U.S. – MEXICO BORDER ENVIRONMENTAL ISSUES: IMPACTS OF THE NORTH AMERICAN FREE TRADE AGREEMENT

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ABSTRACT

As full implementation of the North American Free Trade Agreement (NAFTA) Environmental Side Agreement nears, waste generated by the United States industry's production and assembly operations in Mexico along the U.S. – Mexico border threatens to overwhelm Mexico's waste management infrastructure and engender "spill over" impacts on both sides of the border. This could further compromise environmental quality, increase health risks, and mute gains in economic growth throughout the border region. The promise of improved public health and a cleaner environment for the U.S. - Mexico border is predicated on three basic events: 1) a decrease in the concentration of the maquiladoras, 2) wealthier citizens and state and local governments in the border area, and 3) strong NAFTA institutions to improve the enforcement of environmental laws including the coordination and funding of environmental clean-up projects.

Border industrial activity has increased, thereby increasing the creation of hazardous waste; data indicates a sharp increase in hazardous waste production since January 1994. Much waste is still washed down the drain untreated. This reality was the driver for a jointly sponsored forum between the City of Carlsbad and the U.S. Department of Energy (DOE) on August 12 and 13, 1998 in Carlsbad, New Mexico. This forum promoted a discussion of public, industry, and government concerns about hazardous waste management in the U.S. – Mexico border region, as well as, approaches for reducing associated environmental and health risks. Topical discussions included projections of hazardous waste production, strategies by industry to curtail waste production and to improve waste management operations, and concepts for government and industry collaborations.

The key outcome of this forum was interest in collaboration among the region's industries, U.S. and Mexican federal agencies, laboratories and academic institutions, and other solution providers. The goal is to merge existing technologies developed by the U.S. government, which is capable of deploying them to the private sector, thus reducing capital investment in research and development (R&D). This allows for more funds to be directly applied to corporate expansion and privatization opportunities. The issues concerning the environmental and human security in the border region can be addressed by first focusing on the economic issues. The strategy is to make technologies developed in the United States available for implementation in industries along the U.S. - Mexico border. NAFTA eliminates the home country protection and home firm R&D spending and output models. This brings to light a new question: How can the United States government, specifically the Department of Energy, provide technologies to noncompetitive companies on both sides of the U.S. - Mexico border and expect these companies to succeed in a noncompetitive atmosphere?

This question is answered by accepting the argument that these companies can greatly reduce R&D cost, assuming that the companies are not borrowing the capital market to finance R&D. Therefore, one can deduce higher output is achieved and greater profits are generated. Marginal cost should go down, while overall R&D cost generally remain constant. This would shift the paradigm of the economic model to yield production and project completion over continued R&D expenditure of federal funds. The government then can focus attention on specific environmental issues, where it has the most experience. This U.S. investment can be further leveraged by transferring these capabilities to U.S. operations in the U.S. – Mexico border region to minimize, or in some cases, completely prevent the generation of industrial hazardous waste by-products. In so doing, threats to human and environmental security on the border region can be minimized while opportunities for technology commercialization by U.S. industry can be maximized.

Introduction: Trade Globalization and the Issues of Economy

Industrial growth along the border between the United States and Mexico has a central focal point on establishing a continental economy that acts as a catalyst to the legal agreements established since the Mexican revolution of 1910. These agreements have encouraged reforms within Mexico to liberalize its economy in an attempt to enhance the quality of life for its residents and also U.S. residents in the border region. This process accelerated during the mid-80s, Mexico was unable to pay its external debt causing many business people in the private sector of Mexico to question the old standard of import-substitution strategy. They concluded that this

strategy was no longer viable. In 1983, the La Paz agreement was signed, creating the opportunity for industry to flourish along the border. It relaxed import duties on the manufacturing industries sharing the U.S.-Mexico border, thus encouraging the founding of the first *maquiladora* (manufacturing, processing and/or assembling U.S. parts that are shipped back to the United States) industries. Since the signing of NAFTA in 1992 and its subsequent enactment in 1994, these industries have multiplied.

However, as the maquiladoras generate jobs and income, they also introduce industrial wastes into the environment exposing the public and workers to toxic materials. Rapid industrialization, which attracts population growth, can result in significant impacts on human security and the regional environmental security (1)(2). This can be argued by introducing the areas of environmental and human security and their impact on national security (3). Human security, environmental security, and national security are three key elements in a government's success. All depend on each other to maintain sustainable protection and growth for a nation. This paper examines how environmental and human securities impact the populace and the shared environment of the United States and Mexico.

Purpose of the Case Study

The DOE's Carlsbad Area Office (CAO) seeks to mitigate environmental degradation through the deployment of DOE technologies. Because of the wide-ranging nature of the problems on the border and the relational impact of economic drivers of NAFTA, action is needed. The *National Performance Review* (4) and *Blair House Papers* (5) present a vision of how government operates through a citizen-owned and customer-oriented paradigm (6). The U.S.-Mexico border issues should embrace the same philosophy of local, state, and federal agencies working with industry and citizens to improve living conditions, reduce health risks, and enhance local and regional economies. Regional needs have been identified such as energy, water, and environmental management; however, the two other areas may have by-product impacts of technology deployment and commercialization are education and housing.

In 1996, the DOE's office of Environmental Management (EM) began an initiative to advance a program of environmental collaboration with Mexico's government, industry, and academia community. This initiative focused on the international cooperation contributing to EM's ability to solve environmental contamination at DOE sites in the United States. Additionally, the initiative attempts to coordinate, and at times integrate its activities with those of sister federal agencies contributing to their initiatives for political stabilization, trade promotion, technical assistance, international standards, and ensuring environmental justice policies.

This initiative identified priority needs for Mexico. These needs were linked to the economic development for Mexico as well as the local development along the 2000-mile U.S. – Mexico border. Environmental degradation includes the contamination of watersheds and air pollution in large cities, including solid waste pollution. Because of the significance of these issues and their potential public health effects, the governments of the U.S. and Mexico jointly established the North American Development Bank (NADbank) under the auspices of NAFTA Integrated Environmental Plan for U.S.- Mexico border side agreement. The intent of this bank is to finance environmental infrastructure projects for the border region.

Energy consumption in Mexico and the border region is growing at approximately twice the rate of U.S. energy consumption. Mexico is expected to add approximately 12,000 MW of electricity to its power grid, which represents an increase of nearly 35 percent over current capacity. Much of this electricity will be generated using natural gas in an effort to reduce emissions. The Mexican government is also concentrating its energy efforts on cogeneration, improved electricity, hydroelectric power, geothermal power, wind power, and solar power.

Water availability is one of the most critical issues of Mexico's economic development. The northern part of Mexico, which equals almost one-third of the nation's area includes a number of the nation's major industrial centers, has only 3 percent of its water. This region, however, is experiencing rapid industrialization and urbanization, and economic growth. The rapid industrialization and urbanization on the border region has outpaced the development of Mexico's environmental infrastructure, particularly for municipal wastewater and solid waste collection and treatment. Industrial capacity of the border region has increased over 150 percent in the past 14 years.

Economic growth, driven by the maquiladora industry, is similar on the U.S. side of the border, where jobs have been created to service its needs. The increased population and economic growth has placed increased demand for drinking water on both sides of the border. Next to water supply and wastewater treatment, solid waste management is the major environmental priority for the border region. Many of Mexico's municipal landfills are open dumps and are either nearing capacity or overflowing. There are only rudimentary infrastructures to transport, recycle, and dispose of hazardous industrial waste. Environmental needs for Mexico are air pollution control technology, water

and wastewater systems, resource recovery, hazardous and solid waste management. These include equipment, analytical and consulting services, instrumentation for measurement and monitoring, and pollution prevention technologies. Water pollution control equipment and services are currently the largest environmental market segment in Mexico and are expected to continue to represent approximately 40 percent of the total environmental market. The fastest growing markets are in waste pollution control and solid and hazardous waste management. Solid wastes are from manufacturing, mining, and oil processing. Mexico has the facilities to manage only about one-third of the hazardous waste generated.

Industries on the Border: Who Owns Them?

According to the Federal Reserve Bank of Dallas as of June 1997, there are approximately 2,675 registered maquiladora companies, of which over one-half have U.S. invested interests. Registration shows that Mexico owns 1,175, 1,005 owned by the U.S., and 345 owned jointly. The National Institute of Ecology (INE) in Mexico City reported that as of January 1999, the number of registered maquiladoras has fallen to 2,038, of which 582 are Mexican owned, 940 U.S. owned, and 319 jointly owned by the U.S. and Mexico. The drop is thought to occur because the industries may be declaring themselves as national companies in Mexico, thereby eliminating the requirement to ship hazardous waste back to the original suppliers of raw materials (U.S. and abroad). INE believes that the cost to ship this waste back to the generator is approximately $700 per tonne. This represents considerable savings, considering that hazardous waste projections for Sonora alone are approximately 4,850 tonne/year. Where is this waste going? Some believe it is dumped into insufficient landfills and shallow graves or injected into wells. In any case, improved hazardous waste accountability is much needed, especially since the NAFTA environmental side agreements concerning hazardous waste treatment, storage and disposal are not to be in force until January of 2001.

Figure 1 provides some detail as to the number of plants owned by the United States and those owned by Mexico. Additionally, plants jointly owned by the U.S. and Mexico are depicted in this figure. Japan and other owners are represented; however, their numbers are very low compared with to the U.S. and Mexico. Figure 1 also shows the data provided by INE in January 1999 and is depicted by the double asterisk identifier.

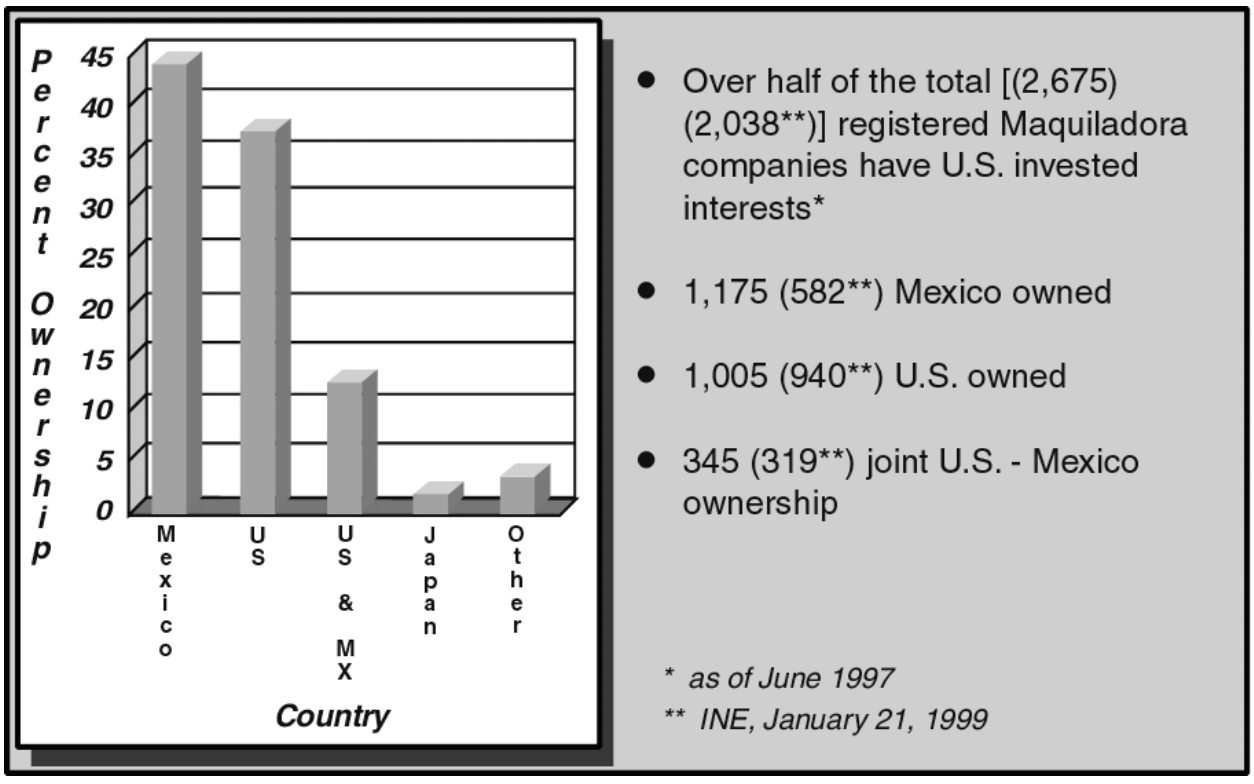

Figure 1. Ownership of Maquiladora Industries Source: Instituto Nacional de Estadística, Geografía Informática taken from Lucinda Vargas, *Business Frontier*, Issue 4 – 1997 (Federal Reserve Bank of Dallas, El Paso Branch).

Socio-Economic Aspects Of the Maquiladoras and the Border Region

What types of industries are represented in the maquiladora districts of the border and what impact have they had on employment and population growth? The more dominant industries are microelectronics, apparel/leather goods, wood products, automotive parts, and metal industries. The principal industrial sectors are electric/electronics, transportation equipment (automobile parts, metal industry/products), and textiles/apparel, which together account for nearly 73 percent of total maquiladora employment. In the microelectronics sector, employment surged approximately 19.1 percent from 1996, while the transportation sector employment grew at a 10.2 percent rate. Clearly, the most rapid growth was seen in the apparel /textile sector with a growth rate of 33.2 percent compared with 1996. Since 1995, the apparel/textile sector has outgrown the other principal sectors, and according to the Federal Reserve Bank of Dallas, represents nearly 19.1 percent of total maquiladora employment.

Indeed, maquiladoras have grown significantly: Raw material processing reached nearly $27 billion during January through September of 1997, up 20.5 percent from 1996. Approximately 97.8 percent of these raw materials were imported. Growth in employment accompanies industrial growth. The El Paso Branch of the Federal Reserve Bank of Dallas estimates that maquiladora employment has increased nearly 20 percent during January through September 1997 compared with 1996. Therefore, the tremendous industrial growth and employment is directly related to population expansion on the border region. Along with industrial growth, economic expansion, and population growth comes the environmental implications. The impact to the environment and human health of rapid industrial expansion and population growth is evidenced by the proliferation of poor communities near industrial complexes. Additionally, only 3 percent of the total water supply are in the border region, but industry use of that water supply has increased nearly 150 percent in the last 14 years -- classic sociological model, which represent the “tragedy of the commons”.

Table 1 provides 1997 information as to maquiladora employment by sector and region. This table provides an excellent summary of the employment growth reflected by the rapid industrialization along the border.

TOTAL	BORDER	INTERIOR	TOTAL	% Change from Year Earlier
	595,410	286,879	882,289	19.7
SECTORS				
Electric & Electronics	246,972	57,815	304,787	19.1
Transportation Equipment	132,495	40,783	173,278	10.2
Textiles & Apparel	37,239	131,180	168,419	33.3
Furniture & Wood/Metal	38,567	5,187	43,754	10.3
Services	25,043	9,853	34,896	14.1
Chemicals	13,718	2,386	16,104	19.8
Food	5,072	6,955	12,027	6.8
Toys & Sporting Goods	12,763	1,024	13,787	27.8
Machinery & Tools	8,406	776	9,182	15.2
Footwear & Leather Goods	6,083	2,757	8,840	18.2
Other Manufacturers	69,052	28,163	97,215	27.3

Table 1. Maquiladora Employment by Sector and Region
January – September 1997

Source: Instituto Nacional de Estadística, Geografía Informática taken from Lucinda Vargas, *Business Frontier*, Issue 4 – 1997 (Federal Reserve Bank of Dallas, El Paso Branch).

Industrial growth causes employment growth that requires large population centers resulting in environmental concerns. The border region is nearly 2000 miles in length and only 125 miles in width. A rapid industrialization and population growth is occurring in a relatively small area over a very scarce water supply. The estimates of maquiladora industries relative to location along the border are provided in Figure 2, as well as the number of plants (registered maquiladora) and employees by region. The total estimated amounts of effluents introduced into the biosphere are also reflected in this figure. For example, Baja California has approximately 740 maquiladora plants that employ nearly 162,000 workers and produce about 17,000 tonne per year of hazardous and toxic wastes.

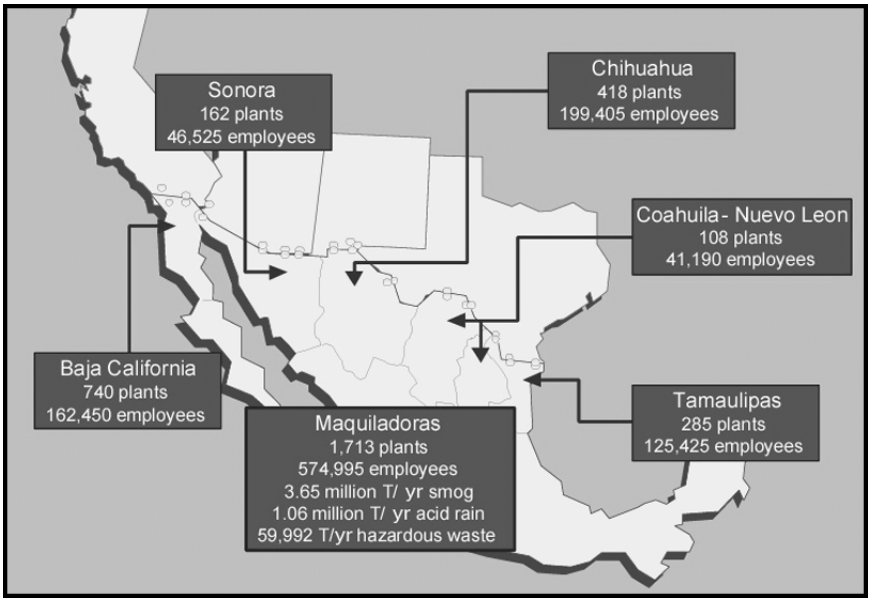

Figure 2.
Estimates of Maquiladora Industries
Source: Instituto Nacional de Estadística, Geografía Informática taken from Lucinda Vargas, *Business Frontier*, Issue 4 – 1997 (Federal Reserve Bank of Dallas, El Paso Branch).

Industrial Emissions and Effluents

Research has identified five distinct industries (microelectronics, apparel/leather goods, wood products, automotive parts, and metal industries) that are widely distributed along the 2000 mile border. Since the microelectronics industry is active throughout the border region it is used as an example in figure 3 to illustrate particular pollutants and emissions relative to environmental degradation.

Information collected in the *Environmental Protection Agency's Toxic Release Inventory* and *The Complete Twin Plant Guide*, Volumes I, II, III, Solunet, 1997 Edition, provides a better understanding of the types of wastestreams generated from this industry. The major effluents are tichlorethane (TCA), tichloroethylene (TCE), xylene, ammonia, acetone, copper, zinc, and sulfuric acid. Figure 3 also depicts the relationship of these identified effluents to the medium they seem to effect.

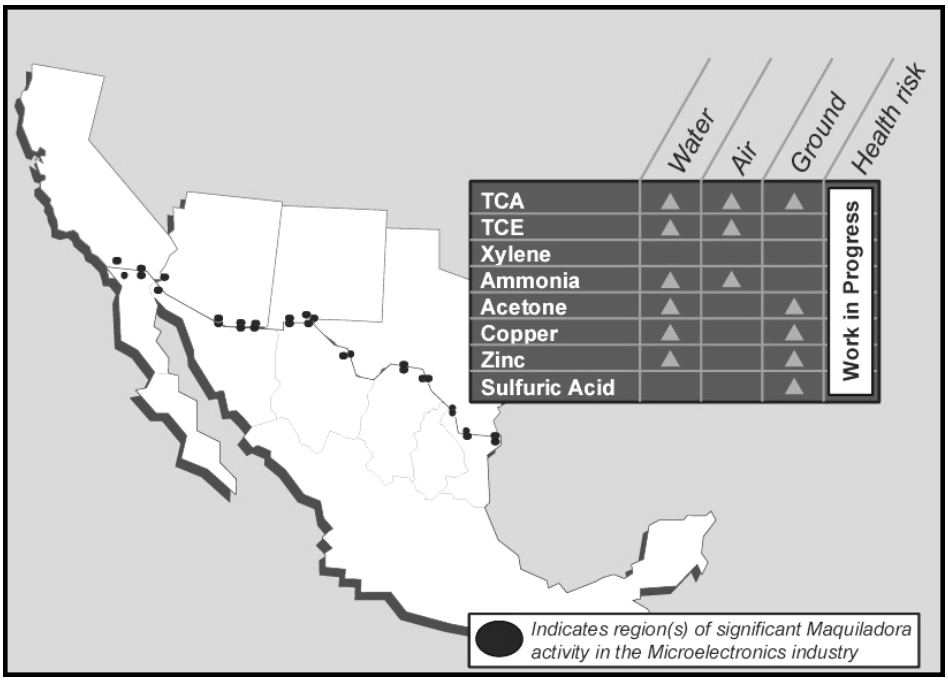

Figure 3. Major Effluents Attributed to the Microelectronics Industry
Source: The Complete Twin Plant Guide, Volumes I, II, III, Solunet, 1997 Edition; Review of the Maquiladora Industry and Waste Emissions, ASL, 1997; EPA Toxic Release Inventory, website: www.epa.gov/airs/afsd-co.html.

Given the argument above, the microelectronics industry may be a significant contributor to the environmental impacts widely distributed along the border. It is reasonable to assume that the DOE would focus attention on demonstrating their technologies in this industry. Both the EPA and the INE of Mexico indicate that the volumes of waste generated are not known and are not under continuing accountability. However, the specifics of what particular wastes are generated and where they are generated are known, allowing DOE to identify technologies that address the various waste streams in many of the industries.

Matching DOE technologies to specific effluents discharged from the identified industries were reported in a DOE study published in 1996 (7). Of the existing 385 technologies investigated, 179 were found directly applicable to hazardous waste management. Eighty-five of the 179 could be applied to the border region and were found to be readily available for commercialization or privatization. These technologies mitigate environmental degradation, either through waste minimization activities, environmental remediation, or waste management activities. The decrease in human health issues would be a measure of their performance. Enhancing human health on the border by reducing the risk of environmental contamination is the ultimate goal of the CAO project. Specific performance could be measured by introducing technologies that treat a specific waste stream, then measuring reductions in specific illnesses, such as; respiratory infections, toxic poisoning, or hepatitis (as monitored the Federal Health and Human Services Agency and environmental groups).

Human Health Issues

Figure 4 shows the dominant health problems associated with the four U.S. Border States. These illnesses can be used as a performance measure against the deployment of technologies. The research in this area has become fairly sensitive, since industries will not disclose any liabilities that concern their particular operations, environmental issues, and the associated human health risks. However, the goal of the DOE CAO is not to attack the industry, but to offer demonstration projects that allow industry to remain profitable, while simultaneously addressing their pollution problems.

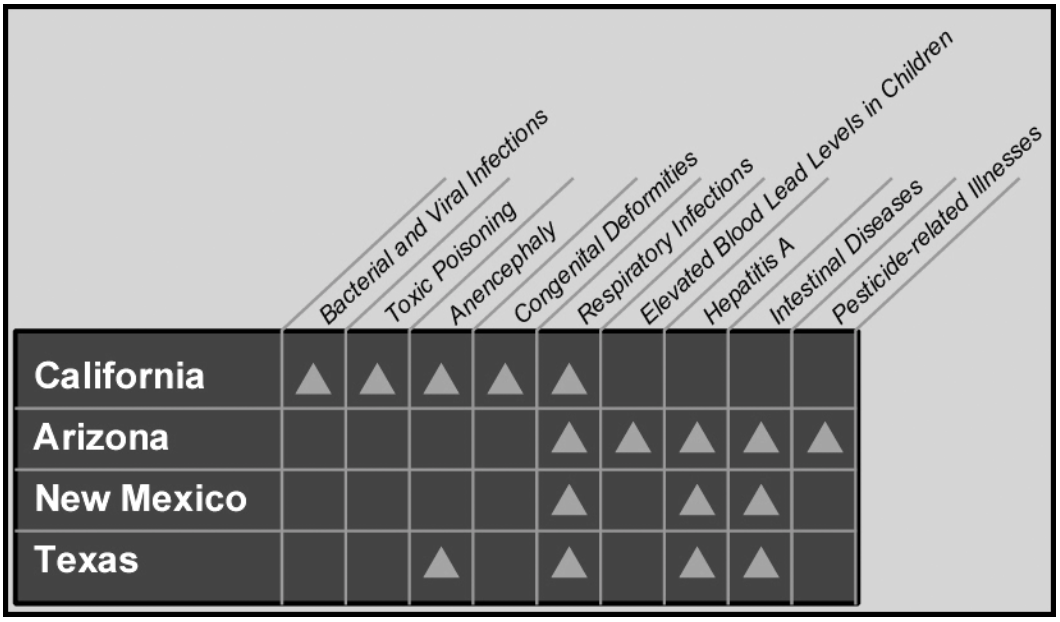

Figure 4. High Incidence Health Problems Along U.S. – Mexico Border
Source: U.S. EPA, US - Mexico Border XXI Program Framework Document, EPA160-R-96-003, October 1996.

The DOE CAO strategy is to have the Federal Health and Human Services monitor changes in these public health conditions to ascertain whether or not the deployment of DOE technologies are reducing health risks. This information relates specific diseases associated with each state. Are these diseases related to specific industrial operations or processes? If so, then mitigating the pollution output may result in a decrease in the reported diseases in these categories overtime.

The case study provides information on environmental and human security for the border region. The implementation of the Environmental Side Agreement of NAFTA begins in January 2001; there is concern that the maquiladoras will not have the infrastructure in place to treat, store, and dispose of hazardous waste generated in their districts. Additionally, with the population explosion occurring along the border communities that support the maquiladoras, basic living standards are poor and there is a greater health risk for the populace. Economic conditions are also deteriorating (no heating fuels, electricity, and utilities). Degradation in environmental security is now impacting human security. This is the critical issue that the United States and Mexico are jointly addressing. NAFTA, and its environmental side agreements help focus on the efforts of environmental degradation directly affecting each nations' progress. Nations can now redefine their roles to deal with these problems effectively based on agreements reached in the trade agreements such as the NAFTA, and other environmental conventions. For example, the Rio Earth Summit was important because it helped set the tone for environmental awareness and economic stability for the evolving global society.

One of the more important lessons from this summit was summed up in an address by Elinor G. Constable, Department of State, Assistant Secretary for Oceans and International Environmental and Scientific Affairs. Ms. Constable stated that "one of the most important lessons is - as stated at the Rio Earth Summit - that environmental protection and economic growth can be mutually supportive goals and must be pursued in tandem."(8) Certainly, we need to ensure that the world is safe (both politically and environmentally) and economically strong, especially when our (United States) interest is at stake**.** The Environmental Protection Agency (EPA), DOE, and other federal, state, and local agencies are now reinventing how government does business by building coalitions that effectively work with communities involved in border issues. This is the topic of the *Blair House Papers* and the *National Performance Review*: Building partnerships and providing community solutions through a sharing approach. This logic is reflected in the case study conducted by the DOE CAO.

The DOE's CAO is involved in hazardous waste initiative, because it is centrally located along the 2000 mile border and is the only federal facility within 2 ½ hours drive of the border that boasts a technical capability in hazardous waste management. Therefore, the DOE CAO believes it can play an important role in the process, partnering with EPA and other agencies, provided that its model is incorporated into the overall federal strategy.

Merging Reinvention Perspectives With Case Study Initiatives: Establishing Interest

Responding to increasing national interest and the concerns of local and regional communities in the U.S.-Mexico Border Region, DOE CAO and the City of Carlsbad, New Mexico, sponsored a forum to discuss how to leverage DOE's science and technology investment to improve the environment in the border region. DOE-CAO worked closely with the City of Carlsbad in the planning and coordination of the forum, *The U.S. – Mexico Border Region Forum: Application of U.S. Department of Energy Technologies to Hazardous Waste Needs* (9) was held on August 12-13, 1998 in Carlsbad, New Mexico. The forum discussed the border region's key environmental problems and health issues and suggested ways to apply the DOE's environmental management technologies to these problems. Participants included U.S. elected officials and their staffs; representatives of U.S. and Mexican local, state, and federal government offices; scientific leaders from the DOE's national laboratories and Mexico's research institutions; U.S. and Mexican university researchers; and representatives of U.S. and Mexican industries.

The forum had three objectives:

1. Raise the awareness of hazardous waste management issues of the U.S. – Mexico border region as identified in the La Paz agreement of 1983.
2. Identify opportunities for applying the DOE's environmental management technologies to improve hazardous waste management throughout the border region; and
3. Stimulate binational discussion on the benefits, necessity, and importance of developing a path forward for leveraging the U.S. investment in environmental science and technology for improving border region conditions.

The broad participation in the forum reflected strong interest to deploy the U.S. science and technology investment to solve key environmental problems of the border region. A clear binational consensus emerged: The DOE's innovative environmental management technologies offered promise for addressing the border region's needs. Other key findings and conclusions are highlighted below.

- U.S. Congress Representatives concurred with the DOE's efforts to apply its technologies to help solve the border region's problems and encouraged the DOE-CAO to continue the leadership role.

- The Government of Mexico requested U.S. assistance in reducing hazardous waste production in the border region; improving the safety and efficiency of hazardous waste transportation, storage, and treatment; and preparing environmental regulations for the management of hazardous wastes.
- The Government of Mexico emphasized Mexico's urgent need to reduce hazardous waste production levels and requested U.S. participation. To that end, the Mexican government made a commitment to host a binational workshop in April 1999 in Mexico to develop a detailed breakdown of hazardous waste management needs.
- The DOE, EPA, and the Department of Health and Human Services jointly acknowledged the need to work together to resolve border region problems. The EPA stated that it would work to form an interagency alliance with the DOE to leverage the DOE's technologies improving hazardous waste management throughout the border region. It confirmed that the DOE's efforts are complementary, not duplicative, of the EPA's ongoing border region environmental programs.
- The forum's six working groups independently concluded that the DOE's technologies offered promise for solving hazardous waste problems in the border region. The participating legal experts agreed that there are no insurmountable legal barriers that prohibit the implementation of a joint U.S. – Mexico commercialization program for solving border region needs.
- The DOE-CAO affirmed its willingness to serve as the DOE's lead office for U.S. – Mexico collaboration on border region hazardous waste management issues

Forum Structure

The goal for the first day was to develop an improved understanding of the border region's key environmental management and health issues. Representatives from DOE laboratories and Mexican industries were invited to summarize innovative technologies useful for solving similar environmental management problems. Other topics included:

- U.S. Congressional (bipartisan) views on the border region's social, economic, and health issues
- U.S. and Mexican government officials' views on border region environmental and health issues
- DOE Washington D.C. Headquarters' discussion of its developed technologies
- U.S. and Mexican laboratory presentations of their technology

The second day included a joint U.S.-Mexico planning session. The goal of this session was to develop a path forward for leveraging DOE's science and technology investment in solving key border region hazardous waste management problems. The results of these activities are reported in proceedings of the *U.S. Mexico Border Region Forum: Application of U.S. Department of Energy Technologies to Hazardous Waste Needs*.

The DOE Carlsbad Perspective

The outcome of the forum includes a process to select DOE technologies for demonstration and testing at border region industrial and municipal sites. This process includes full participation by stakeholders (citizens and industrial leaders). The selection process is implemented over an initial two-year phase. Demonstration projects will be selected during this phase. In this way, DOE investment in technology development will be quickly recovered by acquiring additional technology performance data, improving subsequent technology deployment at DOE sites. Technology demonstration projects will also support the commercialization process; they also help to recover the investment of public funds for technology development. The experiences and knowledge gained from the technology demonstrations will be integrated into the initiatives strategic business plan. DOE-CAO will develop the strategic business plan with input from U.S. and Mexican industry sectors; federal, state, and local governments and offices; citizen input through public hearings, public project involvement, and interest groups. DOE-CAO believes that its effort will also support the Interagency Coordination Committee for U.S. – Mexico Border Health and EPA initiatives by providing DOE technologies for reducing or eliminating hazardous and toxic emissions. The environmental health community believes these technologies reduce public health risks.

This effort should also focus on issues of environmental and human security. By providing this focus, the DOE CAO is designing a program that provides solutions to communities (*Blair House Papers*) through the deployment and commercialization of technologies. Additionally, the CAO is forming working partnerships and alliances with agencies such as the EPA, Department of Health and Human Services, local governments, international agencies such as the INE of Mexico, and others. This effort incorporates the spirit of the *National Performance Review* and *Blair House Papers*, and also reaches out to stakeholders through public participation. This grassroots effort is consistent with the concept of citizen-ownership and customer-oriented government. Synthesizing these two concepts into one "new" paradigm is an effective approach to providing a mechanism for programmatic success.

DOE CAO is aware of the impacts of environmental degradation on human security. Great care is taken to identify the human health issues along the border and the relationship of these issues to environmental degradation and of treating the taxpayer as a citizen-owner and a customer.

Forming alliances with other agencies on the federal, state, and local government scale strengthens the argument of partnerships and community solutions. The CAO believes that mechanisms must be in place in the form of grants, cooperative programs, and contracts that result in a downward flow of funds to assist communities in providing their own solutions. By acquiring bipartisan support in the Congress, the project gains public support especially with the involvement of the Border Trade Alliance (BTA) and other advocacy groups. This certainly allows the people access to government (pluralism) while providing political insulation for elected officials. However, in this case would political insulation be appropriate? Republicans and Democrats, including the Greens, have provided strong support for the CAO's border initiative. Therefore, I can conclude that the case study has adequately addressed the issue of pluralism and federalism.

Deploying technologies in the border region where environmental degradation is more pronounced and meets the principal purpose of government action. The objective is to mitigate environmental degradation to ensure a reduction in health risk for the inhabitants of the region. Introducing technologies into the industries will also enhance the socio-economic, long-term sustainability for the region and interior communities by providing a better quality of life and better public health.

Additional research is required to ascertain the impacts of environmental degradation on education, health and housing activities. Most important is the question of education and health. Could environmental degradation have an impact on education to the extent that the gains achieved in free trade are mute? Does environmental degradation in the border region impact health care costs? The CAO believes that these kinds of questions can be addressed in future research. For example, education enhancement can be a performance indicator associated with the deployment and successful commercialization of federal technologies. Ultimately, DOE can actively play a role to mitigate environmental degradation on the border while assisting other federal agencies in reducing the overall cost to national health care and simultaneously enhance the educational future for our children!

The DOE CAO has taken a leadership role in providing an avenue for DOE technology investment to be capitalized through commercialization, privatization, and demonstration projects pertaining to hazardous waste management systems. Currently, DOE CAO is teaming with DOE Headquarters and the complex to ensure successful implementation of the program in conjunction with other agencies, state and local governments, Congress, and advocacy groups such as the BTA. Additionally, DOE CAO is seeking partnership agreements with the academic community to further research and analysis opportunities that encompass hazardous waste technologies, education, housing, transportation and other issues that plague the border region.

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