59% of exports. Conversely, while service segments account for 50% of industry revenues, they are only 18% of exports. On balance, the U.S. environmental trade surplus declined, from \$8.0 billion in 1998 to \$7.3 billion in 1999 because imports gained ground on U.S. exports.

### **Global Marketing**

Foreign competitors enjoy an advantage in global water and wastewater management and operating contracts. This is also increasingly true in the solid waste management segment, where the United States has traditionally enjoyed the advantage (EBI 1998c). Control of water and solid waste service segments has an effect on equipment and

supply sales. When the equipment that supplies the waste and water infrastructure is added to the service totals, the U.S. environmental industry is losing competitiveness in two-thirds of the global market. The U.S. environmental industry remains fairly well positioned for the remaining third of the market, as it leverages its comparative advantage in consulting and engineering, remediation, instruments, and information technology. Opportunities in automation for treatment systems and monitoring, advanced design, biological systems, materials reuse and efficiency, and use of the

Internet are all areas in which U.S. companies should be in good position to gain market share (EBI 2000a).

### Global Market Growth

Overall, the global environmental market totaled \$499 billion in revenues in 1999, representing a 2.9% growth over 1998. It is projected that the global market will grow to \$562 billion by the year 2004 and \$615 billion by 2008. The projected growth in the global environmental market by region is shown in Table 2.3.

**Table 2.1. U.S. environmental industry export performance and trade balance, 1993–1999 (billions of dollars)**

	1993	1994	1995	1996	1997	1998	1999	% Growth 98–99
U.S. industry revenues <sup>a</sup>	165	172	180	181	186	190	197	3.5
Global market	423	440	453	464	474	485	499	2.9
U.S. market <sup>b</sup>	160	167	172	174	178	182	189	4.0
Non-U.S. market	263	272	281	288	296	303	311	2.6
% exports <sup>c</sup>	5.7%	6.4%	7.9%	8.6%	9.8%	10.0%	10.8%	9.0
U.S. exports <sup>c</sup>	9.4	11.1	14.2	15.6	18.2	18.9	21.3	12.8
Growth in U.S. exports	20%	18%	28%	10%	17%	3.8%	13%	
U.S. share of non-U.S. market	3.6%	4.1%	5.1%	5.4%	6.1%	6.2%	6.9%	11
Trade surplus	4.6	5.3	7.6	7.1	8.5	8.0	7.3	-8.6

Sources: U.S. Department of Commerce, International Trade Administration, at <http://www.ita.doc.gov> and *Environmental Business Journal* 12, nos. 9–10 (2000).

<sup>a</sup> Revenues generated by U.S. companies worldwide.

<sup>b</sup> Revenues from U.S. customers by companies from all nations.

<sup>c</sup> Exports do not include ownership of overseas companies but do include repatriated profits.

**Table 2.2. U.S. environmental industry trade balance by market segment, 1999**  
(billions of dollars)

Industry segment	U.S. industry <sup>a</sup>	U.S. market <sup>b</sup>	Surplus	Exports <sup>c</sup>	Imports	% exports
<b>Environmental services</b>						
Solid waste management	37.2	37.3	-0.1	0.67	0.8	2%
Wastewater treatment works	26.7	29.0	-2.3	0.19	2.5	1%
Consulting and engineering	16.4	14.8	1.6	2.30	0.7	14%
Remediation/industrial services	11.2	11.1	0.1	0.40	0.3	4%
Hazardous waste management	5.30	5.5	-0.2	0.05	0.2	1%
Analytical services	1.18	1.1	0.1	0.05	0.0	5%
<b>Environmental equipment</b>						
Water equipment and chemicals	20.0	16.6	3.4	5.88	2.5	29%
Air pollution control	17.1	15.4	1.7	3.60	1.9	21%
Waste management equipment	9.70	9.4	0.3	1.75	1.4	18%
Instruments and information systems	3.20	2.2	1.0	1.31	0.3	41%
Process and prevention technologies	1.04	1.1	-0.1	0.06	0.1	6%
<b>Resource management</b>						
Water utilities	29.4	31.4	-2.0	0.09	2.1	0%
Resource recovery	14.4	11.7	2.7	3.03	0.3	21%
Environmental energy sources	3.58	2.4	1.1	1.93	0.8	54%
<b>All segments</b>	<b>196.5</b>	<b>189.1</b>	<b>7.3</b>	<b>21.31</b>	<b>14.0</b>	<b>10.8%</b>

Source: U.S. Department of Commerce, International Trade Administration, at <http://www.ita.doc.gov>.

<sup>a</sup> Revenues generated by U.S. companies worldwide.

<sup>b</sup> Revenues from U.S. customers by companies from all nations.

<sup>c</sup> Exports do not include ownership of overseas companies but do include repatriated profits.

**Table 2.3. Performance and projected growth of the global environmental market (billions of dollars)**

	1997	1998	1999	2004	2008
U.S.	177.7	184.1	189.1	203.9	213.9
Western Europe	141.1	145.5	149.3	164.5	176.7
Japan	89.6	87.9	89.3	96.6	103.0
Rest of Asia	19.7	19.9	21.8	32.7	44.5
Mexico	2.1	2.1	2.2	3.0	3.8
Rest of Latin America	7.6	7.7	8.6	12.0	15.2
Canada	12.5	12.9	13.2	14.8	16.0
Australia/NZ	7.6	7.9	8.2	9.6	10.8
Central and Eastern Europe	7.6	8.0	8.7	11.4	13.8
Middle East	5.7	5.8	6.1	8.5	11.1
Africa	2.6	2.8	3.1	4.7	6.4
<b>Total</b>	<b>474</b>	<b>485</b>	<b>499</b>	<b>562</b>	<b>615</b>

Source: U.S. Department of Commerce, International Trade Administration, at <http://www.ita.doc.gov>.

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