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GLOBAL COMPETITION FOR ENVIRONMENTAL MARKETS - THE CASE OF THE WATER-POLLUTION CONTROL EQUIPMENT INDUSTRY

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Global Competition for Environmental Markets: The Case of the Water Pollution Control Equipment Industry

by Andrew C. Gross
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Introduction

Global environmental spending — for air, water, and solid waste clean-up — is roughly one per cent of world gross domestic product or three per cent of world gross fixed capital formation. Furthermore, these ratios should remain stable during the 1980s. This stability is significant, since concern and action in environmental matters waned under the impact of the energy situation, subsequent inflation, and recent world-wide recession. The explanation for keeping pollution spending in line with economic growth lies in the recognition that cleaning up the environment — or preventing foul-ups — makes good sense, both healthwise and economically. Thus, for example, cleaner air leads to fewer respiratory problems and cleaner water results in lower fuel use in most manufacturing operations.

Pollution control spending of all types around the world is projected to increase from $70 billion in 1979 to $115 billion in 1990, in real terms (the figures are in 1975 US dollars). The amount spent on water pollution abatement is about three-fifths of the total in both years. On a regional basis, the nations of North America, Europe, Oceania and Japan accounted for 76 per cent of the total in 1979, but their combined share will decline to 64 per cent by 1990 as developing nations accelerate their clean-up campaigns. Throughout the 1980s, the US will remain the largest national market, followed by Japan, the USSR, France and West Germany.

While the analysis of the size and nature of national and regional markets for environmental spending and clean-up apparatus is an important undertaking — and will be reported in another article, in due course — the emphasis in this article is different. The focus here is on trade, end use, competitive moves and marketing patterns in regard to a specific segment: water pollution control equipment (WPCE). The value of WPCE shipments globally is projected to rise from $3.3 billion in 1979 to $5.4 billion in 1990. While admittedly a small portion of the total amount spent on water cleansing — the majority of such expenditures goes for brick, mortar, piping and labour — this is a dynamic market worthy of investigation. It is one where trade barriers are low, technical advances do matter, market shares can change and profit margins can still be lucrative.

Methodology

The results reported below are based on a recent 1½ year investigation, conducted on behalf of major clients of a large market research company in the US using both

primary and desk/library research. Personal interviews were carried out with government officials, private sector executives, and academics in North America, Europe and Australia. Secondary data sources consulted ranged from traditional yearbooks of international agencies to unpublished corporate and university reports. The task of reconciling the hundreds of "information bits", opinions and forecasts is both an art and science. The specific manner in which "reconciliation" is done has been documented in other articles and proceedings, by the author, over the past decade[1, 2, 3].

Two approaches were used to analyse the market for WPCE: the "build-down" and the "build-up" method. In the former case, one moves from the general to the specific, from broad indicators to actual shipment statistics. Clues are obtained along the way regarding the forces which impinge on the marketing of such equipment. In this context, the starting point is the wide variety of general economic indicators available from various world and regional public agencies, usually in a historical setting[4, 5, 6, 7]. Forecasts are harder to come by, but can be obtained from public and private sources: the International Monetary Fund, the Organisation for Economic Co-operation and Development, and the World Bank on the one hand, the Bank of America, Chase, Data Resources, and Predicasts on the other. From time to time, independent undertakings result in significant information along these lines[8, 9].

The "build-down" approach began with the time series on the gross domestic product (GDP) of 55 nations. Gross fixed capital formation (GFCF) and non-residential fixed investment (NFI) data, while more scarce, were also collected, with the "data points" being "dove-tailed" and then projected in a surprise-free scenario following a variety of forecasting methods and relying on the advice of "experts". Then total pollution control spending was estimated, in each country, as a percentage of fixed investment; water pollution control spending as a share of total abatement; and, finally, WPCE shipments as a portion of water clean-up expenditure. In this approach, a nation's apparent ability and willingness to spend money on water supply and wastewater treatment — along with its legislative and enforcement practices — prove to be the most crucial consideration. An example of this method is illustrated for the United Kingdom in Table I.

The "build-up" approach ideally begins with corporate and then industry-wide figures on specific products being shipped. For example, how many filtering devices were sold by manufacturers to municipal and industrial water treatment facilities? Few companies, trade associations or government bureaux are able to keep — or reveal — how many units at what price were in fact shipped to what end-users. Furthermore, differences in terminology, classification, and financial/accounting practices make the task almost impossible from nation to nation. A few statistics emerge from volumes dealing with water supply/water demand[10, 11, 12, 13, 14], from trade groups or corporate sources; and from government offices. But even when "authoritative sources" report on primary research, major errors can occur. Consider the example cited below.

Usually at the request of interested exporters, the US Department of Commerce will conduct a "global" market survey on a specific product line. This was the case in the mid-1970s, when it commissioned consultants in 13 key nations to ascertain the size of the market and the nature of marketing practices for clean-up apparatus[15]. Detailed guidelines were given, the same to each consultant, prior to undertaking

Table I. Selected Economic and Environmental Indicators, United Kingdom, 1976-1990

Item	1976	1979	1985	1990	% annual growth 1990/1979
Population (mill. pers.)	55.9	55.9	56.3	56.7	0.1
GDP/capita (75$)	4,250	4,510	4,760	5,380	1.6
Gross Domestic Product (bill. 75$)	238.0	252.4	268.0	305.0	1.8
% GFCF	19.1	17.2	18.7	19.4	
Gross fixed capital formation (bill. 75$)	45.45	43.40	50.10	59.20	2.9
% Non-residential fixed investment	46.2	45.5	46.7	48.0	
Non-residential fixed investment (bill. 75$)	21.00	19.75	23.40	28.40	3.4
% PC expenditure	7.8	8.7	8.2	7.7	
Pollution control expenditure (mill. 75$)	1,640	1,715	1,920	2,190	2.2
% Water pollution control expenditure	77.0	75.0	72.0	69.0	
Water pollution control expenditure (mill. 75$)	1,260	1,285	1,380	1,510	1.5
% WPC equipment	8.8	8.9	8.9	9.0	
Water pollution control equipment (mill. 75$)	110	115	123	136	1.5
Industrial production index (1975 = 100)	103	110	112	130	1.5

a primary survey. Yet the published results must be viewed with some scepticism. Data in Table II, based on the US Department of Commerce survey, reveal the size of the Belgian market for water pollution control equipment to be almost ten times as large as the one in the Netherlands. But the two nations are roughly comparable in terms of size, population, income *per capita*, and water quality. When the writer confronted USDC with the evidence, government officials ultimately acknowledged the error. An investigation revealed that the Belgian consultant to the US government made an enormous mistake — it included labour, mortar/brick and piping along with the data on equipment.

Thus, even "expert counts" need to be "winnowed and sifted", compared and contrasted.

International Trade

Comparable figures on the exports and imports of water pollution control equipment (WPCE) are not available, because: (1) categories are too broadly defined, (2) classification schemes differ from nation to nation, and (3) WPCE is too small a portion of total foreign trade to keep track of. With the aid of various national yearbooks and related publications, plus a key OECD source available only in microfiche format[6], an approximate framework was constructed which revealed the following trends. Foreign trade in WPCE constitutes usually less than one-fifth of total shipment. Developed nations trade among themselves, usually with traditional partners. Finally, the industrialised countries — not surprisingly — export heavily but do not import from Third World countries.

Table II. Estimated Sales of Air and Water Purification and Pollution Control Equipment, Belgium and Netherlands, 1973-75 (millions of current US dollars at prevailing exchange rates)

Item	1973	1974	1975
A. Belgium			
Air pollution control equipment	12.5	13.0	15.0
Water supply equipment	54.6	66.6	81.2
Waste-water equipment	111.2	165.7	246.9
Air and water purification and pollution control instruments (meters, controls, monitors)	4.5	13.7	15.0
Total	182.8	259.0	358.1
B. Netherlands			
Air pollution control equipment	21.4	23.7	26.3
Water supply equipment	13.8	14.9	16.0
Waste-water equipment	19.5	17.6	20.2
Air and water purification and pollution control instruments (meters, controls, monitors)	7.7	8.6	9.9
Total	62.4	64.8	72.4

Note: Table is reproduced based on the original two tables. Special attention is to be paid to lines 2 and 3 in the case of each country.

Source: US Department of Commerce, 1976, p. 30 for Belgium and p. 117 for Netherlands[15].

The trend that most developed nations supply about four-fifths of their own WPCE needs is expected to continue throughout the 1980s. However, with the exception of Japan, these nations — because of their diverse needs and the size of their markets — remain open to the importation of innovative devices from abroad. Belgium, Italy, the Netherlands, Spain, and Sweden are significant importers of WPCE equipment from other Western nations and should remain attractive markets for foreign-made apparatus. Each major West European nation, much more so than the US, is an aggressive exporter of WPCE units to Eastern Europe, Africa, and Asia. Canada and the US trade with each other and then focus on Latin American markets. Japan promotes its wares aggressively in Asia and Oceania, while staying immune to imports. The reliance of a given traditional partner is illustrated in the upper half of Table III for the US; in contrast, the lower half of Table III shows the West German drive for apparent diversification in its exports.

Technological and marketing leadership in WPCE would create ready-made foreign markets, but such a characteristic is not the preserve of any one nation. Instead, our analysis revealed definite specialisation. For example, the US has been very strong in instrumentation, while Canada and Western Europe pioneered the design and manufacture of advanced ozonation equipment. A consensus is building which holds that developed nations will emphasise the export of "advanced devices" in the 1980s, while Third World countries will encourage their domestic suppliers to make less

Table III. Trade in Filtering and Purifying Machinery and Apparatus (Liquid and Gas), USA and West Germany, 1978

Exports Country/Region	Share (%)	Imports Country/Region	Share (%)
A. USA			
Canada	40.9	Canada	23.1
Latin America	14.5	Latin America	2.6
European Economic Community	16.9	European Economic Community	61.0
Other Western Europe	6.2	Other Western Europe	6.3
Eastern Europe	0.1	Eastern Europe	0.0
Africa-Mideast	2.9	Africa-Mideast	0.2
Japan	5.5	Japan	6.1
Other Asia	10.9	Other Asia	0.5
All other	1.7	All other	0.2
Total — %	100.0	Total — %	100.0
— mill. curr. $	243.7	— mill. curr. $	53.7
B. West Germany			
US	3.7	US	20.3
Brazil, Venezuela, Ecuador	1.5	European Economic Community	39.8
European Economic Community	31.8	Other Western Europe	25.8
Other Western Europe	18.8	Yugoslavia	2.4
USSR	13.5	Japan	9.5
Other Eastern Europe	7.8	All other	2.3
Iran	5.0		
Selected Africa-Mideast	10.0		
Japan	0.5		
All other	7.9		
Total — %	100.0	Total — %	100.0
— mill. curr. $	340.2		86.2

Source: Microtables — Imports/Exports, Paris, OECD, 1980[6].

sophisticated, mechanical cleaning devices. But several industrialising nations, for example Brazil, are eager to become partners in the manufacture of biological, chemical, and other advanced treatment devices for both their domestic and foreign markets. Indeed, Brazil insists on joint ventures in almost all phases of making pollution control equipment and on the undertaking of aggressive export drives. Mexico will not allow importation of any major clean-up apparatus if a comparable product is available locally.

European firms more so than US ones have compiled excellent track records in their export drives, whether to other Western nations or to developing countries. As of late, aggressive marketing has been undertaken by Japan, South Korea and Singapore. Such salesmanship on the part of Asian and European nations can be attributed to the following key factors: (1) a far longer tradition and reliance on foreign trade than is the case for the US; (2) the linguistic ability and multicultural background of foreign trade experts; and, (3) flexible adjustment to local practices and clients' needs. A more recent, but significant, factor is the way in which certain non-US firms establish rapport

with large "turnkey" construction companies to supply clean-up devices as a new plant is being built.

A final major consideration touches upon the sensitive subject of subsidised goods. Many observers claim that European and Asian manufacturers offer major subsidies and in many cases illegal payments or bribes in order to win foreign markets. Space does not permit a full analysis of this issue here. But it is significant to note that for each $1 million worth of manufactured export goods, France and Japan spend about $600, Italy about $1,400, and the United Kingdom almost $2,500 in governmental promotion — while the figure for the US is about $350, and the US government creates more barriers to its export-minded manufacturers than do other nations.

Type of Equipment and End-use Patterns

The four major categories of water pollution control equipment (WPCE) are: (1) mechanical cleaning devices; (2) chemical, biological, and other advanced units; (3) package stations, for small installations and remote locations; and, (4) instruments, that is meters, controls and monitors. The dollar distribution of these classes in the USA reveals a relative stability over the years among the categories at 38, 40, 8 and 14 per cent, respectively, as of the early 1980s. However, the slight, steady gains by advanced devices and instruments at the expense of mechanical units are expected to continue — in the USA and in other industrialised nations as well. In developing nations mechanical cleaning apparatus should still command the largest share throughout the 1980s. Instruments constitute the smallest, but fastest growing, segment; that is because a minimal level of metering and controlling is necessary to ascertain water quality. Applications of any category or device can range widely; for example, membrane separation units are used to treat industrial waste-water in the West, while in the Middle East they augment water supply via desalinisation.

Two major end-uses for WPCE are water supply (improve incoming water quality) and waste-water treatment (cleanse the outflow or effluent). Four major end-user sectors can be identified — government agencies, industrial/commercial firms, farms, and households — but only the first two segments are of interest usually to manufacturers. Table IV A shows WPCE shipments by major treatment and end-user categories for the US and a combination of other nations. Stability and similarities are more striking than changes and differences over time and between the US and other countries. Prevailing patterns indicate that the public sector accounts for one-half, the private sector for the other half of shipments; water supply takes one-third, waste-water treatment the other two-thirds of the total. Table IV B reveals that four heavy-manufacturing sectors account for over one-half of all shipments in that sector. Further breakdown on a country basis would reflect the nature of that economy; for example, the pulp and paper industry in Canada plays a key role and hence takes a large share of WPCE shipments.

Industry Structure and Competition

The water pollution control equipment (WPCE) industry is world-wide fragmented, and highly diversified; the same holds true in the major developed nations of North America and Western Europe. Thousands of private firms and dozens of state organisations are participating in the global market, though only a handful derive a significant

Table IV. Shipments of Water Pollution Control Equipment: Selected Nations, Categories and Years

A. Selected nations, by major end use and treatment class (percentage distribution)

US			End use and treatment class	Selected nations*	
1974 %	1977 %	1983 %		1973 %	1978 %
22.3	17.9	18.0	Industrial water supply treatment	9.3	10.5
25.1	23.9	25.6	Industrial waste-water treatment	49.1	35.9
14.9	15.0	13.1	Government water supply treatment	14.0	11.3
37.7	43.2	43.3	Government waste-water treatment	36.6	42.7
100.0	100.0	100.0	Total — percentage	100.0	100.0

B. Selected nations, by major manufacturing industries (percentage distribution)

US			Industry	Selected nations*	
1974 %	1977 %	1983 %		1973 %	1978 %
10.8	11.9	9.9	Paper and pulp	19.9	13.0
17.2	18.7	19.5	Chemical and allied	15.6	27.8
20.5	23.5	20.7	Petroleum and allied	2.9†	13.5
10.8	13.1	11.8	Primary metals	14.5	13.3
40.7	32.8	38.1	All other manufacturing industries	47.1	32.4
100.0	100.0	100.0		100.0	100.0

Notes: *Australia, Brazil, France, Iran, Italy, Japan, Mexico, Netherlands, Spain, Sweden, Taiwan, UK, West Germany.

†No figure reported for Australia, Brazil and Japan for 1973.

Source: US Department of Commerce, OECD, United Nations, and primary research by the author for US for 1983[16].

share of their business from the sale of pollution control devices. There is, of course, some concentration. In the US, there are over 700 companies active in marketing WPCE. Some directories put the actual number at 2,000-3,000; on the other hand, a government survey in 1977 showed only about 150 firms as primary producers of WPCE, with 20 companies accounting for 77 per cent of all shipments. Still, the concentration is far less and the situation is more competitive than in France, as Table V illustrates. In France, the three largest firms are responsible for 60 per cent of all WPCE shipments. In the UK, the top 15 firms have over 80 per cent of the market. In countries with a small population and a well-established tie to another nation (usually through previous colonisation), a few companies are likely to be dominant. This is the case in Australia, where British firms came in first, and still maintain some corporate relationships, though others have been spun off.

Table V. Shipments of Water Pollution Control Equipment: Corporate Market Share, US and France, 1970s

Name of Company/Key Subsidiary	Approximate Market Share (%) 1974 %	1978 %
A. USA		
Envirotech	10.8	10.8
Trans Union/Ecodyne	8.2	8.5
Rexnord/Envirex	4.5	7.0
General Signal	3.1	6.7
FMC	2.9	6.0
Wheelabrator-Frye/Neptune	6.2	4.5
Dorr-Oliver	5.6	4.0
Peabody	4.8	3.5
Pennwalt	5.1	3.0
Chicago Bridge & Iron/Walker	2.5	3.0
Sterling Drug/Zimpro	3.4	2.0
Degrement/Infilco	4.3	2.0
Sybron	4.8	2.0
All others	33.8	37.0
Total — percentage	100.0	100.0
B. France		
Degremont	31.0	36.0
Omnium d'Assainissement (ODA)	15.0	18.0
Companie Europeene de Traitement de l'Eaux (CETE)	9.0	10.0
All others	45.0	36.0
Total — percentage	100.0	100.0

Notes: For US, figures may include some instrumentation shipments; for France, figures may include some solid waste handling equipment. In France, St. Gobian Techniques Nouvelles controls Degremont, SGEA as well as air pollution control equipment makers; Campagnie Generale des Eaux (CGE) controls ODA, CETE, and other pollution control equipment firms.

Source: US Department of Commerce, OECD, selected trade associations, Government of France, primary research by the author[16], confidential corporate sources.

Though concentration increased in the 1970s in the WPCE industry of most developed nations, it is not as intense as in most other durable goods sectors. The industry evolved in each case from a number of manufacturing segments, a broad base of participants, and the adaptation of many existing devices to the task of water pollution control. There are five ways to enter the industry:

(1) form a broad, environmental operation;

(2) develop a narrow product line;

(3) expand from a machinery base into mechanical devices;

(4) expand chemical base into advanced clean-up apparatus design, and

(5) specialise in instrumentation.

Entry conditions remain relatively easy and many small firms prosper with a narrow product line. For example, in the US in the early 1980s, almost 90 per cent of WPCE manufacturers offered devices in three or fewer categories out of a total of 23 major product lines.

Successful operation of the WPCE industry requires the following steps:

(1) an in-depth assessment of customer needs and observation of governmental codes, rules, and enforcement practices;

(2) a "systems approach" to marketing, with due recognition of the importance of support services, e.g., maintenance;

(3) a cadre of experienced personnel on board, at the laboratory, plant, and office.

Several firms suffered major losses during the 1970s, especially in marketing their goods to government agencies, as a result of being locked into fixed-price contracts. While some companies were able to re-negotiate their arrangements, others left the industry; the lessons learned did result in the growing popularity of "indexed agreements".

The following major trends emerged in the WPCE industry during the late 1970s and early 1980s:

(1) an emphasis on innovation, in regard to both the equipment and the accompanying services offered ("user friendly" or "caring" arrangements);

(2) a definite widening of product lines at medium and large manufacturers;

(3) price increases, in line with inflation, with price-cutting used only to fend off aggressive competitors;

(4) temporary shortages of raw materials, semi-finished goods and trained personnel;

(5) more aggressive pursuit of small end-users; and

(6) expansion via exports or direct investment in foreign markets.

Marketing Practices

Marketing strategies and tactics in the water pollution control equipment (WPCE) industry, as in other sectors, require the judicious blending of the "4Ps" of product, promotion, place, and price. Product policies demand that tradition and end-users' preferences be considered. For example, curved bar screens are universal in Europe, while straight bar screens prevail in the US. Europeans prefer clarifiers with a peripheral drive mechanism, while US customers are used to fixed bridge, circular sludge scrapers. As a general rule, more liberal standards and less costly materials prevail in Europe; there is a tendency to over-design or over-engineer in the US. These differences, as well as distinctions in regard to support and follow-up services, between North America and Europe are highlighted in the upper half of Table VI.

Promoting WPCE calls for a different approach in the case of the public sector from that in industrial markets. These differences are noted in the lower half of Table VI. Government agencies often let contracts in two stages, one for design and one for construction. Thus, manufacturers must overcome inertia and red tape on the part

Table VI. Water Pollution Control Equipment: Market Characteristics and Marketing Practices. Selected Regional and End-Use Comparisons

A. Regional Comparison Item	North America	Western Europe
Primary factors in choice of equipment	Quality Reliability	Cost Energy use
Level of technology	High	High
Influence of independent consultant in equipment choice	Strong	Weak
After-sales service provided by manufacturer	Some	Considerable
Supplier of equipment responsible for all phases (design, construction, etc)	Unlikely	More likely
Suitability of "made in USA" products	Excellent	Medium
B. End-Use Comparison **Item**	**Government**	**Industry**
Nature of pollutants to be handled (including toxics)	Simple to medium	Medium to very complex
Technical content of equipment specifications	Low to medium-high	Medium to high
Possible assistance requested/rendered from supplier of equipment re-filing of environmental impact statements	Less likely	More likely
Promotion required/recommended *vis-à-vis* end-users	Yes; versus inertia, red tape	Yes; versus idea of "non-productive" equipment
Importance of advertising and trade shows	Low to medium	Medium to high
Personal selling activity to end-users	More pre-sales engineering, less selling	Less pre-sales engineering, more selling
Likely profitability of contract	Low to medium	Medium to high

Source: Primary research by the author; US Department of Commerce; Rexnord/Envirex; B.P. Shapiro/Harvard Business School; and trade associations.

of bureaucrats; they should also aid and assist any consultant who is working with government officials in the first or second phase of the installation. In contrast, industrial applications are made in the framework of a one-stage contract, though the equipment is more complex. Since purchasing managers and the technical personnel at private companies tend to be knowledgeable, less time can be spent on "pre-sales

engineering" and more on actual selling. Managers in industry need to be convinced that they are buying more than "non-productive hardware". Makers of WPCE can cite such points as cleaner water contributing to lower fuel use and the purchaser satisfying environmental regulations which must be met.

A variety of ways can be used to promote WPCE to potential users, whether in government or industry, in developed or developing nations. Progressive companies take advantage of several approaches, ranging from placement of large advertisements in trade magazines to exhibiting at major trade fairs such as Aqua-Expo in Brussels in 1979. Publishing articles by the research staff in respected technical journals, conducting sales training sessions, and building demonstration units are other means of convincing buyers. Sala Magnetics installed separation and filtration devices in Japan and Sweden at relatively low prices and then used this "demo" to gain acceptance in the US and access to US customers.

Place or distribution policies will vary from country to country and from company to company, but the dominant channel is the direct one, from the WPCE manufacturer to the industrial or municipal treatment plant. Many large and even medium-size firms employ their own sales force who call on clients; a few established the concept of the brand manager. Smaller firms utilise manufacturers' representatives and local distributors, but try to make sure that the latter take on only non-competing product lines. Of course, many firms find that they can sell not only to end-users but to OEMs, (that is, original equipment manufacturers) who then assemble and market complete water pollution control systems. A rather wise move, whether in an industrialised or developing nation, is to establish close rapport with giant construction firms which are often in charge of major pollution control projects. Examples of such companies are (1) Bechtel, Brown & Root, Fluor, Lummus, and Pullman-Kellogg in the US, (2) Davy, Hochtief, Philipp-Holzman, Skanska, and Wimpe in Europe, and (3) Dong Ah, Han Yang, and Hyundal in South Korea. Once on their preferred list, the WPCE manufacturer has a ready-made outlet for its wares.

While product quality, follow-up service, and on-time delivery are important, price remains a key weapon in competing for the loyalty of old clients and for gaining business from new ones. But price increases or cuts need to be handled gingerly. In the 1970s, inflationary pressure — resulting mostly from higher raw and semi-finished material prices and demands from labour — pushed many WPCE makers to consider substantial increases in the prices they were going to charge. At the same time, they often found themselves locked into fixed government contracts, competing against subsidised firms, or finding smaller than expected markets due to reluctance to spend on the industry or merging with strong companies. Inflation had also abated in many nations. Thus, in the mid-1980s, prices are expected to be more firm; services especially can be set at an attractive level since users are realising also that what does matter ultimately is "life cycle pricing", not just initial prices. The operating cost of any unit, especially its fuel use rate, plus maintenance fee are just as important as the purchase price.

Conclusion

World-wide expenditures for environmental clean-up of all types constitute about one per cent of the world gross domestic product. This ratio should be relatively stable during the 1980s. Spending is now running close to $100 billion per year. About three-

fifths of this amount is spent on water, the remaining two-fifths on air and solid waste clean-up. The industrialised West accounts for three-fourths of all moneys spent, but its share is bound to decline to less than two-thirds by the end of the 1980s.

It is possible to estimate the size of national, regional and global markets via either the "build-up" or "build-down" method, but both routes are full of gaps; heroic assumptions, rough estimating and judgement are needed to estimate the size and the characteristics of such markets. The statistics on trade reveal that the developed nations supply about 80 per cent of their equipment needs from domestic sources. Trade is relatively open, competition is keen, and entry is easy into the water pollution control equipment industry. There is stability in terms of the type of equipment made and marketed. Similarly, end-use patterns are quite stable, with the public and private sector each taking about one-half of total shipments. About one-half of all industrial purchases are accounted for by the paper, chemical, petroleum, and metal manufacturers.

Success in the equipment industry is intimately tied to meeting customer needs, adopting the "systems approach", having experienced personnel on board, innovation in product line development, and aggressive pricing techniques. Segmentation must be practised by region and by end-users. Direct selling, exhibiting at key trade fairs, and journal advertising must be coupled with the establishment of rapport with giant construction firms which have a major impact on "who gets specified". Life cycle pricing is advisable; fixed fee government contracts are not. While a shake-out is coming in the industry, competition will remain keen. Very good market opportunities remain for producers around the globe during the 1980s.

References

1. Gross, A.C., "Analyzing and Forecasting World Markets: Selected Problems and Cases", *Proceedings of the XXVII Congress of ESOMAR, the European Society for Opinion & Market Research, Special Groups Volume*, 1974, pp. 323-342.
2. Gross, A.C. *et al.*, "World Motor Vehicle Markets", (with P.J. Gilewicz and W.W. Ware), *Columbia Journal of World Business*, 3rd Quarter, 1976.
3. Gross, A.C., "Accurate Forecasting of World Industrial Markets", *Marketing News*, 18-19 September 1981.
4. United Nations, *Yearbook of National Accounts Statistics Vols. I-II*, New York, United Nations, 1980.
5. United Nations, *Yearbook of International Trade Statistics, Vols. I-II*, New York, United Nations, 1981.
6. Organisation for Economic Co-operation and Development, *Microtables — Imports and Exports,* (microfiche), Paris, OECD, 1980.
7. Organisation for Economic Co-operation and Development, *Trade by Commodities, Series C*, Paris, OECD, 1981.
8. Barney, G.O. (Ed.), *The Global 2000 Report to the President, Vols. 1-3*, Washington, US Government Printing Office, 1981.
9. Leontief, W. *et al., The Future of the World Economy*, New York, Oxford University Press, 1977.
10. Biswas, A.K. (Ed.), *United Nations Water Conference (Mar del Plata), 1977*, Vols. I-IV, Oxford, Pergamon Press for the United Nations, 1978.
11. Economics Commission for Europe, *Long-Term Perspectives for Water Use and Supply in the ECE Region*, New York, United Nations, 1981.
12. Lvovich, M.I., *World Water Resources and Their Future*, Washington, American Geophysical Union, 1981.
13. Organisation for Economic Co-operation and Development (OECD), *The State of the Environment in OECD Member Countries*, Paris, OECD, 1979.

14. World Health Organisation (WHO), *World Health Statistics Report: Special Issue on Community Water Supply and Excreta Disposal in Developing Countries: Review of Progress*, Vol. 29 No. 10, Geneva, WHO, 1976.

15. United States, Department of Commerce, *Global Market Survey: Air and Water Purification and Pollution Control Equipment*, Washington, US Government Printing Office for USDC, 1976.

16. Primary contacts (personal and phone interviews) with manufacturers, users, and government officials in Australia, Canada, New Zealand, Western and Eastern Europe; selected national yearbooks and other statistical publications; trade association membership lists and directories, too numerous to list individually.

See also

Evans, G. *et al.*, International Marketing Study for Envirex (Rexnord), Philadelphia, Wharton School/Multinational Enterprise United (mimeo), 1979.

Gough, B.E. (Ed.), *World Environmental Directory*, 4th edition, Silvery Spring, Maryland, Business Publishers, 1980.

Leung, K. and Klein, J., *The Environmental Control Industry*, Ann Arbor, Michigan, Ann Arbor Science, 1976.

World Bank, *World Bank Research in Water Supply and Sanitation: Summary of Selected Publications*, Washington, World Bank, 1980.