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R E S E A R C H P A P E R

**The Evolution of the
Environmental Services Industry
in Mexico 1995-2005**

DRAFT

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1 Abstract

It was presumed that the passage of NAFTA would stimulate considerable growth in markets for environmental goods and services in Mexico, and the rapid development of an environmental industry in Mexico. While the commercial activity of companies solving environmental problems is no sure measure of environmental quality, it is a valuable indicator of how both the private and public sector is responding to environmental challenges, as well as the impact that various policy instruments are having on environmental expenditures. This paper quantifies the growth and evolution of environmental market in Mexico since 1995, and characterizes the contribution of imports and Mexico's own environmental industry.

While annual growth in the environmental market has been 5-10% since 1995, environmental companies say NAFTA played only a minimal role in driving growth. Environmental companies believe market demand could be much higher with better enforcement and indeed Mexico's market evolution lags other nations. The Mexican environmental market has seen notable increases in activity since 1995, but imports have outpaced the development of Mexico's environmental industry.

In the broadest terms, NAFTA has not brought proportionally more pollution to Mexico as many feared, but it is gradually bringing higher standards of environmental performance due to the influx of multinational firms operating under their own guidelines. The challenge is to turn these standards into the norm rather than the exception, and working with Mexican authorities to apply similar standards to their environmental infrastructure.

2 Executive Summary

To what extent has NAFTA been the driver of developments in environmental industry in Mexico since 1995? That is the fundamental question that guides the purpose of this paper. To be succinct, the answer is that NAFTA has played a role in driving the environmental market in Mexico, but only a minimal and indirect role.

NAFTA has spurred economic growth, the entry of multinational corporations into Mexico and some increased awareness and attention to environmental issues, and through this the environmental market has grown to an extent. On the other side, NAFTA has at least not resulted in Mexico being a 'pollution haven' as many feared as most foreign company entries into Mexico since 1995 have 'imported' their own corporate environmental standards and operating practices with them. The presence of more multinational firms have even had the effect of accelerating raising the baseline of voluntary environmental operating standards in Mexico in the opinion of several environmental companies interviewed for this paper, although this has yet to have a significant impact in driving market demand for environmental service and equipment companies.

Environmental regulations and their enforcement are the principle drivers of environmental business in the earlier stages of environmental market evolution in a still-developing nation like Mexico. Participants in Mexico's environmental markets cite federal regulations and enforcement as by far the most influential market driver today, but also complain about a relative lack of enforcement in many segments of the market. Growth in the environmental market in Mexico has been between 5% and 10% annually since 1995, and although this growth has been faster than that of the Mexican economy overall, it still lags environmental market growth in other nations at a similar stage of development.

While in the environmental market in Mexico has grown at a respectable rate, the growth of the national environmental industry in Mexico has not grown at an equal rate, widening a trade deficit in environmental goods and services. The most recent research by EBI estimates a \$5.1 billion environmental market in Mexico with a domestic environmental industry of \$2.3 billion that accounts for few exports, and hence a \$2.8 billion trade deficit. Filling the trade gap is largely the USA (US sales account for 27% of the Mexican market), although the rest of the world combined accounts for a slightly larger portion of Mexico's environmental market at 28%.

Environmental companies operating in Mexico report increased cooperation amongst environmental industry companies from all countries, but also a higher level of competition as the market matures. More importantly, while Mexican companies have lost market share in the 10 years since NAFTA, their capacity to address a number of environmental problems has increased

dramatically. The remaining challenges for the Mexican environmental industry to build capacity are to augment their evolving technical abilities with business acumen and furthering their relationships with the policymakers and direct customers they have in government to make a larger foundation for their business.

Separately, government agencies themselves must make environmental conditions a higher priority and begin to take some notice that the environmental industry participants that serve them can also serve as a distinct constituency for them. In other words the environmental industry community has both the environmental quality interests of the government and citizens and the economic and business interests of the private sector in balance to assure continuity in their business. A step further for government is the realization that a capable and growing national environmental sector is largely dependent on predictable and consistent environmental policy, regulation and enforcement from the government.

In conclusion, the decade since NAFTA was passed has seen changes in Mexico's environmental market and its environmental industry. But while these changes may not have been dramatic, nor principally the result of NAFTA, they are part of a fairly predictable pattern of evolution of environmental markets and industries. NAFTA has served to accelerate some components like the entry of multinationals and the increased transparency required of them operating in a still emerging economy, but it has not had the impact of institutionalizing environmental quality across federal, state and local government and the nation—not that NAFTA was intended to do this, of course. Consistent environmental markets emerge over more than a course of 10 years and while NAFTA has accelerated the process, there is still a ways to go.

2.1 Data Highlights

- The environmental market in Mexico grew 8% in 2006 to reach \$5.1 billion.
- The environmental market in Mexico grew 84% from 1995-2005 from \$2.6 billion in 1995 to \$4.7 billion in 2005.
- The environmental market in Mexico accounted for 0.59% of Mexico's gross domestic product (GDP) in 2006, up from 0.44% in 1995
- The environmental industry in Mexico accounts for about 44% of the Mexican market (or 56% is imports, mostly from the USA), representing \$2.3 billion in revenues. Mexican environmental exports were only \$80 million in 2006, but have grown from \$50 million in 2001.
- In just services, the environmental industry in Mexico accounts for about 50% of the Mexican market, representing \$1.2 billion in revenues in 2006.
- Foreign direct investment in Mexico remained fairly consistent from 1995-2005 (64% from the USA for the 10-year period), with the exception of a spike in 2001 resulting

mostly in the financial services industry. While official statistics on FDI make no mention of environmental services, interviews with companies indicate very modest investment and some movement of persons, but mostly the transfer of expertise and the hiring of local personnel.

- EBI Survey Results: In general environmental companies say NAFTA has played only a minimal role in driving growth of the Mexican environmental market. Survey respondents rated NAFTA only 8th out of 12 market drivers, well behind regulations, enforcement, global standards of multinationals, overall economic growth and even media coverage.
- EBI Survey Results: Environmental companies rated foreign-owned companies as customers as contributing to environmental market growth significantly more than Mexican companies with 60% rating growth from foreign-owned companies as 'high' or 'very high', and 90% rating growth from Mexican companies as 'modest' or 'little growth'. By customer type the top five in the rankings for pacing growth from 1995-2005 were: oil & gas, light industry/automobiles, heavy industry (chemical, steel, paper, etc.), tourism, construction & development; at the bottom were agriculture, local/city government and state government.
- EBI Survey Results: In general, environmental companies rated the activity level of Mexican, US and Canadian firms in Mexico as increasing noticeably from 1995-2005. While 63% of respondents characterized the market in 1995 as having 'no competition' or 'very little competition', only 7% characterized it as having 'no competition' or 'very little competition' in 2005.
- EBI Survey Results: Environmental companies have seen noticeable increase in the technical capacity of the domestic environmental industry in Mexico from 1995-2005. A majority (61%) of respondents characterized the Mexican environmental industry as having a "low level of capacity to address only a few types of environmental problems" in 1995. In 2005 a plurality (48%) of the same respondents characterized the Mexican environmental industry as having a "moderate level of capacity to address many types of environmental problems" and 19% said a "high level of capacity to address a few types of environmental problems."

3 Methodology

To assess the evolution of the environmental market and environmental industry in Mexico from 1995-2005, the author and Environmental Business International Inc., (EBI) undertook research in three principle areas:

1. A literature search of all material of any pertinence to the environmental industry in Mexico from 1995-2005 in terms of business activity, market size, market growth, market drivers, government programs, expenditure patterns, or other areas and a review and compilation of that information. It should be noted that EBI has conducted annual or bi-annual updates on Mexican markets (and global environmental markets as well), mostly derived from secondary information provided by government agencies and augmented by a few interviews with companies active in the environmental business in Mexico. More detailed studies were conducted on Mexico in 1994, 1999 and 2003 by EBI and perspective has been drawn from them.
2. A survey of companies actively operating in environmental industry in Mexico to determine their growth over the last decade, their estimate of environmental industry growth, their perception of customer categories, market drivers, level of cooperation and competition and other factors. A database was updated and constructed from Mexican government lists and EBI sources and the survey instrument was designed by the author.
3. Detailed interviews with selected companies to determine their experiences and opinions on environmental markets and the industry in Mexico from 1995-2005.

Limitations: Market quantifications derived from an incomplete census of companies are never perfect and the environmental industry in Mexico is still relatively new and unformed. Also standard industry classifications for environmental companies do not exist, so traditional forms of industry and trade data and analysis are not applicable. Estimates of size in market segments and the entire industry, number of companies, exports, imports and trade balance in this paper are made on a best efforts basis derived from what is believed to be the best and most reliable sources but are subject to change given more accurate information in certain segments or certain countries.

Following is a summary table of environmental industry segmentation EBI has evolved since pioneering environmental industry analysis in the USA in 1987. It should be noted that EBI has had some involvement with governments and international entities regarding their structure and definition of the environmental industry or exercises to achieve the same (EuroStat, OECD, Industry Canada and Statistics Canada, for example) but no clear and distinct international consensus has been agreed upon nor have all-inclusive harmonized codes be adopted for

consistent comparable data on revenues, employment, exports and others statistics in the environmental industry.

Figure 3-1 Environmental Industry Segments: EBI Definitions

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

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

4 Presentation and Discussion of Findings

4.1 EBI Statistics on Environmental Market and Industry

The environmental market in Mexico almost doubled in size during the decade between 1995-2005, and amounted to \$4.7 billion in 2005. The largest three of the 14 segments of water utilities, wastewater treatment works and solid waste management the represent environmental infrastructure account for 56% of the market.

Figure 4-1 The Environmental Market by Segment in Mexico (in \$Mil)

Segment	1995	2005	Growth %
Equipment			
Water Equipment & Chemicals	180	460	155%
Air Pollution Control	160	190	22%
Instruments & Information Systems	30	80	170%
Waste Mgmt Equipment	100	270	166%
Process & Prevention Technology	10	50	352%
Services			
Solid Waste Management	410	740	82%
Haz Waste Management	20	80	305%
Consulting & Engineering	90	160	77%
Remediation/Industrial Services	210	310	50%
Analytical Services	10	30	214%
Water Treatment Works	430	900	110%
Resources			
Water Utilities	640	990	55%
Resource Recovery	160	260	62%
Clean Energy Systems & Power	130	200	52%
Total	2,570	4,730	84%

Source: Environmental Business International Inc., San Diego, derived from compiled analysis of the environmental market in Mexico performed by EBI from 1992-2008.

EBI estimates that there are approximately 8,300 revenue-generating entities in the environmental industry in Mexico, the vast majority of which are small firms. If the infrastructure segments (mostly public sector water and solid waste collectors) and scrap collectors/dealers classified in the resource recovery segment are eliminated, then only a core of about 2,200 companies operate in the Mexican market.

Figure 4-2 The Environmental Industry in Mexico: Estimated Number of Companies and Entities in 2006*

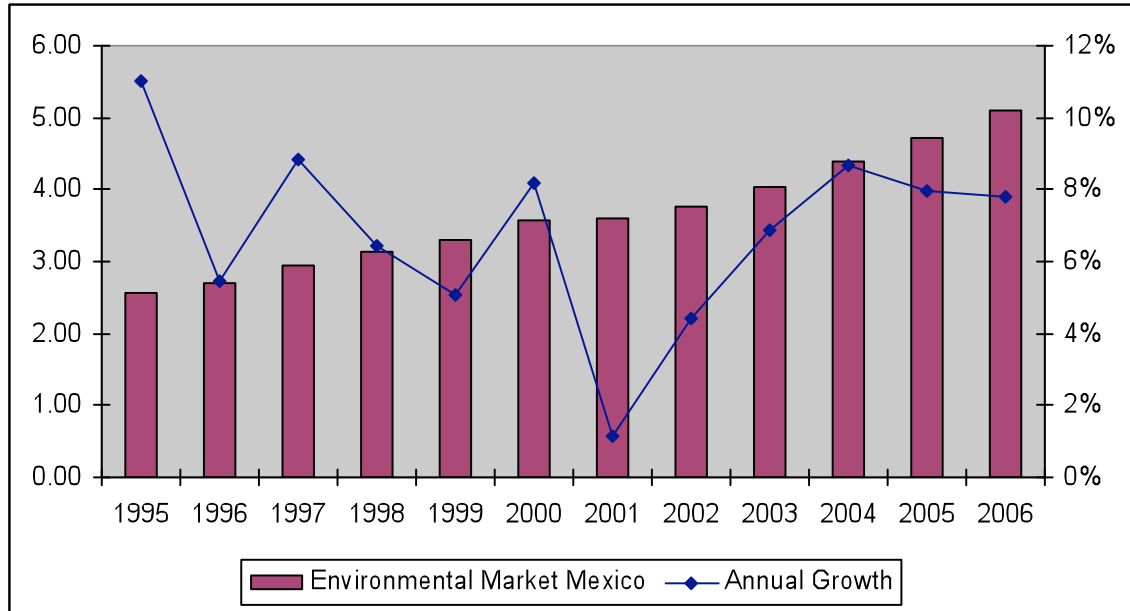
Segment	Estimated Number of Companies in 2006
Equipment	
Water Equipment & Chemicals	200
Air Pollution Control	100
Instruments & Information Systems	30
Waste Mgmt Equipment	300
Process & Prevention Technology	30
Services	
Solid Waste Management	1,200
Haz Waste Management	350
Consulting & Engineering	900
Remediation/Industrial Services	120
Analytical Services	70
Water Treatment Works	2,340
Resources	
Water Utilities	1,360
Resource Recovery	1,200
Clean Energy Systems & Power	100
Total	8,300

Source: Estimates by EBI derived from a variety of sources and interviews with environmental industry participants in Mexico. *Also includes revenue-generating or service-providing entities in the public sector, mostly in water, wastewater and waste management.

4.2 Environmental Market Growth and GDP Comparison

With the exception of the year 2001, the environmental market in Mexico grew between 4% and 9% a year from 1996-2006. This growth represents growth anywhere from one percentage point to almost six percentage points higher than that of the economy during the period.

Figure 4-3 The Environmental Market in Mexico: Sales and Growth, 1995-2006 (in \$Bil)



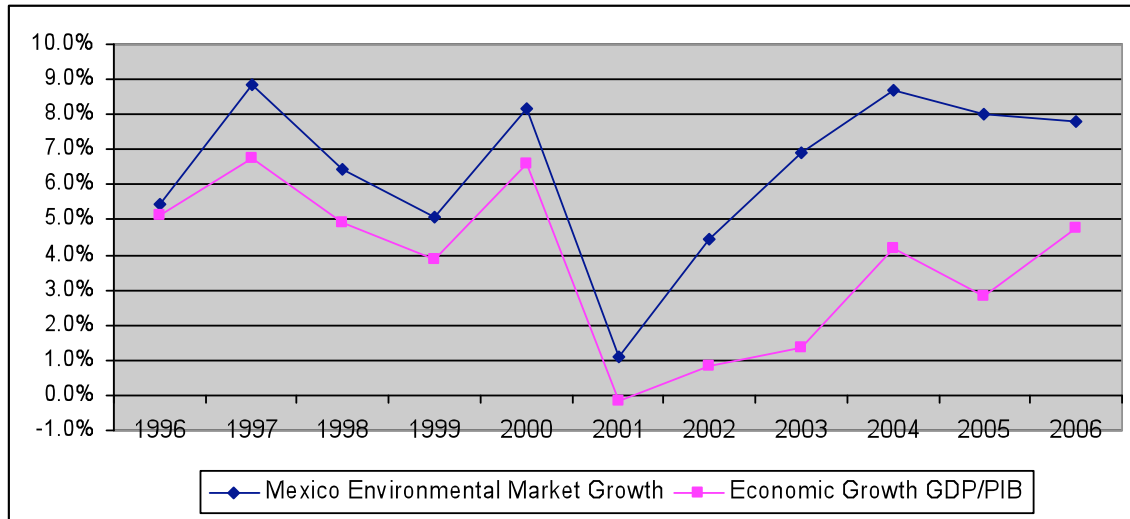
Source: Environmental Business International Inc., San Diego, derived from compiled analysis of the environmental market in Mexico performed by EBI from 1992-2008.

Figure 4-4 The Environmental Market in Mexico: Sales and Growth, 1995-2006 (in \$Bil)

	1995	1996	1997	1998	1999	2000
Environmental Market in Mexico	2.57	2.71	2.95	3.14	3.30	3.57
Growth	11%	5.4%	8.9%	6.4%	5.1%	8.2%
	2001	2002	2003	2004	2005	2006
Environmental Market in Mexico	3.61	3.77	4.03	4.38	4.73	5.10
Growth	1.1%	4.4%	6.9%	8.7%	8.0%	7.8%

Source: Environmental Business International Inc., San Diego, derived from compiled analysis of the environmental market in Mexico performed by EBI from 1992-2008.

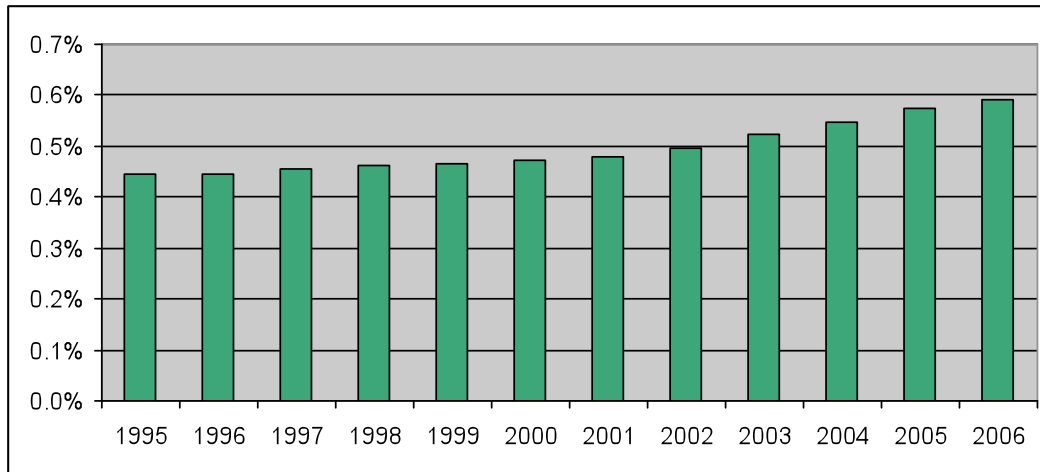
Figure 4-5 Mexico: Environmental Market Growth & Economic Growth



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

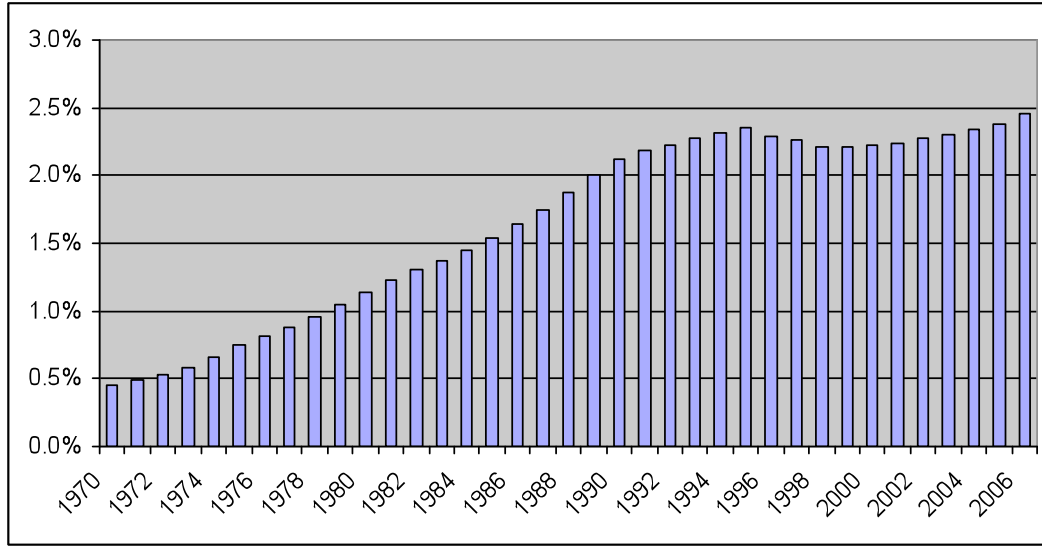
As a percent of the economy, Mexico’s environmental market represents 0.59% of the GDP in 2006. This has grown from 0.44% in 1995, but the pace of growth as a function of the GDP shows the relatively early stage that the environmental market in Mexico is still in.

Figure 4-6 Environmental Market as % of GDP in Mexico



Source: Environmental Business International Inc., San Diego, derived from compiled analysis of the environmental market in Mexico performed by EBI from 1992-2008.

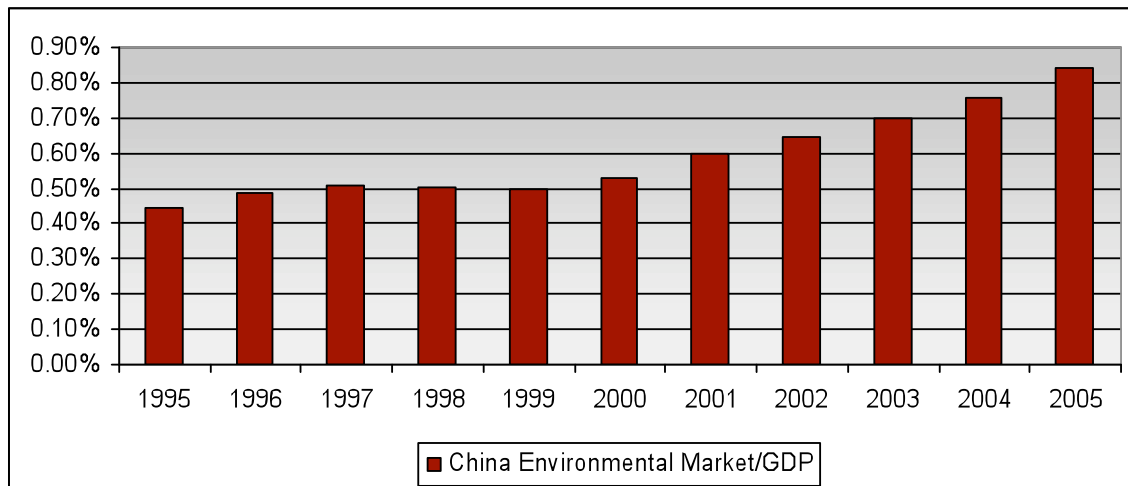
Figure 4-7 Environmental Industry as % of US GDP



Source: Environmental Business International Inc., San Diego, derived from annual analysis of the environmental industry performed by EBI from 1987-2008.

Comparing Mexico to the USA, whose environmental market was 0.45% of GDP in 1970, one sees much more dramatic growth in the US where a decade later in 1980 the US environmental industry represented over 1.1% of the GDP or a change of 0.7% points. In Mexico the growth in the last decade was 0.15% points. Clearly the nations are different in many ways and are at different stages of their development politically, economically and socially, etc. But what it does show is that the environmental industry and the environmental market in Mexico are still relatively undeveloped.

Figure 4-8 Environmental Market as % of GDP in China



Source: Environmental Business International Inc., San Diego, derived from annual analysis of the global environmental market performed by EBI from 1992-2008.

Comparing Mexico to the China, one can see growth and the evolution process has been considerably more rapid in China. China has devoted more resources to its environmental infrastructure mostly because of economic pressure but also mounting public pressure, has developed its environmental institutions and the federal and provincial level more than Mexico, has higher economic growth than Mexico and has had an international driver of hosting the Olympics in 2008 to accelerate their evolution process.

4.3 Stages of Environmental Market Evolution

The following tables update a sort of continuum in the evolution of environmental markets that EBI first published in the mid-1990s along with ratings of where nations lay. Basically it conveys that a strong environmental market requires first an aware and likely mobilized population capable of asserting their rights for a clean environment. Second it requires a stated policy by the leadership administration to manage environmental issues. Third it requires legislation or laws and fourth specific regulations or rules governing environmental standards or performance. Given that stages 1-4 are fully achieved, we theorize that a strong and consistently growing environmental market grows and evolves fairly rapidly to a contribution of around 2.5% of the nation's GDP. The following table characterizes EBI's subjective classification of these first five and the final two stages for Mexico and the USA.

Figure 4-9 Seven Stages of Environmental Market Evolution in a Nation

Seven Stages of Market Evolution in a Nation
1. Public Awareness and Pressure
2. Government Policy Stated
3. Legislation Enacted
4. Regulations Promulgated and Agency Empowered
5. Enforcement Creates Strong Market for Environmental Firms Pollution Control, Cleanup & Waste Management
6. Proactive Effort by Regulated Community to Circumvent Costs of Compliance & Pollution Control, Regulation & Liability: <i>Pollution Prevention</i>
7. Internalization and Integration of Environmental Efforts: <i>Sustainable Development</i>

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

Figure 4-10 Phase of Environmental Industry Evolution

	1	2	3	4	5	6	7
United States	Blue	Blue	Blue	Blue	Blue	Grey	Red
Mexico	Grey	Grey	Grey	Red	Red	Red	Red

Fully achieved	Blue
Substantially achieved	Grey
Partially achieved	Red

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

4.4 Environmental Market and Industry Trade Estimates

A final piece of data on the Mexican environmental industry and the environmental market looks at trade estimates, comparing 2006 with 2001.

First, it is clear that Mexico has a large trade deficit in the environmental industry and that exports are relatively insignificant. Second, when looking at the ‘Comparison’ chart of 2001 to 2006 trade below, while the Mexican environmental industry and its exports are growing notably, they are trailing the overall environmental market growth as well as import growth. This disparity leads to lessened ‘capacity’ expressed in a function of proportion of the market served by the indigenous Mexican environmental industry. Another way to put it is that imports represented 46% of the market in 2001 and 56% in 2006.

Figure 4-11 Environmental Trade in Mexico, 2006

	MEX ind	MEX mkt	surplus	exports	imports	% export	% import
Equipment							
Water Equipment & Chemicals	0.11	0.50	-0.4	0.005	0.39	4%	78%
Air Pollution Control	0.06	0.21	-0.2	0.005	0.16	7%	75%
Instruments & Info. Systems	0.01	0.09	-0.1	0.000	0.08	2.0%	90%
Waste Mgmt Equipment	0.20	0.28	-0.1	0.029	0.11	14%	40%
Process & Prevention Tech.	0.04	0.05	0.0	0.001	0.01	2%	20%
Services							
Solid Waste Management	0.57	0.78	-0.2	0.006	0.22	1%	28%
Hazardous Waste Mgmt	0.05	0.09	0.0	0.001	0.04	1%	40%
Consulting & Engineering	0.09	0.18	-0.1	0.003	0.09	3%	50%
Remediation/Industrial Svcs.	0.15	0.35	-0.2	0.010	0.21	6%	60%

The Evolution of the Environmental Industry in Mexico 1995-2005

Analytical Services	0.02	0.03	0.0	0.001	0.01	3%	40%
Water Treatment Works	0.33	0.97	-0.6	0.005	0.64	2%	66%
Resources							
Water Utilities	0.59	1.04	-0.5	0.009	0.46	2%	44%
Resource Recovery	0.06	0.29	-0.2	0.002	0.23	3%	80%
Clean Energy Systems & Power	0.04	0.24	-0.2	0.003	0.21	6%	86%
Total	2.3	5.1	-2.8	0.079	2.9	3.4%	55.9%

Source: EBI Inc., San Diego CA, units in \$bil. Mex ind is revenues generated by Mex cos worldwide. Mex mkt is revenues from Mex customers for all companies worldwide.

Figure 4-12 Environmental Trade in Mexico, 2001

	MEX ind	MEX mkt	surplus	exports	imports	% export	% import
Equipment							
Water Equipment & Chemicals	0.08	0.37	-0.3	0.002	0.29	2%	80%
Air Pollution Control	0.04	0.16	-0.1	0.003	0.12	6%	75%
Instruments & Info. Systems	0.01	0.07	-0.1	0.000	0.06	0.3%	90%
Waste Mgmt Equipment	0.14	0.21	-0.1	0.014	0.08	10%	40%
Process & Prevention Tech.	0.03	0.03	0.0	0.000	0.01	1%	20%
Services							
Solid Waste Management	0.44	0.55	-0.1	0.004	0.11	1%	20%
Hazardous Waste Mgmt	0.04	0.07	0.0	0.000	0.03	1%	40%
Consulting & Engineering	0.05	0.10	0.0	0.002	0.05	4%	50%
Remediation/Industrial Svcs.	0.12	0.28	-0.2	0.006	0.17	5%	60%
Analytical Services	0.02	0.03	0.0	0.000	0.01	2%	40%
Water Treatment Works	0.46	0.67	-0.2	0.009	0.22	2%	33%
Resources							
Water Utilities	0.50	0.74	-0.2	0.005	0.24	1%	33%
Resource Recovery	0.07	0.23	-0.2	0.001	0.16	2%	70%
Clean Energy Systems & Power	0.02	0.10	-0.1	0.001	0.08	5%	80%
Total	2.0	3.6	-1.6	0.050	1.6	2.5%	45.5%

Source: EBI Inc., San Diego CA, units in \$bil. Mex ind is revenues generated by Mex cos worldwide. Mex mkt is revenues from Mex customers for all companies worldwide.

The environmental industry in Mexico accounts for about 44% of the Mexican market (or 56% is imports), representing \$2.3 billion in revenues. Mexican environmental exports were only \$80 million in 2006, but have grown from \$50 million in 2001. In just services, the environmental industry in Mexico accounts for about 50% of the Mexican market, representing \$1.2 billion in revenues in 2006.

Figure 4-13 Comparison of Mexican Environmental Trade: 2001 vs. 2006

Segment	2001	2006	% change
Mexican Environmental Market	3.61	5.10	41%
Mexican Environmental Market Imports	1.64	2.85	74%
Mexican Environmental Industry	2.02	2.33	15%
Mexican Environmental Industry Exports	0.05	0.08	57%
Domestic Capacity*	55%	44%	-19%

Source: EBI Inc., San Diego CA, units in \$bil. Mex ind is revenues generated by Mex cos worldwide. Mex mkt is revenues from Mex customers for all companies worldwide. Domestic capacity is Mexican industry minus exports divided by Mexican market.

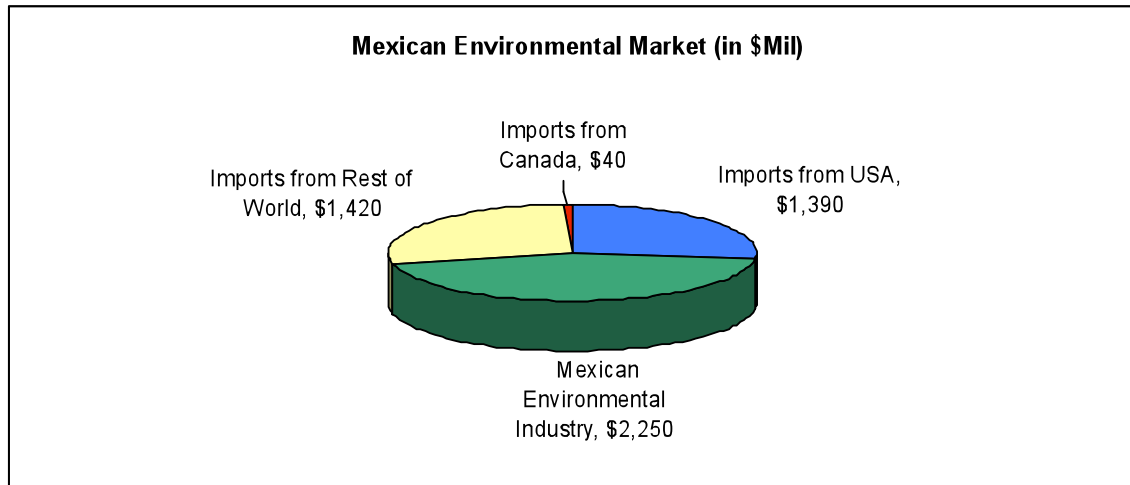
Figure 4-14 Comparison of Mexican Environmental Trade: 2001 vs. 2006: Services Only

Segment	2001	2006	% change
Mexican Environmental Market: Services Only	1.70	2.40	42%
Mexican Environmental Market Imports: Services Only	0.59	1.21	106%
Mexican Environmental Industry: Services Only	1.13	1.22	8%
Mexican Environmental Industry Exports: Services Only	0.02	0.02	7%
Domestic Capacity*	65%	50%	-24%

Source: EBI Inc., San Diego CA, units in \$bil. Mex ind is revenues generated by Mex cos worldwide. Mex mkt is revenues from Mex customers for all companies worldwide. Domestic capacity is Mexican industry minus exports divided by Mexican market.

As the figures above show, the Mexican environmental market grew 41% from 2001-2006, but the Mexican environmental industry grew only 15%. So since the national Mexican environmental industry has not grown in step with the environmental market demand in Mexico (let alone with Mexico's environmental needs), imports have stepped in to take up the slack. It is understandable that U.S. firms have a strong position in the Mexican market due to their proximity, but imports from the rest of the world combined account for a slightly larger percentage of the Mexican market that does the U.S. environmental industry.

Figure 4-15 Mexican Environmental Market (\$5.1 BILLION IN 2006)



Source: EBI Inc., San Diego CA, units in \$mil. Figures rounded to the nearest \$10 million

Companies noted some particular strengths and influences of foreign representation in the Mexican market. European firms, particularly French and British water utilities, have played a significant role in the development, upgrade and management of the water and wastewater

infrastructure. Equipment vendors in water/wastewater tend to tilt more toward U.S. and Japanese firms, however. Japanese firms also have notable representations in air pollution control equipment and systems and to a lesser extent in instrumentation. Imports of environmental goods or equipment from other than developed nations such as China are currently almost non-existent.

The figure below represents the percentage of the Mexican market serviced by U.S. firms by segment. Lastly, it is worth noting again that in the largest, environmental infrastructure segments of solid waste, water utilities and wastewater treatment works, Mexican capacity (and much of it in the public sector as well as private sector) carries the majority of the business or revenue generation.

Figure 4-16 Mexico-US Environmental Trade (\$mil) in 2006

	Mexican Market	Mexico Imports from USA	USA % of Mexican Environmental Market
Equipment			
Water Equipment & Chemicals	500	310	62%
Air Pollution Control	210	90	43%
Instruments & Info. Systems	90	60	66%
Waste Mgmt Equipment	280	190	66%
Process & Prevention Tech.	50	10	13%
Services			
Solid Waste Management	780	40	5%
Hazardous Waste Mgmt	90	60	69%
Consulting & Engineering	180	70	39%
Remediation/Industrial Svcs.	350	60	17%
Analytical Services	30	10	29%
Water Treatment Works	970	70	7%
Resources			
Water Utilities	1,040	30	3%
Resource Recovery	290	220	78%
Clean Energy Systems & Power	240	140	58%
Total	5,100	1,390	27%

Source: EBI Inc., San Diego CA, units in \$mil. Figures rounded to the nearest \$10 million

4.5 Observations on Foreign Direct Investment

Foreign direct investment in Mexico remained fairly consistent from 1995-2005 ranging from \$8 billion to \$18 billion a year (see tables in the annex), with the exception of a spike of \$27 billion in 2001 resulting mostly from investments in the financial services industry. While official statistics on FDI make no mention of environmental services, ‘electricity and water’ utilities may

include some water related activity that impacted trade in services, and ‘other manufacturing’ likely includes some pollution control equipment or at least some ‘dual-use’ equipment like pumps or valves that may be used for water treatment for instance. Either way these two categories amount to a very small percentage of FDI so it is safe to say that measured FDI in the environmental industry is almost non-existent.

Interviews with environmental companies, however, indicate very modest investments and some movement of persons, but mostly the involvement of U.S. or Canadian environmental companies in Mexico involves the transfer of expertise and the hiring of local personnel. Two companies interviewed for this report were companies that had started and operated as Mexican companies but were acquired by larger U.S. firms. An American executive from another firm remarked that their principal form of expansion in Mexico was through the hiring of local staff.

4.6 Results from EBI 2008 Survey of Mexican Environmental Industry

During January and February of 2007 a survey of companies actively operating in environmental industry in Mexico was conducted by EBI. A database of more than 300 contacts was constructed from Mexican government lists and updated EBI sources, and more than 50 respondents made some attempt to respond to the survey questions, with 35 virtually complete responses received. (A partial list is included in the appendix; some requested not to be identified.) The survey’s broad intent was to determine their company growth over the last decade, their estimate of environmental industry growth, their perception of customer categories, market drivers, level of cooperation and competition and other factors. Below is a summary of the more salient results.

4.6.1 Growth

Figure 4-17 Average Growth Estimate by Survey Respondents

Question: Please estimate the growth for the total environmental market in Mexico for each year in percentage change of revenues:

		1996	1997	1998	1999	2000
Growth estimate		4.2%	5.0%	5.0%	5.4%	6.2%
	2001	2002	2003	2004	2005	2006
Growth estimate	4.8%	7.0%	7.0%	7.8%	7.7%	9.0%

Source: EBI 2008 survey of Mexican Environmental Industry; Note: While more than 35 companies responded to portions of the survey not all respondents filled in an estimate for all years, only the years the

felt qualified to estimate. Results are an average of responses and not necessarily the same as EBI conclusions as to overall market growth in each year.

4.6.2 Market Drivers

In general environmental companies say NAFTA has played only a minimal direct role in driving growth of the Mexican environmental market. Survey respondents rated NAFTA only 8th out of 12 market drivers, well behind regulations, enforcement, global standards of multinationals, overall economic growth and even media coverage.

Federal regulations and enforcement levels are consistently by far the most significant drivers in emerging environmental markets, and are often the most significant in developed markets as well. Notably different in Mexico than in the USA and other advanced markets was the lower status of state and local regulatory enforcement as a driver in Mexico where little activity takes place. Noteworthy for its influence on the Mexican market in 2007 is what is ranked third: “Global environmental standards observed by multinational corporations”, which would have been the highest rank if we chose not to weight the ‘very significant’ twice that of ‘significant’. As was reflected in a number of direct comments by environmental companies, multinationals customarily ‘import’ their own standards of operation for corporate image and liability protection reasons. The state of the economy in general and of the company’s client base to a slightly larger extent are also seen as considerable factors in driving environmental markets.

While companies may not believe NAFTA has played a highly significant a role, some observers assert that NAFTA and the North American Agreement on Environmental Cooperation (NAAEC) don't necessarily have specific obligations to change environmental standards. Instead, they are intended to provide enabling tools. So whereas it may not been seen as a prominent market driver for companies, NAFTA should facilitate greater use of environmental technologies but not necessarily be causative. Additionally, provisions in NAAEC reinforce the more highly ranked factors: laws and regulations; and enforcement.

Figure 4-18 Ranking of Environmental Market Drivers in Mexico

Question: Please rate the following factors for their direct impact on creating demand for environmental services in Mexico.

	Very significant impact	Significant impact	Some impact	Little impact	Very little impact	No impact
Mexican Federal Laws and Regulations	15.4%	23.1%	53.8%	7.7%	0.0%	0.0%
Enforcement Activity by Mexican Federal Authorities	19.2%	26.9%	23.1%	30.8%	0.0%	0.0%
Global environmental standards observed by multinational	3.8%	57.7%	7.7%	30.8%	0.0%	0.0%

corporations						
Economic Growth in the sectors your company works for in Mexico	3.8%	34.6%	46.2%	15.4%	0.0%	0.0%
Economic Growth across all of Mexico	7.7%	19.2%	50.0%	23.1%	0.0%	0.0%
Mexican State Laws and Regulations	3.8%	19.2%	46.2%	30.8%	0.0%	0.0%
Enforcement Activity by Mexican State Authorities	7.7%	23.1%	23.1%	42.3%	3.8%	0.0%
Media, newspaper or TV coverage of environmental conditions	0.0%	23.1%	30.8%	42.3%	3.8%	0.0%
International pressure resulting from NAFTA or other trade agreements	3.8%	3.8%	53.8%	26.9%	11.5%	0.0%
Enforcement Activity by Mexican Municipal, Local or City Authorities	0.0%	15.4%	38.5%	34.6%	11.5%	0.0%
Activity by Mexican citizens or consumers	0.0%	7.7%	53.8%	26.9%	11.5%	0.0%
Activity by Mexican environmental groups or non-profits	0.0%	11.5%	42.3%	34.6%	11.5%	0.0%

Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer. Note: Ranked by an index of the 'very significant' multiplied by 2, plus 'significant', plus some impact divided by 2.

4.6.3 Customer Segments

Environmental companies rated foreign-owned companies as customers as contributing to environmental market growth significantly more than Mexican companies with 60% rating growth from foreign-owned companies as 'high' or 'very high', and 90% rating growth from Mexican companies as 'modest' or 'little growth'. By customer type the top five in the rankings for pacing growth from 1995-2005 were: oil & gas, light industry/automobiles, heavy industry (chemical, steel, paper, etc.), tourism, construction & development; at the bottom were agriculture, local/city government and state government.

Figure 4-19 Ranking of Customer Segments in Environmental Markets in Mexico

Question: Please rate the following industries, or customers for environmental services, that have grown the most in Mexico since NAFTA or from 1995-2005, specifically in their demand for environmental services.

	Very high growth	High growth	Modest growth	Little growth	No growth	No demand at all for environmental services
Foreign-owned companies	10.0%	50.0%	33.3%	6.7%	0.0%	0.0%
Oil & Gas	0.0%	46.7%	30.0%	13.3%	10.0%	0.0%
Light Industry (manufacturing, assembly): Automobiles	3.4%	34.5%	37.9%	24.1%	0.0%	0.0%
Heavy Industry (chemical, steel, paper)	6.7%	23.3%	40.0%	30.0%	0.0%	0.0%

The Evolution of the Environmental Industry in Mexico 1995-2005

Tourism	10.0%	20.0%	30.0%	40.0%	0.0%	0.0%
Construction and Development	10.0%	6.7%	53.3%	30.0%	0.0%	0.0%
Light Industry (manufacturing, assembly): Electronics	3.4%	20.7%	41.4%	34.5%	0.0%	0.0%
Federal Government	0.0%	23.3%	43.3%	30.0%	3.3%	0.0%
Light Industry (manufacturing, assembly): Consumer Products	0.0%	13.3%	56.7%	30.0%	0.0%	0.0%
Mexican-owned companies	0.0%	10.0%	63.3%	26.7%	0.0%	0.0%
State Governments	0.0%	6.7%	46.7%	36.7%	10.0%	0.0%
Local or City Governments	0.0%	0.0%	46.7%	53.3%	0.0%	0.0%
Agriculture	0.0%	10.0%	23.3%	43.3%	23.3%	0.0%

Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer. Note: Ranked by an index of the 'very high' multiplied by 2, plus 'high', plus 'modest growth' divided by 2.

4.6.4 Activity of Mexican, US and Canadian Firms

Environmental companies rated the activity level of Mexican, US and Canadian firms in Mexico as increasing noticeably from 1995-2005.

Figure 4-20 Growth in Activity of Mexican Environmental Firms In Mexico from 1995-2005

Question: Please characterize the activity of Mexican environmental services firms in the Mexican Environmental market in 1995 and 2005

	Activity in 1995		Activity in 2005	
	# of responses	% of responses:	# of responses:	% of responses:
Very active in all segments	0	0.0%	1	3.3%
Very active in some segments	1	3.4%	2	6.7%
Active in all segments	0	0.0%	7	23.3%
Active in some segments	5	17.2%	14	46.7%
Moderate activity in all segments	4	13.8%	5	16.7%
Moderate activity in some segments	13	44.8%	1	3.3%
Not very active in all segments	6	20.7%	0	0.0%
Total	29	100.0%	30	100.0%

Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

Figure 4-21 Growth in Activity of US Environmental Firms In Mexico from 1995-2005

Question: Please characterize the activity of US environmental services firms in the Mexican Environmental market in 1995 and 2005

	Activity in 1995		Activity in 2005	
	# of responses	% of responses:	# of responses:	% of responses:
Very active in all segments	1	3.4%	4	13.3%
Very active in some segments	1	3.4%	3	10.0%
Active in all segments	2	6.9%	7	23.3%
Active in some segments	6	20.7%	12	40.0%
Moderate activity in all segments	5	17.2%	2	6.7%
Moderate activity in some segments	10	34.5%	2	6.7%
Not very active in all segments	4	13.8%	0	0.0%
Total	29	100.0%	30	100.0%

Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

Figure 4-22 Growth in Activity of Canadian Environmental Firms In Mexico from 1995-2005

Question: Please characterize the activity of Canadian environmental services firms in the Mexican Environmental market in 1995 and 2005

	Activity in 1995		Activity in 2005	
	# of responses	% of responses:	# of responses:	% of responses:
Very active in all segments	0	0.0%	1	3.3%
Very active in some segments	2	6.9%	1	3.3%
Active in all segments	2	6.9%	2	6.7%
Active in some segments	2	6.9%	10	33.3%
Moderate activity in all segments	1	3.4%	3	10.0%
Moderate activity in some segments	4	13.8%	12	40.0%
Not very active in all segments	18	62.1%	1	3.3%
Total	29	100.0%	30	100.0%

Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

4.6.5 Competition

While 63% of respondents characterized the market in 1995 as having ‘no competition’ or ‘very little competition’, only 7% characterized it as having ‘no competition’ or ‘very little competition’ in 2005.

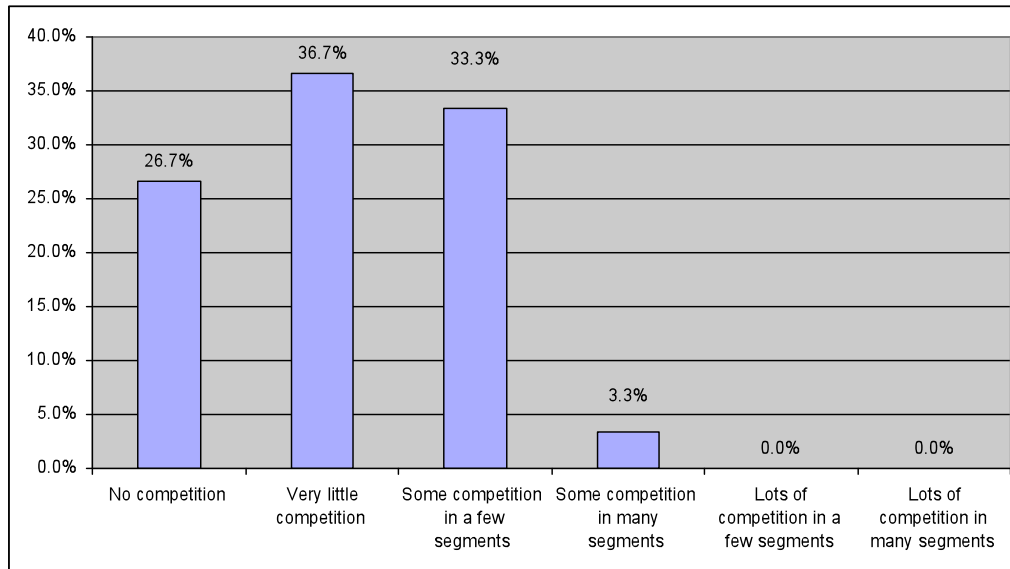
Figure 4-23 Level of Competition in Mexican Environmental Market: 1995 and 2005

Question: Please rate the level of competition across the broad Mexican Environmental industry in 1995 and 2005

	Competition in 1995		Competition in 2005	
	# of responses	% of responses:	# of responses:	% of responses:
No competition	8	26.7%	0	0.0%
Very little competition	11	36.7%	2	6.7%
Some competition in a few segments	10	33.3%	8	26.7%
Some competition in many segments	1	3.3%	16	53.3%
Lots of competition in a few segments	0	0.0%	4	13.3%
Lots of competition in many segments	0	0.0%	0	0.0%
Total	30	100.0%	30	100.0%

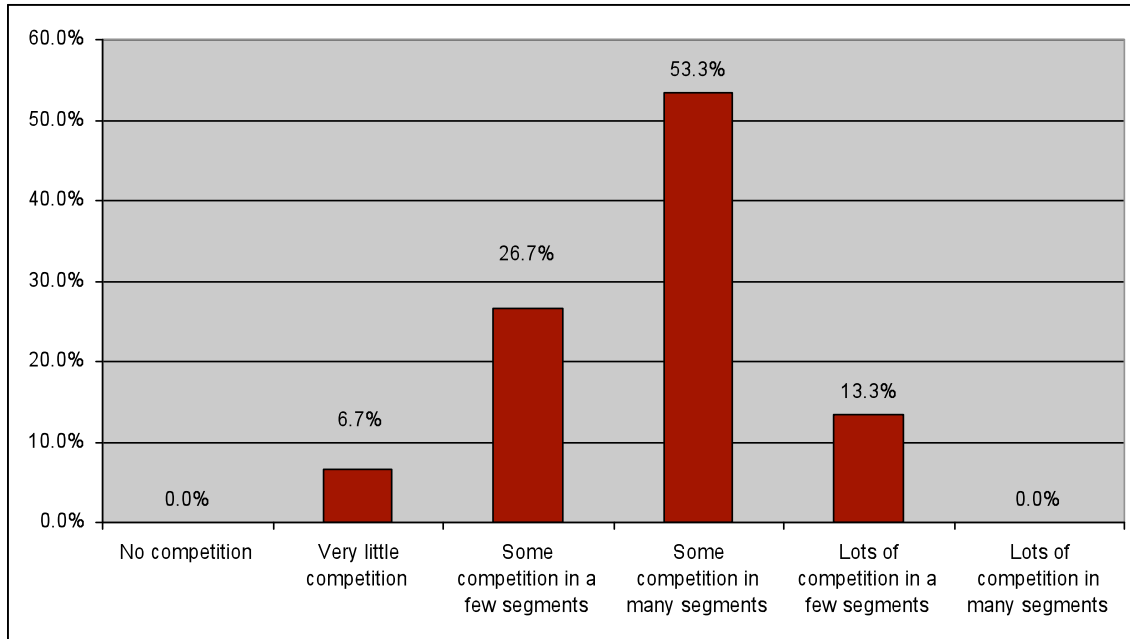
Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

Figure 4-24 Level of Competition in Mexican Environmental Market: 1995



Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

Figure 4-25 Level of Competition in Mexican Environmental Market: 2005



Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

4.6.6 Domestic Capacity

Environmental companies have seen noticeable increase in the technical capacity of the domestic environmental industry in Mexico from 1995-2005. A majority (61%) of respondents characterized the Mexican environmental industry as having a “low level of capacity to address only a few types of environmental problems” in 1995. In 2005 a plurality (48%) of the same respondents characterized the Mexican environmental industry as having a “moderate level of capacity to address many types of environmental problems” and 19% said a “high level of capacity to address a few types of environmental problems.”

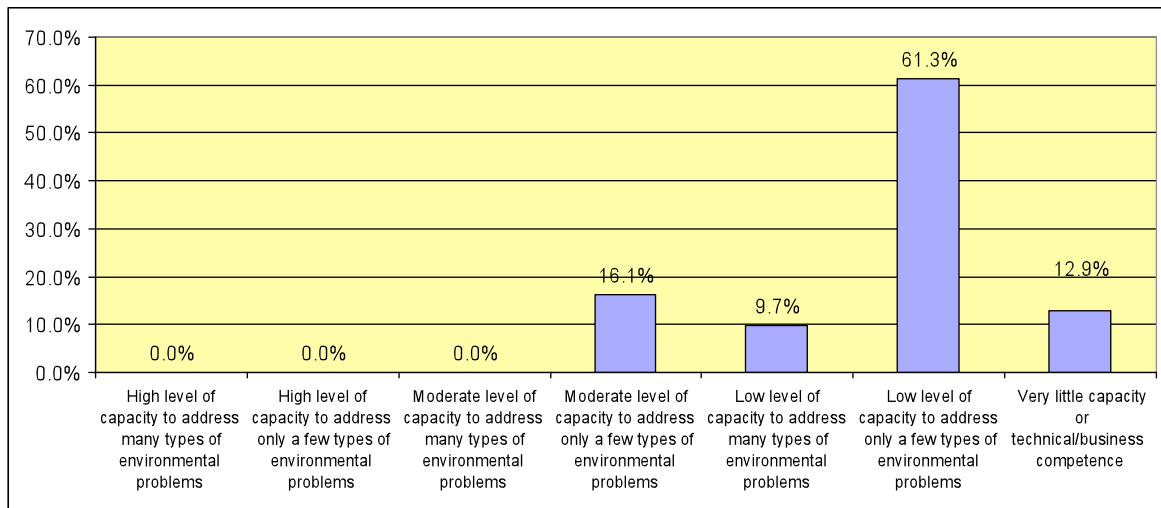
Figure 4-26 Level of Capacity of Mexican Environmental Industry: 1995 and 2005

Question: Please rate and comment below on the capacity or technical/business competence of Mexican firms or the Mexican Environmental Industry to address, manage or solve environmental problems in Mexico in 1995 & 2005

	1995		2005	
	# of responses	% of responses:	# of responses:	% of responses:
High level of capacity to address many types of environmental problems	0	0.0%	4	12.9%
High level of capacity to address only a few types of environmental problems	0	0.0%	6	19.4%
Moderate level of capacity to address many types of environmental problems	0	0.0%	15	48.4%
Moderate level of capacity to address only a few types of environmental problems	5	16.1%	4	12.9%
Low level of capacity to address many types of environmental problems	3	9.7%	1	3.2%
Low level of capacity to address only a few types of environmental problems	19	61.3%	1	3.2%
Very little capacity or technical/business competence	4	12.9%	0	0.0%
Total	31	100.0%	31	100.0%

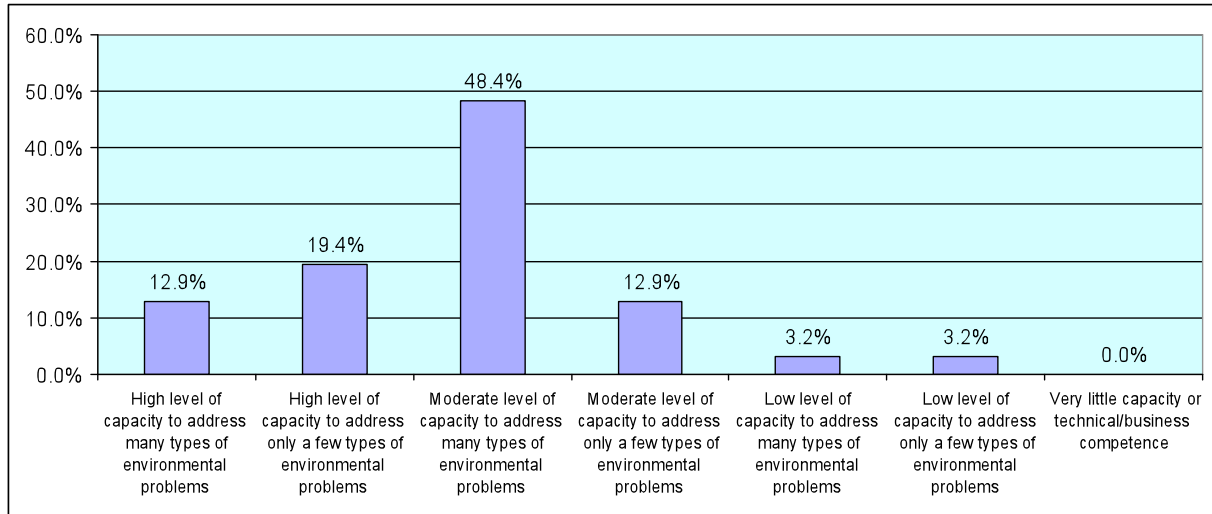
Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

Figure 4-27 Level of Capacity of Mexican Environmental Industry: 1995



Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

Figure 4-28 Level of Capacity of Mexican Environmental Industry: 2005



Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

4.6.7 Comments on Capacity Development

Comments from EBI survey respondents on capacity development in the Mexican environmental industry.

Question: Please make any comment on capacity development in the Mexican environmental industry between 1995 and 2005.

- Demand in certain sectors has made local companies develop skills fairly rapidly.
- Capacity development of Mexican companies is slow but picking up steam.
- US firms have been good at hiring Mexican specialists as they growth their business here. Some day these young people will start their own business.
- Companies in Mexico are accomplished in design/build/operate contracts for wastewater facilities now. There are many contracts of 15-20 years for municipalities. Also private international companies like GM have requested advanced services like water reuse and Mexico's Pemex has required zero discharge for water at its six refineries. This has driven many added skills and demand for systems and equipment.

- Ability has increased in analysis at early stage of remediation projects. More learning will happen as projects are cleaned up.
- Capacity development has increased every year too fast. I think there are many Mexican companies with poor background doing not fair competition with low price levels.
- There are a lot environmental consultants but there are few good environmental consultants. The micro industry is most affected, because they buy the cheap service and the common occurrence is that the cheap service is bad.
- There is not a good level on development because the low level of Mexican culture about the environment, so it means that we do not care about the environment. This lack of care begins with government which does not invest in equipment for reducing pollution. However, there are some companies that have started to create business related to environmental matters but it is very small compared to how it could be.

Note: Some responses have been edited for clarity.

4.6.8 International Cooperation

Figure 4-29 Level of Cooperation in Mexican Environmental Market: 1995 and 2005

Question: Industry Please rate the degree of cooperation or technology transfer amongst all North American companies in solving environmental problems and doing business together in Mexico in 1995 & 2005

	1995		2005	
	# of responses	% of responses:	# of responses:	% of responses:
Very cooperative, lots of collaboration and partnerships	0	0.0%	6	19.4%
Somewhat cooperative, some collaboration and partnerships	5	16.1%	19	61.3%
Only a little bit cooperative, only a few collaborations and partnerships	9	29.0%	5	16.1%
Not cooperative at all	17	54.8%	1	3.2%
Total	31	100.0%	31	100.0%

Source: Environmental Business International survey of environmental firms operating in Mexico. Of the more than 35 total respondents in January and February 2008, 70% were Mexican firms, 26% were U.S. firms and 4% were Canadian firms. By segment the respondents were 43% in consulting & engineering services, 19% in pollution control equipment for air or water, 8% in clean/renewable energy, 13% in solid waste or water utilities, 5% in laboratory testing and the rest in other services. Respondents were encouraged to respond only to questions they believed they were qualified to answer.

4.6.9 Comments on NAFTA's Role

Comments from EBI survey respondents on the Mexican environmental industry and NAFTA.

Question: Please make comments on how you believe the environmental industry in Mexico has evolved from 1995 to the present, what was most responsible for these changes and if NAFTA has had any role.

- There has been some growth; however the growth has been in some companies off of government projects. Government has made a number of new programs but they do not follow them. Our culture and education is low, so it does not really help the environmental industry growth. Some transnational companies that come to establish business here do not follow the American or Canadian rules, it means that if Mexican laws are poor, they do poor (transnational co.) about taking care the environment. Another point is that poor education, high taxes, expensive equipment, high bank interest rate and corruption. The result is low growth including other fields.
- Yes, I think NAFTA has a lot to do with our growth in the environmental industry. Unfortunately, we need to solve first basics issues as public security and unemployment, and at the same time to implement some aggressive support programs that can make affordable to low income families have access to new technology.
- While the concern and interest of the Mexican population about heritage resources has increased during the last several decades of infrastructure growth, actual environmental (heritage) compliance studies have been hampered by lack of agency coordination and communication and by outdated/cumbersome permit requirements for (and national control of) archaeological resources.
- The environmental industry in México has evolved from 1995 quickly. We are strengthening in the technical development stage, but actual economics condition can stop this evolution.
- SEMARNET has become more proactive since Fox. Laws are stronger and there is more enforcement so both private and government markets are growing. NAFTA has not really made much of a difference. It is the level of government activity.
- NAFTA has made a difference for us. The focus is very much on environmental issues these days. We feel NAFTA put pressure for political change in Mexico that had made more environmental improvements. The change with President Fox was perhaps bigger in remediation that other areas as federal agency started much more enforcement and in water that happens in cities. And with Calderon the remediation has increased even more.
- There are many small initiatives everywhere which only focus on certain environmental problems (e.g. waste disposal) but there is widespread confusion on most subjects and much technological backwardness. NAFTA has had little impact in my view. The Kyoto Protocol and the Carbon markets have had much more in comparison.
- Our observation is that NAFTA did support growth in many sectors of the economy. Some of these parts of the economy required environmental services and some did not. Economic development has certainly been the priority for the government, but in some regions the efforts of government, the attention of the people have grown to force a higher standard than the regulators may have been able to enforce.

- NAFTA has not played an important role, the companies we work with are doing environmental because they are locating new plants and they require the studies for permits. They are looking for the cheapest projects just to comply with the rules, but there is not interest in environmental issues beyond that. And the same goes for Mexican as for International companies located in Mexico.

Note: Some responses have been edited for clarity.

4.7 Interview Highlights

4.7.1 A Consultant's Perspective

ERM is one of the world's largest environmental consulting & engineering firms with roughly \$500 million in annual revenues worldwide. ERM also has one of the largest practices in Mexico outside of the major water & wastewater environmental consulting & engineering firms that design, build and operate water and wastewater plants for municipalities. ERM employs 42 people in 2008 in Mexico in the Mexico City region and in Monterrey. The private sector accounts for over 95% of its business. Jaime Martinez manages the business and has been in the environmental business for almost 30 years in Mexico, first with the Ministry of Health and the last 17 years in the private sector.

Martinez characterizes the evolution of the Mexican environmental market broadly into phases centered around environmental media. Air was the first priority starting around the 1970s. There were some regulations but not very stringent, said Martinez. U.S. EPA helped a lot with institutional development in the 1970s and 1980s. Most of the attention focused around Mexico City and mostly on automobiles. The result was changing of the fleet and fuel changes, something that didn't much contribute to an environmental industry. Factories were targeted, but most were closed or moved to the north of Mexico, again not much contribution to an environmental industry. (Although now in the 21st century, Martinez said there is a significant amount of remediation activity at these old facilities and they are developed into commercial properties and housing in a brownfields market.)

A second phase in the environmental business focused on water in the late 1980s and large equipment vendors like US Filter and international engineering firms like Degremont, CH2M Hill and Veolia came in to service municipal contracts. However Martinez believes that 80-85% of the wastewater facilities built in the era don't work that well today, and in water in Mexico there are 'problems everywhere... both in scarcity and quality.'

A third phase started in the late 90s focused more on waste and hazardous waste. Vendors set up collection networks and disposal sites to some extent but "little has been done in the reduction

generation of wastes. Two or three years ago a new waste reduction law came in (emphasizing the 3Rs of reduce, reuse and recycle) but it has had no positive effects yet,” said Martinez. Overall in waste, “it’s a capacity issue” said Martinez. “We need infrastructure and there are few facilities.”

The most recent phase that ERM has participated in particularly has been strong growth in remediation, and the site assessments [often called ‘Phase Is’ or Phase IIs for more advanced assessments], analysis, design engineering and compliance issues that precedes remediation. First there are regulations in place which Martinez emphasizes are important, although he says enforcement activity is minimal. What is really driving the remediation business in Mexico that past few years are transactions: property development, brownfields and corporate merger & acquisitions. “Lots of former industrial sites are going to commercial development,” he says, “and it’s nothing to do with the government... There is lots of M&A activity too.” Remediation related to M&A is mostly multinationals buying companies or facilities and cleaning up to avoid liability or industrial companies cleaning up before selling, or just front-end analysis of sites to determine likely cleanup costs or potential liability to account for in the transaction value.

The remediation activity has mostly been responsible for growing ERM’s Mexican operations at about 20% per year for the last seven years. Martinez said 30-40% of ERM’s work is site investigation or remediation, 15% environmental management systems, 15% related to M&A, 15% permits and 15% compliance audits. ERM’s revenues are about \$4 million in Mexico and while Martinez believes ERM has perhaps a 10% share in remediation and corporate environmental C&E, he acknowledges that including the larger water and waste projects in total environmental C&E could bring ERM’s share down to 2-3%. [Note this is consistent with EBI’s estimate of a market of \$160 million.]

In terms of recent growth in the Mexican environmental market, Martinez believes ERM is in the higher tier of growth in its service areas. Remediation-related and corporate environmental work for international firms in Mexico is growing around 15-20%, but adding in the largest segments of water and waste that are likely growing only 3-5% (compared to recent economic growth of 2-4%) puts overall environmental market growth in the 6-9% range.

As to the impacts of NAFTA on the environmental market in Mexico, Martinez believes it “played a role” but that overall “it’s had little effect on the Mexican [environmental] industry.” Martinez believes that his customer segments react in a fairly predictable pattern concerning environmental issues: 1) there is a ‘negative response’ stage of resistance to rules and regulations; 2) there is a ‘have-to-do’ stage of reluctant acceptance to do what is required by regulations; and 3) there is a ‘management stage’ where companies do their environmental management as a part

of all projects or even prepare ahead. Martinez says that NAFTA has accelerated the development of these stages, but only in a few companies and most of them international companies.

In general Martinez, who has participated in many economic, environmental and trade policy discussions in Mexico concerning NAFTA, says that before NAFTA many in Mexico were saying that US companies would come down here to pollute. “This has not happened,” he said. “They have brought their own standards into Mexico,” and generally the standards have improved in Mexico as international companies use their own standards.

For the entire economy Martinez says he has no doubt that NAFTA has had a favorable impact on Mexico. “There is a lot more business” he said “but still there are two Mexicos, the winners and the losers... and internally Mexico has to do something [about income disparity]... but that is a different issue.”

Lastly concerning capacity and the indigenous Mexican environmental industry, Martinez says recently it has been ‘booming,’ There is even significant competition for qualified professionals. However he says there is still great disparity within the environmental industry in Mexico. As an example ERM did an EIA [environmental impact assessment] report for a permit for a company and the cost was \$1 million. Some local firms will do an EIA for as little as \$2-3,000, he said. And Martinez has concerns about the water and wastewater infrastructure that is not really part of his business at ERM: “We are losing the battle” in wastewater treatment, he said. “The performance of the plants is bad... and few [of the designers, builders and operators] have a permanent presence.”

4.7.2 A Regulator’s Perspective

Mark Joyce of US EPA believes NAFTA had some impact on the Mexican environmental industry but “not as dramatic an effect as was expected.” In general, globalization and NAFTA have “brought more international standards to Mexico, ISO standards, the same standards as in US and European companies, and this has had some effect down the supply chain.” In addition the entry of multinationals in Mexico with their operating standards is “nurturing in-country talent” for the environmental industry. They employ “up-and-coming engineers.” Joyce observed this has some negative impact on EPA’s sister regulatory agency. “The government can’t hold on to people,” he said. “They go to the DuPonts of the world” as well as the growing environmental companies. Growth in environmental markets has been apparent, but not what it could be said Joyce. In many cases the authorities still lack the ‘political will to shut down a plant,” he said. And separately, while maquilas have driven a fair amount of environmental work, many maquilas have been losing jobs to China in recent years. While traditional environmental work has challenges, Joyce says there is lots of interest in renewable energy, including its potential for jobs and indigenous industry. On another note, “what’s holding back environmental infrastructure

[water and waste] is money and politics.” Joyce observed that while SEMARNAT has made progress, it has only about 700 people, compared to about 17,000 for US EPA. “It is a question of resources,” he said “but it’s also political.” Joyce is encouraged about the general direction, however, just cautions about expecting change too fast. Mexico has “become much more open and transparent... they have revolutionized the civil service... and the political system is still evolving.”

Note: Opinions expressed by the respondent are his own personal observations and are not official positions of the U.S. EPA or the U.S. government.

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6 Appendix

6.1 List of Survey Respondents

Companies responding to the 2008 EBI survey of Environmental Firms Operating in Mexico included:

ACS Medio Ambiente
AECOM
Boytec Sondajes de Mexico S.A. de C.V.
Bufete De Tecnologia Solar S A
Columbia Filter Co. De Mexico
Conestoga Rovers Y Asociados De Mexico
Consortio Ecológico De México, S.A. De C.V.
Consultores En Prevención Y Mitigación De Impactos Ambientales
Crandall Engineering Ltd.
Dames & Moore De México
Earthbound Environmental Inc.
Earthtech
Ecobiol Laboratories De México, S.A. De C.V.
Emerson Process Management
Enlaces Ambientales, Sc
Enviroprocess S.A De C.V.
Grupo De Integración Ambiental Empresarial, S. A. De C. V.
Hidroagua
Industrias Y Servicios Vic
Invensys Systems Mexico
Kleinfelder
Metcalf Archaeological Consultants
Michael Baker de Mexico, S.A. de C.V.
Proactiva Medio Ambiente México
Sagcap S.A. de C.V.
SCS Engineers
SENES Consultants Limited
Solusolar S.A. de C.V.
Tecnologias para Proteccion Ambiental, S.A. de C.V.
TestAmerica
Total Energy Services S.A. de C.V.
TRG Mexico
Trihedral Engineering Limited
Tú Transformas
Universidad Autonoma del Estado de Morelos
Versar, Inc.

6.2 Additional Data Tables

6.2.1 Statistics on Environmental Segments in Mexico

Figure 6-1 Plantas de tratamiento de aguas residuales industriales 2001

Plantas	#	
En Operación	1,405	95%
Fuera de Operación	80	5%
Total	1,485	100%
Tipo de Tratamiento	#	
Primario	479	34%
Secundario	863	61%
Terciario	61	4%
No Especificado	2	0%
Total	1,405	100%

Source: Elaboración del Autor en base a datos de SEMARNAT-CNA, Situación del subsector de agua potable, alcantarillado y saneamiento, Diciembre 2001, México, 2002, pp. 51-56. * CPD: Condiciones Particulares de Descarga.

Figure 6-2 Hazardous waste treatment infrastructure (Infraestructura instalada para tratamiento de residuos peligrosos)

Infraestructura	Número de unidades autorizadas (2002)
Almacenaje	124
Recolección y transporte	411
Re uso	9
Reciclaje	167
Incineración (Incluyendo residuos industriales usados como combustible alternativo, así como residuos biológico-infecciosos)	44
Tratamiento	114
Deposición (Tiraderos de basura controlados)	4
Total	873

Source: Instituto Nacional de Ecología, citado en: Presidencia de la República; Anexo del Segundo Informe de Gobierno de Vicente Fox Quesada. México, 2002.

Figure 6-3 Percentage growth of Mexican companies that participate in environmental services (Incremento porcentual de firmas mexicanas que participaron en el mercado de servicios ambientales (2001 a 2002))

Segmentos de Mercado	Firmas 2001	Firmas 2002	% incremento
Agua	150	198	32

The Evolution of the Environmental Industry in Mexico 1995-2005

Aire	41	55	34
Suelo	51	75	47
Residuos	152	203	34
Energía	24	31	29
Riesgo & seguridad	31	42	35
Consultaría	208	274	32
Auditoría & certificación	24	37	54
Laboratorios	46	67	46

Source: ECODIR 2001 y 2002. Nota: El incremento anual puede ser parcial debido a aumentos en registros estadísticos de firmas

Figure 6-4 Empresas de servicios ambientales en México

Grupos OCDE-Eurostat	Firmas solo Servicios	%*	Firmas que ofrecen bienes y servicios	%	Total
Control de Contaminación	164	36	137	39	301
Gestión de recursos naturales	369	81.1	112	31.9	481
Firmas que participan en más de un grupo	46	10.1	153	43.6	199
Total	455	56	351	44	806

Source: Instituto Nacional de Ecología. <http://www.ine.gob.mx/publicaciones/libros/442/cap8.html>. Porcentaje de las firmas en operación de cada grupo. Se excede el 100% debido a que algunas empresas participan en más de un grupo y el número total de firmas se calcula después de eliminar las duplicaciones. ECODIR 2002

Figure 6-5 Companies in the Mexican Environmental Market

	Pord. Quim. (Chemical Mfgr)	Otras manufacturas	Otras	Number of Cos	% of SIEM cos
Pollution control	694	3,041	311	4,046	0.73%
Clean tech products	429	236		665	0.12%
Natural resources management	548	580	529	1,657	0.30%
Total	1,671	3,857	840	6,368	1.15%

Source: Instituto Nacional de Ecología. <http://www.ine.gob.mx/publicaciones/libros/442/cap8.html>.
 *Padrón empresarial SIEM (Sistema de Información Empresarial Mexicano). Las firmas contabilizadas son productoras de bienes incluidas en las clases industriales en las cuales se encuentra al menos un bien ambiental, de acuerdo con la clasificación OCDE – Eurostat, independientemente del uso final que éste pueda tener (varias de ellas producen bienes multiusos). La adscripción bajo cada clase industrial en el SIEM sigue el criterio de considerar la actividad preponderante. **Directorio ambiental especializado. Incluye empresas que se consideran a sí mismas dentro del ramo ambiental. 1 Número de empresas que producen en alguno de los grupos A, B o C registradas en el SIEM. 2 Porcentaje del total de empresas registradas en el SIEM (el total es 557,392). 3 Exclusivamente bienes. La clasificación incorpora las categorías incluidas en la Clasificación Mexicana de Actividades Productivas (CMAP). 4 Porcentaje de las firmas en operación en cada grupo. Se excede el 100% debido a que algunas empresas participan en más de un grupo y el número total de firmas se calcula después de eliminar las duplicaciones. 5 Los subtotales para los grupos pueden no coincidir con el gran total debido a que algunas empresas participan en más de un grupo.

Figure 6-6 Plantas Potabilizadoras 2001 Por Proceso Empleado (Drinking Water Plants)

Proceso	Número de plantas
Ablandamiento	19
Absorción	11
Clarificación convencional	203
Clarificación de patente	127
Filtración directa	36
Filtros lentos	30
Membrana	19
Remoción de fierro y manganeso	8
Electrólisis reversible	1
Total	454

Source: Instituto Nacional de Ecología. <http://www.ine.gob.mx/publicaciones/libros/442/cap8.html>.

Figure 6-7 Plantas de Tratamiento de Aguas Residuales Municipales 2001 (Municipal Wastewater Treatment Plants)

	# of plants	Percentage	Installed capacity	Percentage
en operacion	938	82.86%	73852.6	91.60%

fuera de operacion	194	17.14%	6770	8.40%
Total	1132	100.00%	80622	100.00%

Source: CEPAL. Bienes y servicios ambientales en México: caracterización preliminar y sinergias entre protección ambiental, desarrollo del mercado y estrategia comercial. By Carlos Muñoz Villarreal.

Figure 6-8 Capacidad Instalada En Mexico En Energias Renovables

Source (fuente)	Installed (instalada)	In Construction (en construccion)	Planned (en proyecto)	% of Power generated in 2002
Hydro (hidraulica)	9,619	1,686	1,575	17%
Geothermal (geotermica)	838	107	5	2%
Minihidraulica	20	8	143	
Wind (eolica)	2	30	690	
Solar	14	0	50	
Biomass (biomasa)	401	0	15	1%
Biogas	12	0		
Total	10,906	1,831	2,478	
Total National Capacity	36,697			

Source: CEPAL. Bienes y servicios ambientales en México: caracterización preliminar y sinergias entre protección ambiental, desarrollo del mercado y estrategia comercial. By Carlos Muñoz Villarreal. Note: Installed capacity is often different from power generated due to intermittancy and outages.

6.2.2 Statistics on Foreign Direct Investment into Mexico

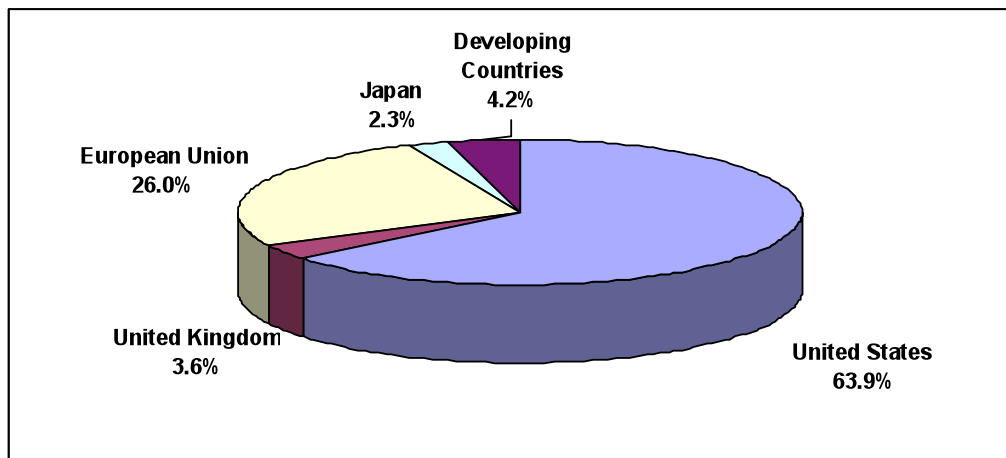
Foreign direct investment in Mexico remained fairly consistent from 1995-2005 (with the exception of a spike in 2001 resulting mostly in the financial services industry). While official statistics on FDI make no mention of environmental services, interviews with companies indicate very modest investment and some movement of persons, but mostly the transfer of expertise and the hiring of local personnel.

Figure 6-9 FDI Flows into Mexico 1994-2005, by Sector, in Millions of U.S. \$

Year	Total	Manufacturing	Services	Agriculture	Mining
1994	10,630	6,195	4,327	10	98
1995	8,337	4,851	3,398	9	79
1996	7,823	4,814	2,891	33	84
1997	12,079	7,298	4,640	10	131
1998	8,325	5,003	3,244	29	49
1999	13,565	9,137	4,207	83	138
2000	17,507	9,879	7,338	92	199
2001	27,059	5,492	21,478	61	29
2002	18,150	7,582	10,234	93	242
2003	13,773	6,204	7,484	11	75
2004	18,361	9,290	9,185	15	142
2005	13,745	7,792	5,955	5	(8)
1994-2005	169,626	83,536	84,382	450.5	1,257
1994-2005	100%	49%	50%	0.3%	0.7%

Source: The Effects of Foreign Direct Investment in Mexico since NAFTA Andreas Waldkirch, April 2007. Department of Economics, Colby College.

Figure 6-10 Mexico: FDI Source Countries 1994-2005, Share as Percent of Total



Source: The Effects of Foreign Direct Investment in Mexico since NAFTA Andreas Waldkirch April 2007. Department of Economics, Colby College. Note: Developing countries are those not characterized as high income countries by the World Bank.

Figure 6-11 Mexican FDI in Selected Manufacturing and Service Sub-Sectors

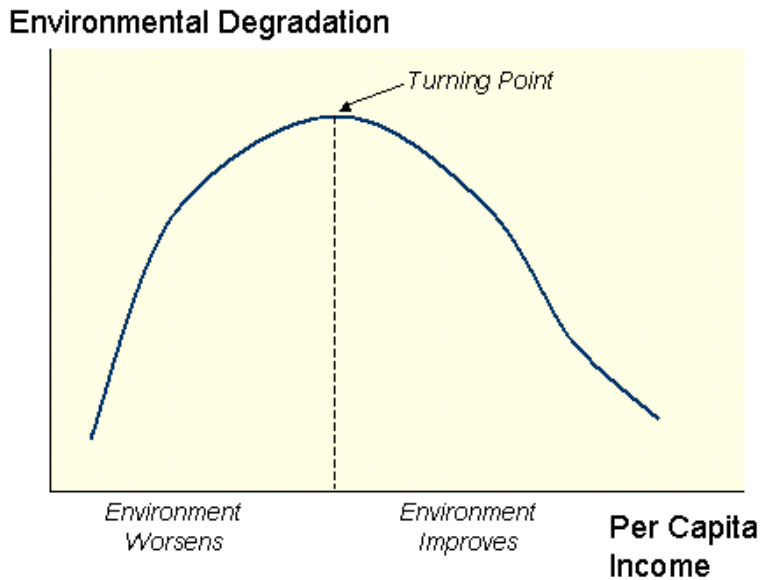
Sector (CMAP code in parentheses)	FDI \$Millions
Food and Tobacco (31)	15,474
Textiles, Apparel, Footwear and Leather	3,121
Wood Products (33)	357
Paper, Printing and Publishing (34)	1,974
Chemicals and Pharmaceuticals (35)	12,143
Clay, Glass, Cement, etc. (36)	1,627
Nonferrous Metals, Iron and Steel (37)	3,029
Metals, Electrical Machinery, Automobiles	40,475
Other Manufacturing (39)**	5,335
Electricity and Water (4)**	1,806
Construction (5)	1,664
Wholesale Trade (61)	10,838
Retail Trade (62)	7,978
Transportation (71)	1,080
Communications (72)	7,577
Banking and Insurance (81)	35,791
Hotels, Bars and Restaurants (93)	4,916
Business and Personal Services (95)**	6,411

Source: The Effects of Foreign Direct Investment in Mexico since NAFTA Andreas Waldkirch April 2007. Department of Economics, Colby College. (**Authors note: These may include some environmental industry companies.)

6.3 Kuznets Curve, an Academic View and Relevance to the Environmental Industry

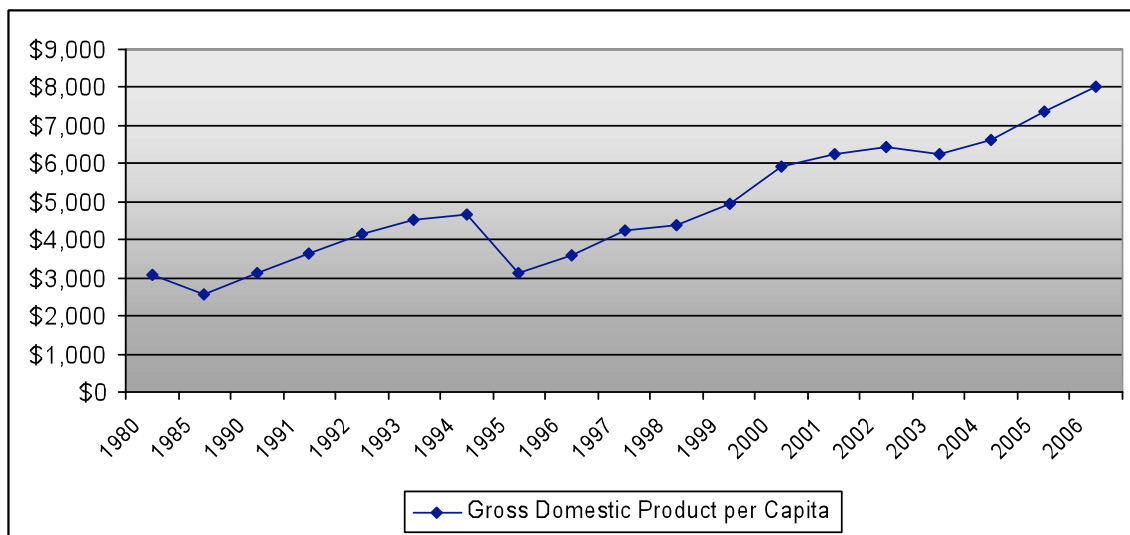
The environmental Kuznets Curve maintains that as per capita income increases, environmental degradation increases as growth objectives trump concerns for environmental quality. This trend continues until a turning point, when increased income creates an enlightened population and/or government that then puts in controls and then the environment improves (or the degradation diminishes) as per capita income continues to increase.

The environmental Kuznets curve



The theoretical turning point in the environmental Kuznets Curve is an income level of \$5,000 per capita, a figure Mexico passed soon after 2000 as illustrated below. However there is little or no evidence that environmental conditions have measurably improved from 2000-2006 as the environmental Kuznets Curve would indicate. While a presentation of pollution statistics in Mexico over this time period is outside the scope of this paper on the environmental industry, suffice it to say that most technical sources indicate an increased level and rate of degradation.

Figure 6-12 Gross Domestic Product in Mexico per Capita, US dollars, 1980-2006



Source: Elaborado por E'dycsa con datos del INEGI. Sistema de Cuentas Nacionales de México. 2006 y Banco de México. www.mexicoenestadisticas.com.mx/oportec/Pib2.xls

Kevin P. Gallagher of Boston University in his “Brasilia Discussion Paper” summary derived from his paper *Economic Integration and the Environment in Mexico: Lessons for Future Trade Agreements*, made the following observations on issues pertinent to this paper on Mexican environmental markets:

Fall-off in Mexican environmental protection spending:

“In the lead-up to NAFTA, Mexico doubled spending on environmental protection and started a much-needed industrial environmental inspection program. However, shortly after NAFTA was signed and fiscal and financial woes set in, attention to the environment nose-dived. According to INEGI [Mexico’s National Institute for Statistics, Geography and Information Systems], since 1994 real spending on environmental protection declined by the equivalent of \$200 million, or 45%. Even at their highest levels, allocations for environmental protection were low in comparison to Mexico’s counterparts in the OECD; as a percentage of GDP, they were only one-fifth the size of other OECD nations. Tellingly, the number of industrial environmental inspections has also decreased by 45% over the same period.” [1994-2000]

Refuting the Kuznet’s curve and pollution haven theories

“Our study confirms the findings casting doubt on the validity of the Environmental Kuznet’s curve hypothesis. There is no evidence that pollution has begun to decrease now that Mexico has passed the theoretical turning point of \$5,000 per capita... [However] fears that NAFTA would create a pollution haven for dirty industry were not justified at all.”

Environmental enforcement does not deter FDI

“If growth alone will not bring with it a long-term tendency toward environmental improvement, or if the turning point is so distant as to make the environmental costs of waiting unacceptable, then governments need to put in place the institutional mechanisms.... Without environmental laws, regulations and the willingness and capacity to enforce them, trade-led growth will lead to increases in environmental degradation.”

Further “the evidence from Mexico suggests that such regulations and enforcement are not generally decisive in most firms’ location decisions... Governments will not be jeopardizing their access to foreign direct investment by enacting strong environmental legislation and enforcing it.”