

HAZARDOUS WASTE MANAGEMENT IN THE
UNITED STATES – MEXICO BORDER REGION:
MORE QUESTIONS THAN ANSWERS



Prepared and Published by:

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Mexico City, D.F
Mexico.

and

Texas Center for Policy Studies
Austin, Texas

*May, 1999
preliminary version*

Acknowledgements

The organizations responsible for this report would like to thank the C.S. Mott Foundation, which in addition to supporting the Border Trade and Environment Project of the Texas Center for Policy Studies, made the elaboration and publication of this document possible. In addition to the authors, Spanish lawyer Ignacio Gavilán Agustí participated in the translation and initial preparation of the document. Also dedicating time and effort were Mary Kelly, TCPS executive director, Alicia Isaac-Cura, TCPS office manager, and Olinca Marino, information coordinator for Programa La Neta. A special thanks to all of these individuals.

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I. INTRODUCTION

The large border region between Mexico and the United States is one of the clearest examples of an economic integration between two countries with profound economic, social and judicial asymmetries. This process has had severe environmental, social and economic consequences which have not been dealt with in an equitable and bilateral manner.

The process was initiated in 1964, when the United States unilaterally broke the Agreement on reception of Mexican workers, known as the "Bracero Program" and Mexico pronounced the 1965 "Decree of Industrialization of the Border Zone." This decision imprinted a model in which each country separately pursued its own policies for a problem which became undoubtably binational in scope.

In essence, just as the United States freed itself from excess Mexican workers in 1964, in large part because of a downturn in the economic cycle, Mexico attempted to retain this flux of workers by decentralizing industrial production toward the north, taking advantage of its giant neighbor and the so-called competitive advantage of the area.

Since then the industrialization process, better known as the maquiladora export industry, has taken on its own weight, extending itself to the south of Mexico, Central America and the Caribbean, with it all of its adverse environmental impacts (*see Annex I. Maquiladora Industry in Mexico*).

The maquiladora production and trade model deepened Mexico's dependency on the industrial dynamic of the United States. Until the 1990s, the increase or decrease of maquiladora production was tied directly to the increase or crisis of U.S. industries as typefied in 72-73, 83-84 or 90-91. After 1992, the expansion of the maquiladora industry toward the south as well as its expansion into new sectors like autoparts, services, or textiles increased, deepening its dependency on the investment policy of other countries, principally the United States, and reproducing a model of investment without adequate requirements of environmental compliance.

A terrible consequence of the development model is the accumulation over decades of an enormous environmental contamination produced by the toxic wastes of the industrial and urban processes of these maquiladora enclaves. Under a policy where all manner of economic and infrastructure incentives have been granted to attract foreign investment with practically no performance-related requirements (such as compliance with labor laws or environmental laws in their own countries, nor a

certain percentage of national inputs), nor with any requirement to provide environmental infrastructure nor with complete compliance with Mexican environmental and labor legislation, the environmental debt of the border region is enormous.

The history of the last 33 years has shown that despite the good intentions of the governments on both sides of the border, reflected in the "La Paz" Agreement, or in various border environment plans, or even in the parallel Agreement on Environmental Cooperation of NAFTA, the specific actions to adequately resolve the problems associated with toxic and hazardous wastes have not been taken. These issues have been discussed through official and unofficial channels repeatedly since the signing of NAFTA, and a series of agreements and actions have taken place, but these have not responded to the demands made over the last six years by social and environmental organizations from both sides of the border.

This document highlights the magnitude and nature of the hazardous and toxic waste problem in the border area, but above all focuses on the challenge it represents for the citizens to increase their own voice, so that public policies force compliance with commitments made by our governments in the name of binational cooperation as well as the commitments spelled out in NAFTA itself to adequately enforce environmental laws.

To counteract the problem of toxic and hazardous wastes in the northern border region implies overcoming the misguided focus and repeated delays with which it has officially been treated. A change in focus begins, but does not end, with the real enforcement and compliance of the law and especially the specific regulations dealing with the obligatory registry of the processes, generation, use and management of hazardous wastes in Mexico, including the return of these wastes to their countries of origin on the northern side of the border.

The lack of a real, credible and accessible registry in Mexico, combines dangerously with official Mexican programs which treat the subject of enforcement and of publicly accessible data as taboo and fail to comply with international commitments, such as those established in NAFTA. This failure is exemplified by the absence of a PRTR -- Pollutant Release and Transfer Registry or RETC -- an absolutely necessary component for the Environmental Audit process, for the clean-up and rectification of environmental problems and for general civic environmental education. It is urgent to abandon the naïve focus, or marriage of convenience with industries, to maintain only a voluntary registry and instead require an obligatory registry to sustain a truly public environmental policy in regards to management and elimination of hazardous and toxic wastes.

A change in focus in public environmental policy would require, from the beginning, complete transparency in how hazardous wastes are managed, as well as the recognition and implementation of the right to information that we have as citizens. This "right to know" is implicit in the obligation that the Mexican State may soon acquire in the coming months to guarantee the right of citizens to live in a safe environment and guarantee sustainable development, once the ratification process of state legislatures culminates in the reform of Articles 4 and 25 of the constitution, which began in the Mexican Congress in December of 1998.

Such a constitutional change would represent an advance in the fight to lessen the existing judicial asymmetries between the U.S. and Mexico with respect to the right to know, judicial interest and effective means to enforce laws. It would also represent an advance toward true bilateral cooperation to resolve this environmental debt that threatens the well-being and sustainable development of the border region.

Although the weakest link of this problem resides on the southern side of the border, its binational and transboundary character obligates responsibility not only of Mexican national agencies, but in the trinational environmental and trade commissions, as well as in the U.S. government. Nonetheless, the experience of citizens of these three countries has shown us that to achieve a change in the policies and official actions, it is important to vindicate the right of citizens to participate more actively before our respective governments, demanding compliance with national laws and international commitments.

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II. HAZARDOUS WASTES ALONG THE U.S-MEXICO BORDER

Binational Context of Hazardous Wastes

The industrialization of the U.S. - Mexico border region over the last 35 years has been accompanied by the generation of millions of tons of hazardous wastes. Defined in both countries as waste that is corrosive, reactive, ignitable or toxic, these wastes represent dangers for public health and the environment, more so if improperly managed. Hazardous waste can be generated at each stage of the production process, as well as in the use and disposal of manufactured products. Thus, many of the industrial products themselves -- tires, batteries, oils and solvents -- in turn present potential hazards to human health and the environment once used, deposited, incinerated or treated.

Industrial production has flourished in Southern and Central California, along the Gulf Coast and in the central corridor of San Antonio, Austin and Dallas-Fort Worth in Texas, and to a lesser extent in Arizona and New Mexico. In Mexico, the growth has been more spectacular, as cities such as Tijuana, Ciudad Juárez and Matamoros now count hundreds of industrial production facilities known as "maquiladoras" within the municipal area. In addition to these newer facilities, more traditional sectors such as petroleum exploration and refining, metal and other mining and steel manufacturing are also present in both countries. All of these facilities are involved in the generation of "hazardous" waste, with real and potential negative impacts to workers, neighborhoods, land, water, air, flora and fauna. Some of the documented problems on both sides of the border have included:

*Hazardous waste dumped illegally just outside city limits, often in unique desert habitat;

- *Exposure of neighborhoods and communities to abandoned or closed waste sites or industrial facilities with hazardous waste which hasn't been cleaned up;
- *Hazardous waste from major industries brought to municipal landfills which can not safely store such wastes;
- *Transportation spills and accidents involving hazardous wastes, often by illegal transporters lacking safety equipment, response training or liability insurance;
- *Exposure of workers in factories to hazardous wastes with disastrous, sometimes fatal, health effects;
- *Water pollution due to inadequately treated industrial process wastewater and runoff from hazardous waste stockpiles;
- *Disinterest and/or opposition to the participation of environmental groups and communities in decisions about hazardous waste management, who nonetheless often are able to stop the issuance of permits to operate these permits, or temporarily or permanently close these facilities.
- *Emergency response units in border communities insufficiently trained, equipped, coordinated and open to public input, often leading to delays in response to industrial accidents, spills and explosions.

One positive development in both countries has been the relatively recent focus on "pollution prevention", including source reduction, reuse and recycling. Rather than producing hazardous wastes as part of their production process, pollution prevention and source reduction approaches focus on minimization and where possible, elimination of hazardous wastes altogether by simply not producing them. Both the U.S. and Mexican governments place source reduction as the top priority in their hazardous waste management regimes, and many large industries have significantly reduced hazardous waste generation, at least in part because of this new focus. Many industries also find ways to reuse or recycle the hazardous waste they produce, either at their own plants or at commercial facilities.

Nevertheless, most industries continue to operate in the same manner that they always have and the search for adequate recycling, treatment and disposal facilities continues. This is because without strict enforcement of environmental regulations in both countries and without clear economic and legal incentives for industries to reduce pollution at the source, the possibility for significant reduction is limited.

In addition, there is significant disagreement over what constitutes pollution prevention and recycling. For example, is the burning of hazardous wastes in cement kilns as a replacement for more conventional fuels a form of hazardous waste minimization and recycling? Or is it, as many communities opposed to burning hazardous wastes maintain, just the elimination of one waste for the creation of another in the form of toxic air emissions?

This report takes an in-depth look at the factors which have contributed to the existence of hazardous waste problems in the U.S. - Mexican border region. These problems include: the lack of basic hazardous waste management infrastructure, the lack of information, the lack of an overall hazardous waste management needs assessment, and the failure to effectively enforce environmental laws. It also presents information about how much hazardous waste is produced along the border and where it goes. Finally, it offers some recommendations and guidelines to the public and environmental officials for promoting more responsible management of hazardous waste, and, perhaps more importantly, promoting pollution prevention.

The Economic Roots of Hazardous Waste

Many of the problems associated with hazardous waste management along the border are attributable to the economic development strategies Mexico enacted in an attempt to increase employment and exports. Mexico's industrialization in the 1960s and 1970s was based upon the development of PEMEX -- the national petroleum company -- and the maquiladora program, established in 1965. PEMEX's operations developed with few environmental controls and relative impunity from enforcement. The maquiladora program has been a successful attempt to increase foreign investment and develop industrial in the northern border.

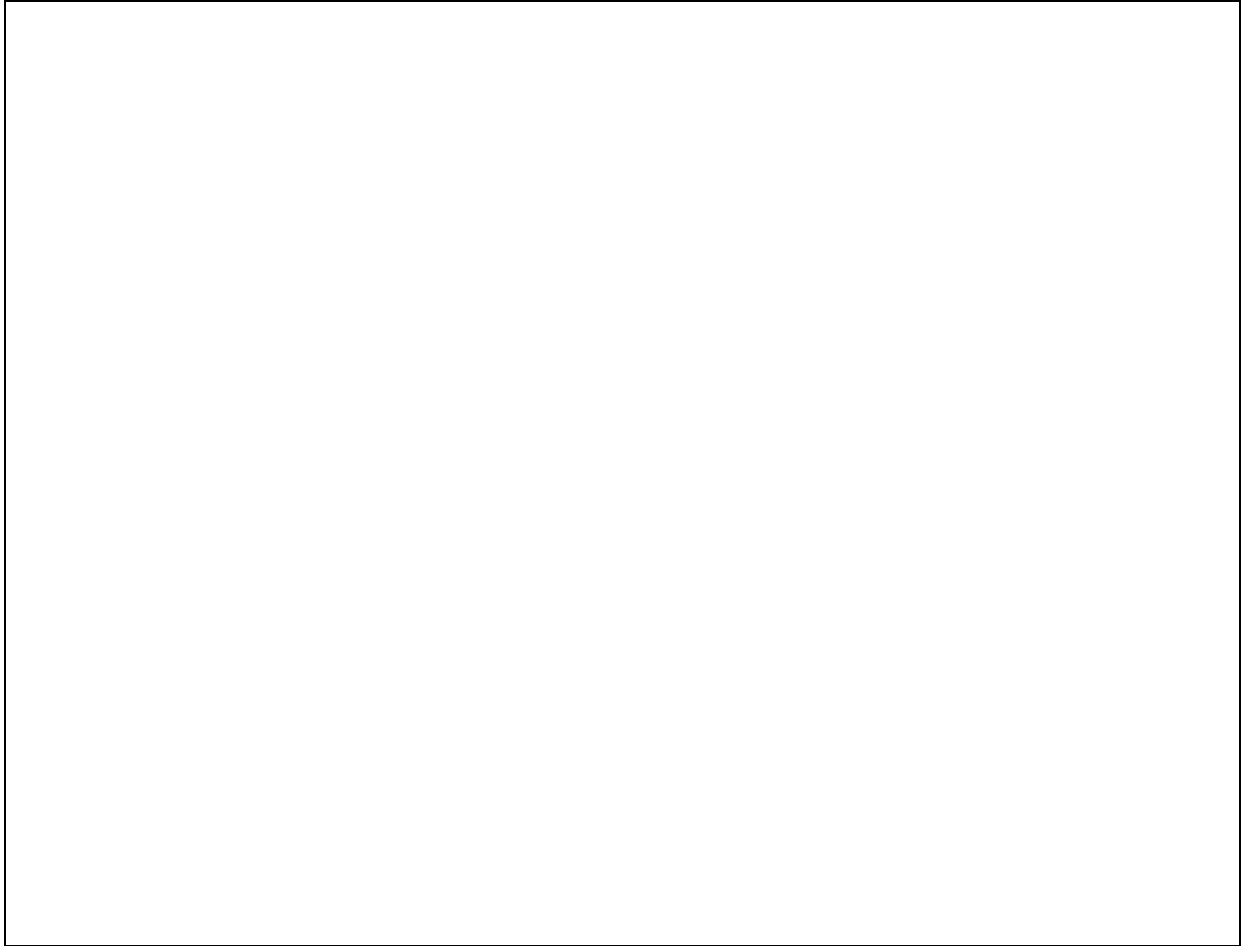
Nevertheless, these strategies were generally implemented without the development of basic infrastructure -- wastewater treatment plants, hazardous waste management facilities, water treatment and safe roads. At the same time, because maquilas paid few, if any taxes, local governments have not been able to provide such basic services. Most of the revenues generated from maquila production have flowed to Mexico City, and have not been redistributed equitably to the border region. During the debate on NAFTA, the estimated cost to provide environmental infrastructure for the border -- clean water, treated wastewater and solid and hazardous waste facilities -- ranged from \$8 to \$20 billion, with most of that need in Mexico.

Although the maquiladora program began officially in 1964, its take-off did not begin until 1974 and it was only 14 years later that Mexico passed the 1988 General Law of Ecological Equilibrium (LGEEPA), which contains basic policies and regulations on the management, export and import of hazardous Wastes. Because Mexico had neither the regulations nor the facilities to manage hazardous waste, Annex III of the 1983 La Paz Agreement signed by the U.S. and Mexico allowed maquiladoras to return hazardous waste to the country from which the raw materials were originally imported, usually the U.S., a provision which became a requirement under the LGEEPA. In addition, the 1988 General Law prohibited the

importation of hazardous waste into Mexico for final disposal, while allowing hazardous waste imports for recycling and treatment.

Even after passage of the 1988 law, Mexico has attracted industrial development by keeping both labor and environmental costs low, in part through limited enforcement and not requiring adequate environmental infrastructure. As long as there is not adequate enforcement, incentives to dispose of waste properly do not exist. In addition, while state and local environmental officials may more closely monitor the day-to-day operations of industries in their areas, enforcement of maquiladora regulations and hazardous waste regulations is a federal issue in Mexico. Local officials must depend on PROFEPA -- the federal environmental enforcement arm -- to inspect and enforce these regulations. But PROFEPA has extremely limited human resources to oversee environmental regulation compliance at the 3,000 maquiladora plants, as well as national industries.

Every time Mexico suffers through a peso devaluation -- as in 1982, 1987 and most recently, December of 1994 -- the number of maquiladora employees and plants jumps (see Figures 1 and 2). Today, there are about 3,000 such plants employing one million people throughout Mexico. While these peso devaluations help keep wages low and thus attract more investment, they also add an incentive to dump illegally because the costs of proper management of hazardous wastes in the U.S. remain high -- and must be paid in dollars. Moreover, the peso devaluations and resulting economic crisis have shrunk the Mexican federal government's resources available for building basic environmental infrastructure like wastewater treatment plants and for enforcing environmental rules.

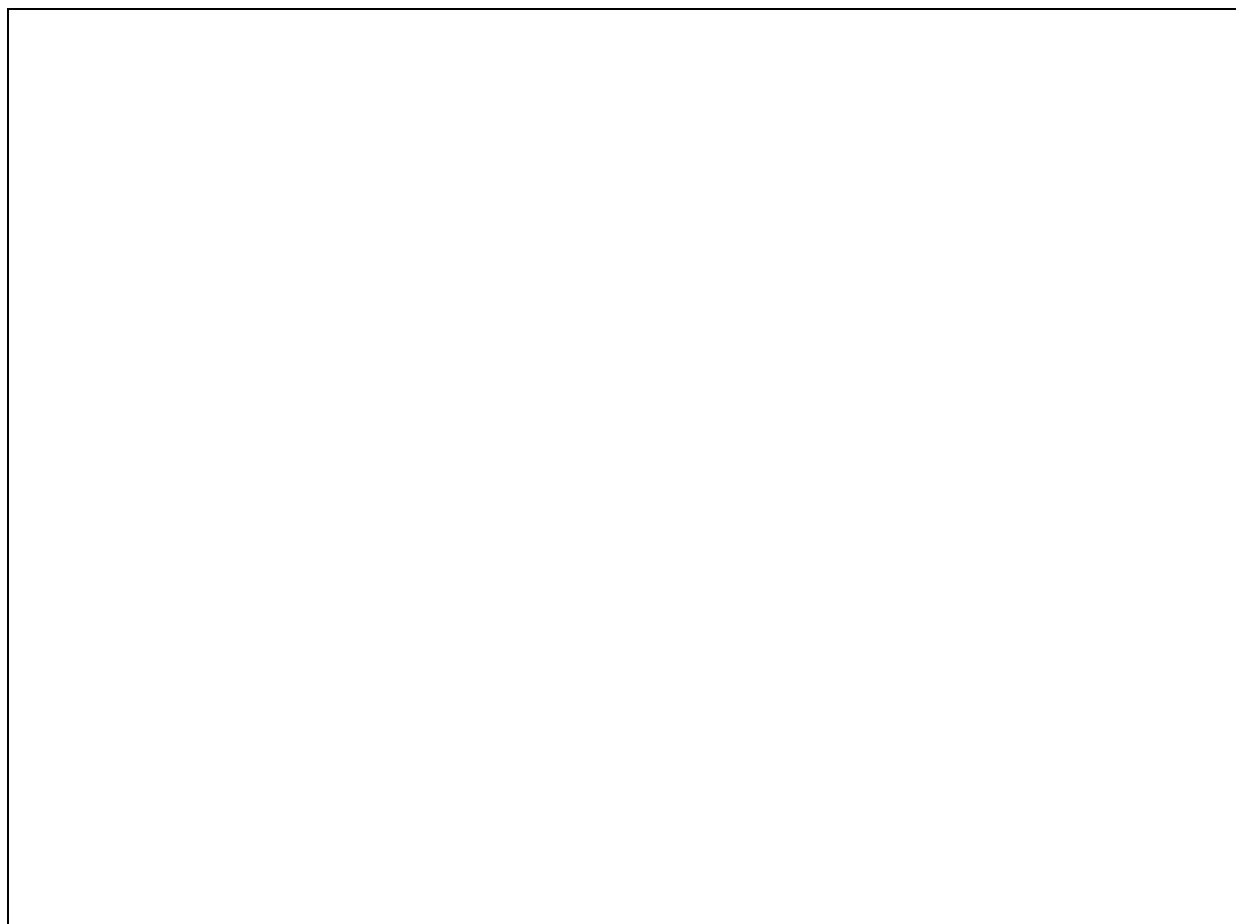


Source: INEGI, Estadísticas de la Industria Maquiladora de Exportación, 1999.

NAFTA and Hazardous Waste

The North American Free Trade Agreement, which went into effect in 1994, also affects management of hazardous waste. First of all, under NAFTA, hazardous waste is considered a "good." Under NAFTA, neither country can restrict imports of a good, including hazardous wastes. However, under Article XI of the General Agreement on Tariffs and Trade (GATT), a country can restrict imports of a good if it is "necessary to protect human, animal or plant life or health." Thus, for example, both the bilateral La Paz agreement requiring maquiladoras to return hazardous waste to the U.S. and Mexico's ban on the importation of waste for final disposal are interpreted as valid because Mexico lacks the proper infrastructure to manage additional hazardous waste. As trade and investment in hazardous waste management facilities increase, however, an argument could be made that both the La Paz Agreement and Mexico's ban on importation of waste for disposal violate NAFTA's free trade provisions for goods.

Moreover, under NAFTA restrictions on maquiladora sales in Mexico are being lifted, blurring any differences between these and other establishments. Beginning in 2001, in fact, maquiladoras will be able to nationalize so long as they give up their "foreign corporation" tax status. If maquilas choose to nationalize, they will no longer be bound by the requirement to return hazardous wastes to the country of origin. For many maquiladoras this change will make the difference. Why should a maquiladora expose itself to liability in the US if it can dispose of the waste -- legally --- in Mexico? Thus, both Mexico and the U.S. anticipate that a larger percentage of hazardous waste generated by the maquiladora industry will remain in Mexico after the year 2000. In fact, according to statistics of SEMARNAP, already some maquiladoras have begun to nationalize.¹



Source: INEGI, Estadísticas de la Industria Maquiladora, 1999.

¹ Chris Reiner, U.S. Environmental Protection Agency, Region IX, telephone interview, april 6, 1999. According to Reiner, more that 200 plants nationalized in 1998, leaving their foreign corporation tax status.

III. DEFINITIONS AND REGULATIONS OF HAZARDOUS WASTES IN BOTH COUNTRIES

United States

The manufacture of consumer and industrial goods and chemicals, the mining of oil and gas and metals and the production of military equipment share a common problem: the generation of wastes which may be toxic, ignitable, corrosive or reactive (see How is Hazardous Waste Defined in the U.S.?).

Everyone -- whether it's the environmental researcher writing a book at his computer, the farmer using pesticides to control insects on his crops, or the plant manager refining petroleum -- has a hand in the production of hazardous waste. In the United States, the amount of hazardous waste generated by manufacturing industries increased from an estimated 4.5 million tons annually after World War II, to some 57 million tons by 1975.² By 1990, this total had shot up to approximately 265 million tons, largely because of a new EPA regulation which defined wastewater containing toxic levels of chemicals above a certain level hazardous.³ Total hazardous waste -- compared to production -- has declined slightly in recent years as industries have enacted pollution prevention measures.

These wastes are generated at every stage in the production, use and disposal of manufactured products. Thus, the introduction of many new products for the home and office -- computers and computer papers, drugs, textiles, paints and dyes, plastics -- also introduced hazardous wastes -- including toxic chemicals -- into the environment.

Before substantial state and federal regulation of waste began in the late 1970s, most industrial waste was disposed of in landfills, stored in surface impoundments such as lagoons or pits, discharged into surface waters with little or no treatment, or burned. Mismanagement of these wastes has resulted in polluted ground water, streams, lakes and rivers as well as damage to wildlife and vegetation.⁴ High levels of toxic contaminants have been found in animals and humans who have been

²*Council on Environmental Quality, Executive Office of the President, Environmental Trends (Washington, D.C.: US Government Printing Office, July 1981), 84.*

³*World Resources Institute, The 1994 Information Please Environmental Almanac (Boston, MA: Houghton Mifflin Company, 1994), 101.*

⁴*US Environmental Protection Agency, Solving the Hazardous Waste Problem: EPA's RCRA Program (Washington, D.C.: U.S. EPA, November 1986), 1.*

continually exposed to such waste streams.⁵ Today, three major federal laws guide management of hazardous and other industrial waste:

* **Resource Conservation and Recovery Act (RCRA) of 1976.** As re-authorized in 1984 by the Hazardous and Solid Waste Amendments, this federal law creates a step-by-step management approach restricting and controlling the treatment, storage and disposal of hazardous waste; mandates a permitting system to assure the safe management of all hazardous waste; and implements a system to track hazardous waste as it moves “cradle-to-grave,” from the point of generation to disposal. The 1984 amendments also banned land disposal of most hazardous wastes without prior treatment.

***Safe Drinking Water Act of 1974, amended in 1986 and 1996.** This act, along with RCRA, protects ground water sources of potable water, and regulates the underground injection of industrial and hazardous wastes;

***CERCLA, the Comprehensive Emergency Response, Compensation and Liability Act of 1980, amended in 1986 as the Superfund Amendment and Reauthorization Act (SARA).** This federal law created a \$1.6 billion “Superfund” to address spills of hazardous waste and clean up of old, abandoned hazardous waste sites.⁶ The Superfund Amendment and Reauthorization Act and more recent congressional action has provided an additional \$13.6 billion.⁷ Title III of SARA, the Emergency Planning and Community-Right-to-Know Act of 1986, requires major industries to report releases, transfers and recycling of toxic chemicals to the Environmental Protection Agency as part of the Toxics Release Inventory Program.

Other federal laws which relate to hazardous waste include the Federal Clean Air Act, the Clean Water Act and the Toxics Substances and Control Act.

Industrial solid waste -- which may be solid, liquid or gas held in containers -- is divided into hazardous and non-hazardous waste. Wastes determined to be hazardous are regulated by hazardous waste rules established pursuant to RCRA's Subtitle C.

⁵Both the Public Health Institute and the Oil, Chemical and Atomic Workers International Union have detailed the health effects of wastes on oil and gas workers.

⁶Texas Water Commission, *Briefing Report on Federal and State Superfund Programs in Texas for Texas Water Commissioners* (Austin: Texas Water Commission, May 1992), Appendix IX, 5.

⁷Office of Hazardous Waste and Emergency Response, U.S. Environmental Protection Agency, *Superfund Homepage* (<http://www.epa.gov/superfund/oerr/>), July 20, 1998.

In addition to federal regulations, most states have adopted their own laws to manage hazardous waste. For example, in Texas, the state environmental agency has been delegated authority over the RCRA program. In 1969, the Texas legislature enacted the Texas Solid Waste Disposal Act, last amended in 1997.

The Texas state law authorizes a full state regulatory program for solid waste including industrial and hazardous waste under the jurisdiction of what today is called the Texas Natural Resource Conservation Commission (formerly the Texas Water Commission). The Act sets out various permitting and enforcement authorities and restricts the location, design and operation of hazardous waste management facilities.

In addition, the State of Texas has its own program for dealing with abandoned or other waste sites which are contaminated with hazardous and toxic wastes. Thus, in 1985, Texas amended the Solid Waste Disposal Act to create the State Superfund Program. Most of the abandoned waste and production facility sites in Texas are related to the production of oil and gas or the chemical industry.⁸ In addition, in 1995, Texas created the Voluntary Cleanup Program, under which property owners can clean up abandoned industrial or commercial sites in return for a release from liability. These efforts are often aimed at "brownfields" in urban areas, which can then be redeveloped.

⁸*U.S. Environmental Protection Agency, Region 6, Progress at Superfund Sites (Dallas, TX: U.S. EPA, Region 6, Winter 1993/1994).*

How is Hazardous Waste Defined in the U.S.?

Under EPA regulations, solid waste is hazardous if:

III. EPA has listed it in one of three categories:

- a) **Source-Specific Wastes.** This list include wastes from specific industries such as petroleum refining, wood preserving and secondary lead smelting, as well as sludge and production processes from these industries.
- b) **Generic (Non-Specific) Wastes.** This list identifies wastes from common manufacturing and industrial processes including spent solvents, degreasing operations, leachate from landfills, and ink formulation waste.
- c) **Commercial Chemical Products.** This list includes some pesticides, creosote and other commercial chemicals after use.

OR

2) it exhibits one or more of the following characteristics, subject to certain tests:

- a) Ignitability;
- b) Corrosivity;
- c) Reactivity;
- d) Toxicity.

Certain wastes are exempt from regulation as hazardous waste under RCRA even though they may potentially harm human health or the environment.

Exempt wastes include:

- a) Domestic sewage;
- b) Irrigation waters or industrial discharges permitted under the Clean Water Act, so long as they are not stored on-site;
- c) Certain nuclear materials as defined by the Atomic Energy Act;
- d) Wastes from the exploration and development of petroleum, gas and geothermal energy. (Wastes from the refining process may be classified as hazardous);
- e) Household hazardous wastes;
- f) Agricultural wastes, except some pesticides.

Source: U.S. EPA, Web Page (<http://www.epa.gov/epaoswer/osw/basifact.htm>), April, 1999.

Mexico: Hazardous Waste Regulations

Hazardous waste is regulated in Mexico through laws, rules and standards. At the top of this hierarchy is the *Ley General de Equilibrio Ecológico y Protección al Ambiente*, the General Law for Ecological Equilibrium and Environmental Protection (LGEEPA), originally enacted in 1988. Through the LGEEPA, Mexico incorporated most environmental issues, including the management of hazardous wastes, into one regulatory scheme. The LGEEPA provides for the definition of hazardous waste, sets out the general policy goals, and establishes obligations and requirements of the federal government. It also sets out policy toward the export and import of hazardous wastes. The LGEEPA, however, does not include specific regulatory standards or implementation programs.

In 1996, Mexico's Congress approved revisions to the LGEEPA. The revisions significantly changed the way hazardous waste is regulated. The revisions to the General Law state that the policy of Mexico is to prevent the generation of hazardous waste, emphasizing minimization policies, recycling and secondary materials recovery.

Major revisions to the LGEEPA related to hazardous waste management include:

*Establishing a system to differentiate the hazardousness of wastes into "high," "medium" and "low," through NOMs (Normas Oficiales Mexicanas), to make them easier to manage.

*Establishing the possibility of transferring control of management of non-hazardous industrial wastes to state governments;

*Allowing disposal of hazardous waste in landfills ONLY in those cases where recycling or secondary materials recovery is not technically or economically feasible and prohibiting the disposal of liquid hazardous wastes in landfills; and

*Prohibiting the import of hazardous materials or wastes that have been banned from production or use in the country of origin.

Under Article 153, section II of the LGEEPA *"the import or export of hazardous materials or wastes are subject to restrictions which the Federal Executive establishes, conforming with the Law of Exterior Commerce. In all cases the following criteria must be met..,"* including section III, which states *"No hazardous waste or materials may be*

authorized for import whose only purpose is for final disposal or simple deposit, storage or landfilling in national territory or wherever the nation exercises jurisdiction and sovereignty or when its use or manufacture is not permitted in the country where it was made." Hazardous wastes can, however, be imported for treatment, reuse or recycling.

Article 55 mandates that hazardous wastes generated from raw materials entering Mexico under the Maquiladora Program must be exported to the country of origin of the raw materials. Despite the existence of Articles 55 and 153, however, Mexico continues to allow dangerous substances to be disposed of in inadequate facilities.

Revisions to the new General Law also addressed the possibility for social participation and access to environmental information. For example, under Article 159 bis-3 "Right to Environmental Information," the Secretary of Environment, Natural Resources and Fishing (SEMARNAP) is required to develop a publicly accessible environmental information system. In addition, one of the newest aspects is the obligation of any state, local or federal environmental authority to answer each and every request for environmental information within 20 days, as well as the community's right to present an administrative appeal should their request be denied. However, if the authority does not respond within 20 days, the request will be considered to be denied. In the experience of communities and organizations, the ability to both obtain information and win an administrative appeal is very difficult. On the one hand, the ability of citizens to request and obtain environmental information was an important victory for citizens in Mexico, particularly those impacted by the generation of hazardous waste. On the other, the law allows the environmental authorities to deny the request for a number of reasons (*see box in text: Article 159 of Mexico's LGEEPA*).

Thus, Article 159 allows authorities great, and arbitrary, latitude to deny the release of environmental information. In addition, unlike the right to request government information in the U.S. under the Freedom of Information Act, Mexican citizens must state why they want the information and how it might be used. This provision can serve to intimidate citizens from requesting the information in the first place.

Article 159 of the General Law of Ecological Equilibrium and Environmental Protection (LGEEPA)

ARTICLE 159 BIS 1. - The Secretary should produce and publish biannually a report detailing the current state of ecological equilibrium and environmental protection in the country.

ARTICLE 159 BIS 3 - Every person has the right to solicit and receive environmental information from the Secretary, the States, the Federal District and the Municipalities, under the terms established by this law. The expenses that are generated are the responsibility of the solicitor..... Every request must be made in writing, specifying clearly the information that is being solicited, and the motives of the request.

ARTICLE 159 BIS 4 - The Authorities referred to in the previous article will deny the request for information when:

- I.- The information is considered legally confidential or by its nature its release would affect national security;
- II.- The information is related to an administrative or judicial procedure or of inspection and oversight in which a decision is still pending;
- III.- The information requested is provided by a third party which is not required legally to provide the information;
- IV.- The information involves inventories and inputs and process technologies, including the description of these.

ARTICLE 159 BIS 5. - The environmental authority should respond in writing to the solicitor of information within a space of no more than 20 days from the time of receiving the request. If the authority is denying the request, he should indicate the

reasons for the denial. If the environmental authority does not respond to the request within the allotted time period mentioned above, the request will be considered resolved as a denial. The environmental authority, within 10 days of receiving the request for environmental information, should notify the solicitor of the information that the request has been received. Those impacted by actions taken by the Secretary under this Chapter, can bring an administrative appeal, under the terms established by this Law and the Federal Law of Administrative Appeal.

ARTICLE 159 BIS 6.- Whomever receives environmental information from the competent authorities under this Chapter will be responsible for its appropriate use and should respond to any damages and liabilities that are caused by its improper use.

Source: Instituto Nacional de Ecología, Página de Web (<http://ine.gob.mx/lgeepa/>), May 1999.

Hazardous Waste Rules

Below the Law itself in Mexico's legislative hierarchy are the Hazardous Waste Rules of the General Law (*Reglamento de la LGEEPA en Materia de Residuos Peligrosos*). These rules focus on hazardous waste reporting, management and treatment. Almost all power to manage hazardous waste is held by SEMARNAP.

Hazardous Waste Rules in the LGEEPA

Federal Competence:

CAP. I Art. 4. It is the competence of the Secretary:

Sec. I

Determine and publish in the Federal Official Daily Register the lists of hazardous wastes.

Sec. II

Expedite the standards and procedures for the management of hazardous materials, with the participation of the Secretaries of Commerce and Industrial Development, Health, Energy, Mines and Parastatal Industry, Agricultural and Hydraulic Resources.

Sec. III

Approve the import and export of hazardous wastes;

Sec. IV

Authorize the installation and operation of hazardous waste management facilities;

Sec. V.

Evaluate the environmental impact of projects for the treatment, disposal and elimination of hazardous wastes;

Sec. IX

Promote the establishment of treatment plants as well as hazardous waste recycling plants;

Sec. X

Authorize the construction and operation of facilities for treatment, disposal and elimination of hazardous wastes;

Sec. XI

Establish and maintain an updated and accurate information system concerning the generation of hazardous waste;

Sec. XII

Encourage professional associations, industrial chambers and similar organizations to prevent and control hazardous wastes;

Sec. XIII

Promote social participation in the control of hazardous wastes;

Sec. XIV

Promote the use of technologies which reduce the generation of hazardous wastes.

State and Municipal Competence

Grant land use permits;

Evaluate the environmental impact of hazardous waste transfer stations.

Source: Reglamento de la LGEEPA en Materia de Residuos Peligrosos, Instituto Nacional de Ecología (<http://www.ine.gob.mx>), 1998.

Mexican Official Standards (NOMs)

NOMs (Normas Oficiales Mexicanas), are the specific standards intended to allow the federal environmental agency to fulfill its obligations contained in the General Law and Hazardous Waste Rules. The process for adopting a NOM is intensive and involves both subcommittees and a National Consultive Standards Committee which is in charge of final approval and publication in the Official Daily Register of Mexico. After a 60-day public comment period, the comments and NOM are sent back to the subcommittees, where a final decision is made. Both the subcommittees and National Consultive Standards Committee are made up overwhelmingly of industrial associations and chambers of commerce and government officials, with little representation from university representatives, and virtually no representation from non-academic, non-governmental organizations. Most representatives are from Mexico City or the surrounding area.

In 1993, INE, through its National Consultive Committee for Environmental Standards, approved seven NOMs related to hazardous wastes and hazardous waste management. For example, NOM 052-ECOL-93 provides all the characteristics that define a waste as hazardous. In 1995, INE approved another NOM related to management of medical wastes (see Mexican Official Standards Related to Hazardous Waste).

Currently, there are 13 NOMs being considered by the Municipal Waste, Hazardous Waste and Material Standard Subcommittee (see box). Some of these NOMs are revisions to those published in 1993. For example, NOM 055, which lists the conditions which must be met by a proposed hazardous waste landfill, would be replaced with a standard for the conditions of a CIMARI, an "integrated center for handling, recycling and disposal of industrial waste." CIMARIs include landfill, fuel blending and recycling operations. The new standard is designed to facilitate the establishment of CIMARIs throughout Mexico since the current standards for hazardous waste landfills has not led to the development of any new landfills.⁹

Other proposed NOMs involve issues not currently covered by Mexican regulations. In 1995, a subcommittee approved a draft of the NOM establishing maximum emission standards for the incineration of hazardous, industrial and municipal waste in incinerators and cement kilns. However, three years later, the NOM has yet to be approved by the larger National Consultative Standards Committee, in large part because the cement industry considered the standards too tough to meet. Instead, a different NOM has been proposed related specifically to the burning of

⁹Two of the operating landfills were developed before the current standard. Luis Wolf, INE, US-Mexican Foundation for Science Conference, Monterrey, Mexico, September 11, 1998.

“alternative fuels” in cement kilns, although this NOM too has not been finalized.¹⁰ Another NOM would, for the first time, establish standards for the clean-up of contaminated industrial sites.

Thus, ten years after publication of the General Law, Mexico still lacks some of the basic standards needed for proper management of hazardous wastes. Even if the new proposed NOMs are adopted, Mexico's hazardous waste legislation has gaps. For example, despite official government policy and programs to promote waste minimization, there are no standards promoting non-end-of-pipe technology such as source reduction. In addition, there is no definition or regulation of "special wastes" -- wastes which are not considered hazardous but still must be properly managed to insure adequate public health and environmental safety.

Mexican Official Standards (NOMs) Related to Hazardous Waste

Key	Description
NOM-052-ECOL-93	Establishes hazardous waste characteristics. lists the different components and indicates the limits that make a hazardous residue toxic to the environment
NOM-053-ECOL-93	Determines the procedures to carry out different extractions to determine waste toxicity.
NOM-054-ECOL-93	Procedures to determine incompatibility between two or more residues considered hazardous.
NOM-055-ECOL-93	Requirements for a hazardous waste landfill site, except radioactive waste landfills.
NOM-056-ECOL-93	Design and construction requirements for complementary works to a hazardous waste landfill site.
NOM-057-ECOL-93	Design, construction and operation requirements for hazardous waste landfill cells.
NOM-058-ECOL-93	Requirements for operation of a hazardous waste landfill site.
NOM-087-ECOL-95	Requirements for separation, packing, storing,

¹⁰ Korina Esquinca, *Secretaria de Medio Ambiente del Gobierno de la Cd. de México, Forum on Burning of Hazardous Wastes, Cd. Juárez, Chihuahua, December 11, 1998.*

	collecting, transport, treatment and disposal of medical hazardous waste.
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Source: Instituto Nacional de Ecología, Página Web (<http://www.ine.gob.mx/normas>), 1998.

Mexican Official Standards Proposed, but Not Adopted

Key	Description
NOM-052-ECOL-97 NOM-052-Bis	Revision of NOM-052 identifying and listing hazardous wastes.
NOM-055	Conditions for Establishment of Integrated Centers for Handling, Recycling, and Disposal of Industrial Waste (CIMARIs).
NOM-056-ECOL-93	Requirements for Design, Construction, Operation and Monitoring of Controlled Landfill Site
New	Identification and labeling of hazardous waste containers
New	Establishes the requirements for storage of hazardous wastes.
New	Proper management of containers and packages that have had pesticides and other toxic substances inside.
New	Control and management of spent industrial solvents
New	Management of PCBs
New	Definition of hazardous wastes stabilized for landfilling.
New	Surveying techniques and management for the analysis of hazardous wastes to determine their hazardousness
New	Requirements and procedures to carry out the restoration of sites contaminated by hazardous waste.
New	Procedure for Thermal Treatment and Control of Municipal, Industrial and Hazardous Wastes, establishing emission limits.

Source: Instituto Nacional de Ecología, Página Web (<http://www.ine.gob.mx/normas>), 1998.

How is Hazardous Waste Defined in Mexico?

Hazardous wastes in Mexico are defined as "all those wastes, in whatever physical state, that due to characteristics of corrosivity, reactivity, explosiveness, toxicity, flamability or biological infectiousness represent a danger for the ecology or the environment."

In addition to these characteristics, waste may be defined as hazardous if it has been identified and "listed" as such in the Mexican Official Standards (NOM).

The definition of characteristic waste in Mexico closely follows U.S. hazardous waste definitions for corrosivity, reactivity, ignitability and toxicity, although some differences do exist. For example, Mexico's toxicity criteria for hazardous wastes includes more toxic chemicals (such as nickel, phenol and toluene) than does the U.S. TCLP (Toxicity Characteristic Leachate Procedure) test (although the total list in the U.S. is larger than the list in Mexico). In addition, the Mexican definition expands on the U.S. definition by including criteria for explosiveness and potential to cause biological infections. In the U.S., medical waste is defined and managed separately from hazardous waste and there is no separate criteria for explosiveness.

Listed wastes are also similar in both the U.S. and Mexico. Mexico lists hazardous wastes in three annexes (II, III and IV) to NOM 052, which correspond to:

- Specific Source Industrial Waste
- Non-Specific Source Waste, which includes hospital waste; and
- Waste from raw materials and chemicals in manufacturing processes.

Thus, the categories of the listed wastes are the same in the U.S. and Mexico, although the wastes themselves are slightly different. In general, the Mexican definition of hazardous waste is more expansive than the U.S. definition.

Source: INE, NOM-052-ECOL-93 and NOM-053-ECOL-93, 1998.

IV. QUANTITY OF HAZARDOUS WASTE GENERATED BY MANUFACTURING INDUSTRY

United States

According to information reported by the EPA and the Texas Natural Resource Conservation Commission, more than 290 million tons of hazardous waste were generated in the U.S. in 1995. Texas ranked first in the nation in total hazardous waste generated, due to the state's large size and extensive industrial base. In the four border states as a whole, a total of 160 million tons were produced, or about 54% of the U.S. total (see Table 2). Most of this waste was generated by "large quantity generators," manufacturing plants which produce more than 1,000 tons of hazardous waste a month on average. In fact, about 25% of all large quantity generators in the U.S. were located in border states, with California and Texas having the second and fourth highest number of large generators of any states.¹¹

Table I. Amount of Hazardous Waste Generated and Number of Large Quantity Generators in Border States and the U.S., 1995

Area	Tons Generated	Number of Large Generators
Texas	148,415,057	1,329
California	11,109,924	1,640
Arizona	66,865	199
New Mexico	204,494	44
Total Border States	159,796,340	4,012
Total U.S.	293,994,277	20,873

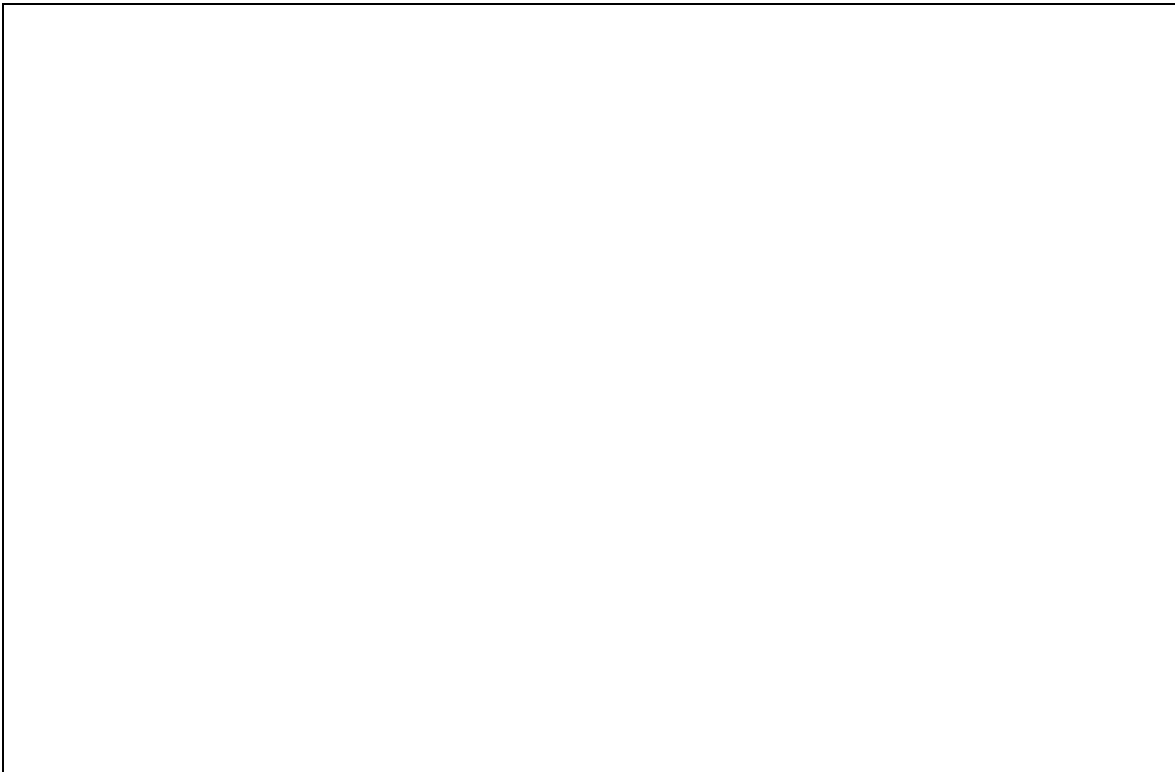
Note: A Large Quantity Generator is considered to be any manufacturing plant which generates an average of 1,000 or more tons per month of hazardous waste.

Source: For California, Arizona and New Mexico, U.S. Environmental Protection Agency, The National Biennial RCRA Hazardous Waste Report (Based on 1995 Data) (Washington, D.C.: U.S. EPA, August 1997), 4. For Texas, information provided by the Texas Natural Resource Conservation Commission.

¹¹U.S. Environmental Protection Agency, *The National Biennial RCRA Hazardous Waste Report (Based On 1995 Data)*, August 1997, Exhibit 1.

The vast majority of this waste is produced by the petrochemical and chemical and allied products industries, which in Texas alone accounted for 76% of the total waste generated.¹² It must be noted that nearly 95% of hazardous waste in the U.S. is actually contaminated wastewater, which must be processed in wastewater treatment tanks and facilities before being discharged into rivers, reservoirs and bays (see Figure 3).

Figure 3. Wastewater vs. Non-Wastewater: Quantity of Hazardous Waste in U.S., 1995



Source: U.S. Environmental Protection Agency, The National Biennial RCRA Hazardous Waste Report (Washington, D.C.: U.S. EPA, August 1997).

Mexico

The amount of hazardous waste generated in the border U.S. states dwarfs the reported amount generated in Mexico, even with that country's increasing industrial production. For example, INE estimates that while all industries generated an estimated 12.7 million tons of hazardous waste in 1997, manufacturing industries generated about 10.5 million tons. The chemical industry and metal products and

¹² Texas Natural Resource Conservation Commission, *Trends in Texas Hazardous Waste Management: 1995 Update* (Austin: TNRCC, 1998).

machinery industries are the leading producers of hazardous waste in Mexico. However, most companies do not report their annual generation of hazardous waste to the INE, as required under Mexican law, and so it is impossible to know with certainty how much hazardous waste is produced in Mexico.¹³ In fact, in 1997, INE only received 10,751 hazardous waste manifests, which apparently covered only about 10% of all companies. In all these companies reported producing 3.46 million tons of hazardous waste, little more than 30% of the estimated waste.¹⁴

In the border area, hazardous waste reporting is as infrequent as it is throughout the nation. For example, according to INE, only 16% of the industries required to report did so during the first six months of 1997 in the heavily industrialized state of Chihuahua. In Nuevo León, which includes Monterrey, only 7 percent of the industries complied with hazardous waste reporting requirements.¹⁵ These compliance rates are similar to other states nationwide, although significantly lower than for the states making up the Mexico City metropolitan area, where INE and PROFEPA are housed.

Here there is a contradictory situation. Whereas the LGEEPA regulates the reporting of hazardous waste, the PRTR or RETC -- the Pollutant Release and Transfer Registry -- is only applicable to industries defined as being of national character and the regulations related to hazardous waste reporting are strictly optional.

Table II. Compliance in Northern Border States and Mexico City Metropolitan Area with Hazardous Waste Reporting Requirements, 1997

State	Hazardous Waste Reporting Compliance Rate
Baja California	7%
Coahuila	11%
Chihuahua	16%
Nuevo León	7%
Sonora	4%
State of Mexico	28%
Distrito Federal	19%

¹³According to the *Reglamento de la Ley General del Equilibrio Ecológico y la Protección Ambiental en Materia de Residuos Peligrosos*, all industrial plants are required to keep monthly hazardous waste generation records and provide an annual summary through the Industrial Survey. In addition, every industry must produce summaries twice a year of all hazardous waste shipped or sent from their facility for disposal, treatment or recycling.

¹⁴INE, Web Page (<http://www.ine.gob.mx/dgmrar/ri/generación.htm>), April 1999.

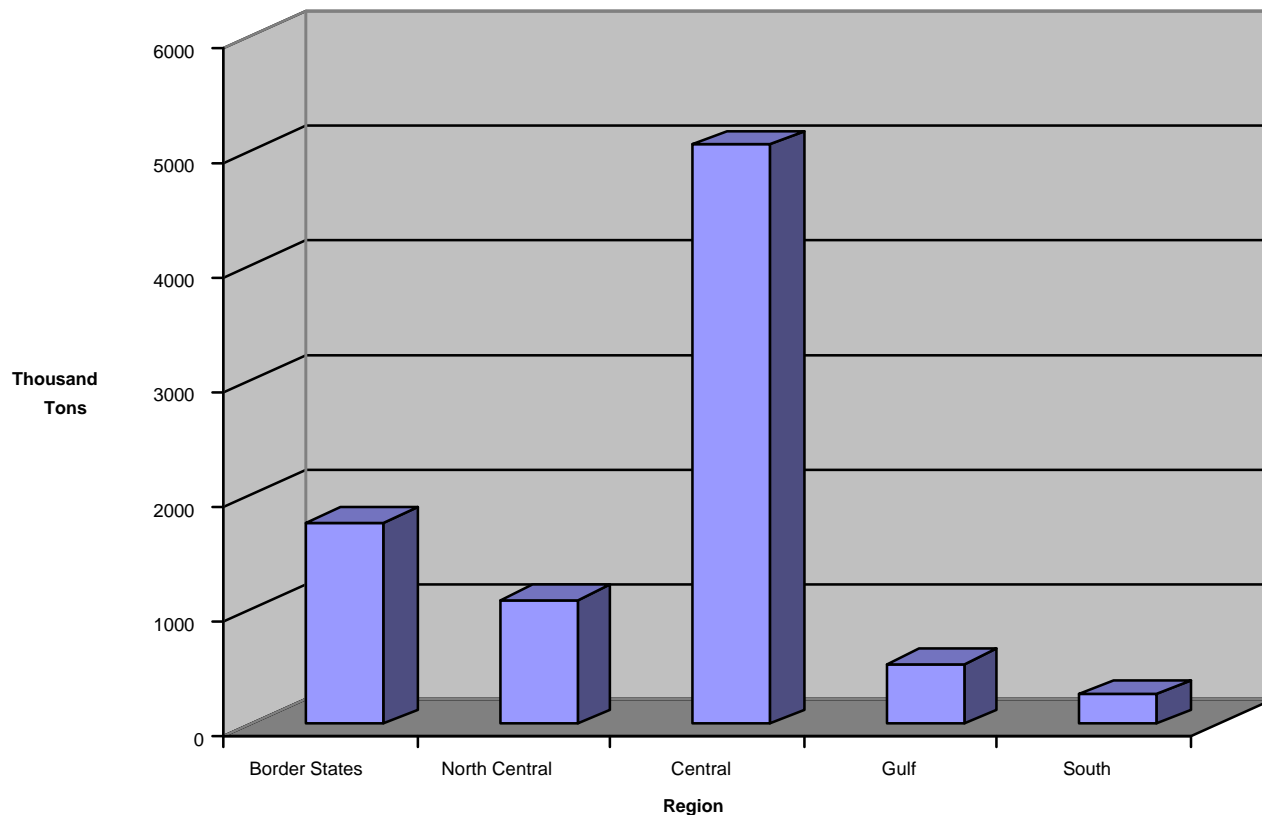
¹⁵Information from INE's Web Page (<http://www.ine.gob.mx/dgmrar/ri/cump-reg/sld0011.htm>).

Source: Instituto Nacional de Ecología, INE Web Page (<http://www.ine.gob.mx/dgmrar/ri/cump-reg/sld001.htm>), Preliminary Information, April 1999.

According to INE estimates, most hazardous waste generated in Mexico is from the country's central region, which includes the Mexico City area. Nonetheless, the six border states do generate over 20 percent of the total hazardous waste stream (see Figure 4).¹⁶ In 1997, industries in the border states generated an estimated three million tons, only about 1,081,411 tons of which were reported to Mexico's environmental authorities (Table 3). Table III clearly indicates that Mexico lacks basic information about its hazardous waste streams, and that there is inadequate enforcement of reporting requirements to help Mexican authorities plan for how the waste can best be managed. What's interesting is that in Chihuahua, the quantity of hazardous waste reported actually surpassed the estimate of total hazardous waste generated, indicating that Mexico's authorities do not have an accurate idea of the total waste generated. Thus, the Mexican administration has not developed nor enforced an efficient environmental reporting system.

¹⁶INE, *Programa para la Minimización y Manejo Integral de Residuos Industriales en México, 1996 - 2000*,

Figure 4. Estimated Annual Generation of Hazardous Waste in Mexico by Region, 1994



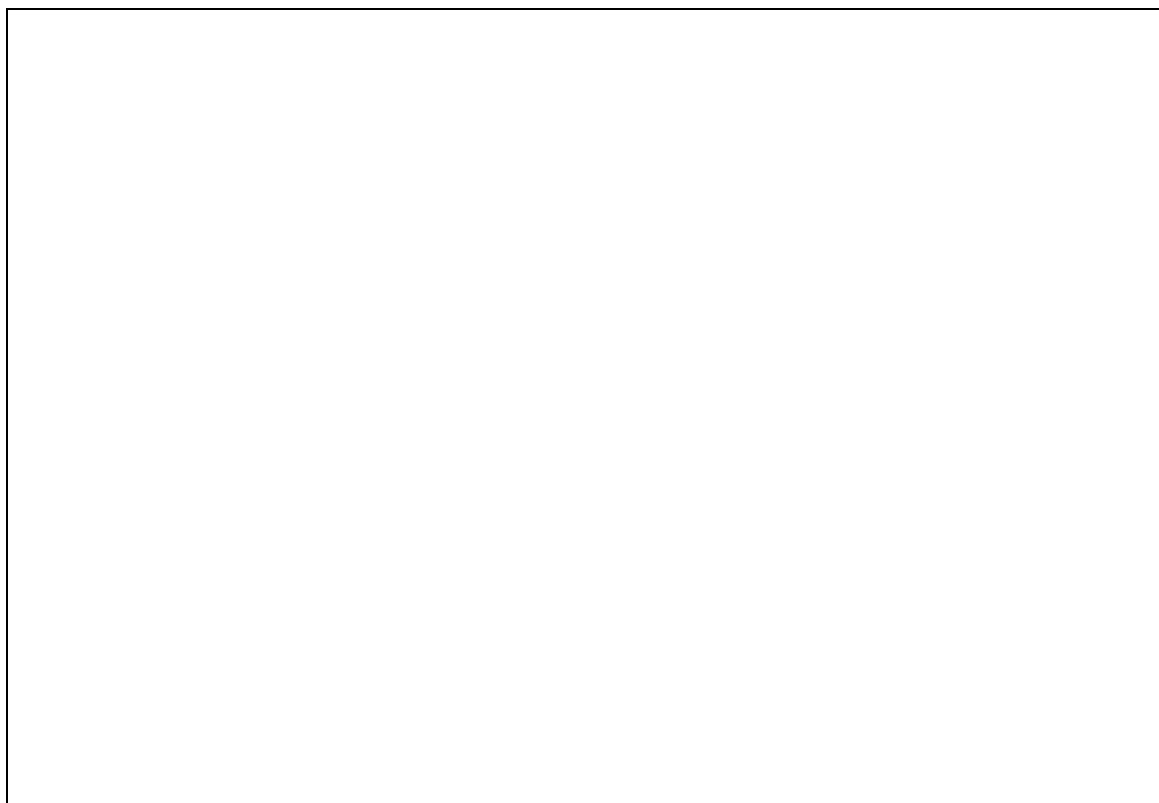
Source: SEMARNAP, Programa para la minimización y manejo integral de residuos industriales peligrosos en México, 1996 -2000, p. 43.

INE does estimate that most waste in the northern border states consists of solids, wastewater, sludges, solvents, and used oils (see Figure 5). Many of these types of waste -- such as used oils, solvents and solids -- can potentially be eliminated. For example, in the U.S. reuse and replacement of solvents with water-based cleaners has occurred in major industries.

Table III. Hazardous Waste Generation by Border State, 1997

Border States	Estimated Hazardous Waste Generated (tons/year)	Hazardous Waste Reported (tons/year)
Baja California	534,564	29,508
Chihuahua	512,241	779,223
Coahuila	389,762	2,359
N. Leom	1,047,951	47,788
Sonora	265,565	3,957
Tamaulipas	295,326	218,576
TOTAL	3,045,409	1,081,411

Source: Column II: INE, Web Page (<http://www.ine.gob.mx/dgmrar/ri/gen-edos/gen>);
Column III: INE, Web Page (<http://www.ine.gob.mx/dgmrar/ri/generacion.htm>), 1999.

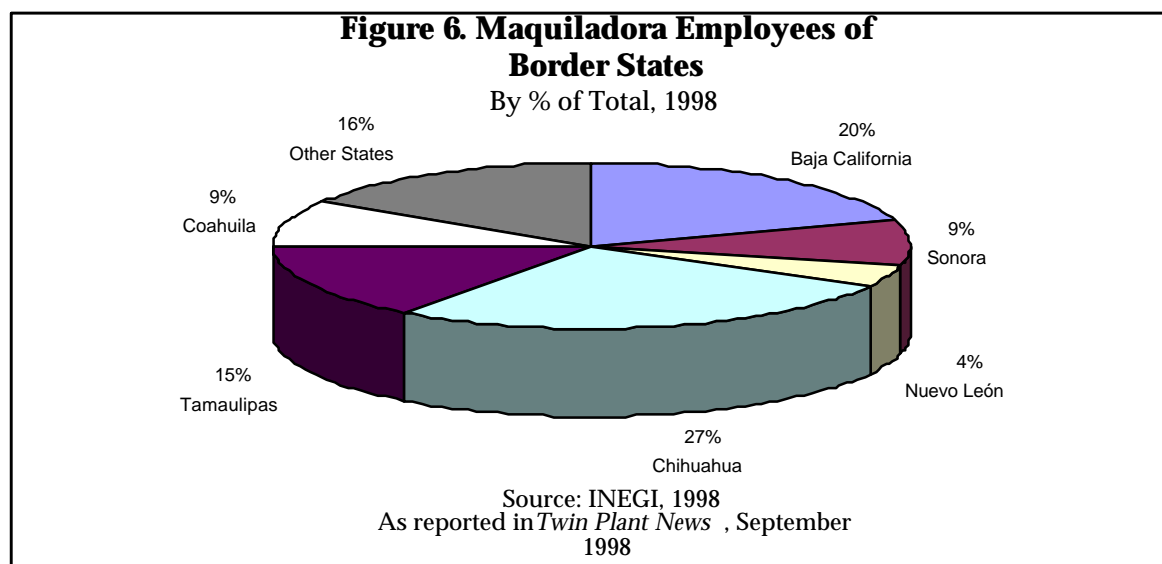


Source: INE, Preliminary Information, 1997, Web Page (<http://www.ine.gob.mx/dgmrar/ri/gen-edos/gen.htm>), October, 1998.

V. HOW MUCH WASTE CROSSES THE BORDER?

Under Mexican law, and as recognized by the 1983 La Paz Agreement between the U.S. and Mexico, maquiladoras are required to return their hazardous wastes

generated to the country from which they imported their raw materials -- usually the U.S. There are currently just over 3,000 maquilas operating in Mexico, 2,250 of which are located in the border states.¹⁷ About 84% of all maquiladora employees -- roughly 840,000 out of 1,000,000 -- are also located in the border states.¹⁸



In 1992, when the U.S. and Mexico unveiled the "Integrated Environmental Plan for the Mexican-U.S. Border Area," one of the highlights was the plan to develop a computer database to track the flow of hazardous waste back and forth across the border. Six years later, HAZTRAKS provides data over the World Wide Web about hazardous waste flows -- at least from Mexico to the U.S -- and has even been used to catch generators and shippers who weren't playing by the rules. For example, as a result of HAZTRAKS, EPA has filed 17 administrative enforcement actions against U.S. non-compliers over the past two years with total penalties of \$482,000, including a \$200,000 International Supplemental Environmental Project (SEP) involving two companies.¹⁹

Yet HAZTRAKS can hardly be labeled a success: the U.S. and Mexico can't agree on whether the HAZTRAKS numbers are correct, information in the system on the flow of hazardous waste from the U.S. to Mexico is limited, and the flow of hazardous waste manifest information from Mexico into HAZTRAKS has often been sporadic.

¹⁷INEGI, *Estadísticas de la Industria Maquiladora de Exportación*, Web Page (<http://dgcnesyp.inegi.gob.mx/BDINE>), Abril 1998.

¹⁸*Ibid.*

¹⁹ Gregg Cooke, U.S. Environmental Protection Agency, *Region 6, Enforcement Issues in the US/Mexico Border Zone*, Texas-Mexico Bar Association Meeting, Mexico City, 10/23/98.

At the heart of HAZTRAKS' deficiencies are the different numbers cited by the US and Mexico environmental authorities. While HAZTRAKS reported that only 11,057 tons of waste flowed from industries in Mexico to the U.S. in 1997, Mexico maintains that some 76,000 tons of waste flowed from the northern border area to the U.S. in 1997 (see Table IV).²⁰ **Map A** shows the quantity of waste which flows across the border, compared to the amount of waste generated in each state.

Table IV. How Much Hazardous Waste Flows from Mexico to the U.S.?

Year	HAZTRAKS (U.S. EPA)	National and Non- Border Maquilas (INE)	Border Maquilas (INE)	U.S. Industries to Mexico for Recycling (INE)
1995	8,510	5,753	33,187	NA
1996	6,983	5,079	72,113	230,417
1997	11,057	9,950	76,808	223,713
1998	NA	22,182	81,024	284,921

Sources:

- Column II: U.S. EPA HAZTRAKS website (<http://www.epa.gov/earth1r6/6en/h/HAZTRAKS/wastepyr.htm>), April 1999;
- Column III, IV and V: INE Autorizaciones de Exportación de Residuos Peligrosos e Autorizaciones de Importación de Residuos Peligrosos (<http://www.ine.gob.mx/dgmrar/ri/imp-exp/sld004.htm>), April 1999;

There are two explainable reasons for the differences in the amount of hazardous waste reported by HAZTRAKS and INE. First of all, because the Mexican definition of hazardous waste is broader, some waste considered non-RCRA in the U.S. is considered hazardous waste in Mexico. In addition, Mexico uses an export manifest document referred to as the guía ecológica. The guía is a permission from INE to a particular generator shipping hazardous waste to export up to a certain amount of waste; thus, it represents the amount permitted rather than the actual amount shipped. Still, even after taking into account the differing definitions, there is still an “unexplained difference” of more than 15,000 tons between the U.S. and Mexican on how much hazardous waste crossed the border in 1997.²¹

²⁰Luis Wolf, INE, Speech Given at US-Mexican Foundation for Science Conference, Monterrey, Mexico, September 11, 1998.

²¹ Alan Hecht, Office of International Affairs, U.S. Environmental Protection Agency, Information provided to authors, October 1998.

Table V. Amount of Hazardous Waste Shipped to U.S. by City of Origin, 1996 & 1997

City of Origin	Tons of Hazardous Waste to U.S., 1996	Tons of Hazardous Waste to U.S., 1997
Reynosa	197	252
Nuevo Laredo	46	23
Matamoros	436	400
Tijuana	1,058	5,803
Mexicali	501	1,258
San Luis	129	130
Nogales	115	137
Agua Prieta	61	67
Ciudad Juárez	2,640	2,066
Ciudad Acuña	55	1
Piedras Negras	2	0
Total Border Cities	5,240	10,137
Other Cities	2,556	920
TOTAL	7,796	11,057

Note: The total for 1996 -- 7,796 -- is different than the total reported in Table IV because EPA has recently adjusted its numbers for 1996.

Source: U.S. Environmental Protection Agency, Region 6, HAZTRAKS Web Page, (<http://www.epa.gov/earth1r6/6en/h/haztraks/usmexmap.htm>), April 1999.

Joe Schultes, who directs HAZTRAKS in EPA Region VI in Dallas said cooperation with Mexico has improved immensely over the last year and EPA is now receiving "guias ecologicas" (ecological guides) from Mexico on a monthly basis, allowing EPA to compare U.S. and Mexican hazardous waste manifest information. Schultes also said the system should improve as Mexico recently announced on November 4, 1998 it is scrapping its current waste export document -- the guias ecologicas -- in favor of a five-day electronic warning document ("Aviso de Retorno").²² The Aviso will include the U.S. manifest number, Mexican and EPA waste codes, and report actual quantities of hazardous waste shipped, as opposed to the level authorized.²³

²²Luis Wolf, INE, Speech Given at US-Mexican Foundation for Science Conference, Monterrey, Mexico, September 11, 1998.

²³ Gregg Cooke, U.S. Environmental Protection Agency, Region 6, Enforcement Issues in the US/Mexico Border Zone, Texas-Mexico Bar Association Meeting, Mexico City, 10/23/98.

At the same time, Mexico has developed a new computer tracking system -- known by its Spanish acronym SIRREP -- which should be compatible with HAZTRAKS.²⁴

There are a significant number of maquiladoras reporting waste return to the U.S. in the HAZTRAKS database. For example, approximately 800 companies, or about 40% of all border maquilas in 1997 are reported as having shipped solid wastes -- which could either be non-hazardous or hazardous --- from Mexico to the U.S. sometime during 1997.²⁵

Table VI. Number of Maquilas in Border Cities and Number Reporting Waste Exports, 1997

City	No. of Maquilas	No. of Maquilas in HAZTRAKS
Tijuana	628	290
Mexicali	158	71
Tecate	91	25
Ensenada	59	17
Nogales	74	35
Agua Prieta	32	10
San Luis	28	7
Hermosillo	32	7
Ciudad Juarez	289	246
Chihuahua	77	19
Ciudad Acuña	53	3
Piedras Negras	45	2
Torreón	59	4
Monterrey	106	11
Nuevo Laredo	52	8
Reynosa	94	13
Matamoros	113	21
Rio Bravo	12	0
Total Border	2002	789

²⁴ U.S. Environmental Protection Agency Region VI, "Improvements to Waste Tracking System Expanded to Include Mexico's New Aviso de Retorno," *Border Bulletin and the Folleto Fronterizo* (Vol. II, No. 5), December 1998, 4.

²⁵ Information obtained from HAZTRAKS Manifest and Company Databases. A simple query was run to "count" the number of companies which reported shipping any form of waste from Mexico to the U.S. Roughly 600 of the 789 companies shipped RCRA hazardous waste.

Note: "Total Border" only includes the cities listed. In all, there were 2,189 border maquilas in December of 1997.

Source: Column II: INEGI, Estadísticas de la Industria Maquiladora de Exportación, December 1997; Column III: Query Run on U.S. Environmental Protection Agency, HAZTRAKS Database, 1998.

Most of the maquiladoras in the database are from two cities: Ciudad Juárez and Tijuana. Thus, 246 of the 289 registered maquiladoras in Juárez and 290 of the 621 operating maquilas in Tijuana did report sending waste back to the U.S. in 1997. However, the vast majority of waste from these two cities comes from just a handful of maquilas. Thus, in Tijuana, just two maquilas -- Samsung and Matsushita -- accounted for more than 50% of the hazardous waste returned to the U.S. in 1996. Similarly, in Ciudad Juárez, just three companies -- TCA, Coclisa and Delmex -- exported 65 percent of the total hazardous waste exported in 1996.²⁶ The rest of the maquiladoras only exported small amounts of waste back to the U.S., often non-hazardous waste.

There is little information in HAZTRAKS from other ports of entry. This is in part due to inadequate coordination between these ports of entry and the EPA. For example, while relatively complete information is obtained from the port of entries in El Paso and Otay Mesa, just northeast of Tijuana, there is very little information coming from Nogales, Arizona or Pharr, Texas. Moreover, the Port of Houston, which could potentially receive significant amounts of hazardous waste from Mexico, has not received adequate training to turn over manifest information to the HAZTRAKS database.²⁷

In fact, despite the attention given to how much waste flows from Mexico to the U.S., significantly more waste flows from the U.S. to Mexico than the other way around. Thus, while Texas only received 1,140 tons of waste from Mexico in 1995, that same year more than 30,000 tons of hazardous waste went from Texas companies to a zinc recycler in Monterrey.²⁸ In all, INE officials estimate that 230,000 tons of waste flowed from the U.S. to Mexico in 1996, a total which increased to nearly 285,000 tons in 1998.²⁹

²⁶U.S. Environmental Protection Agency, U.S. EPA HAZTRAKS website (<http://www.epa.gov/earth1r6/6en/h/HAZTRAKS/wastepyr.htm>)

²⁷Joel Peters, U.S. EPA contractor, phone interview with author, October, 1998. There is no evidence that hazardous waste is entering the Port of Houston from Mexico, but there is a believe within EPA that some waste may go undetected because of coordination problems.

²⁸Texas Natural Resource Conservation Commission, *Trends in Hazardous Waste Management – 1995 Update* (Austin; TNRCC, June 1997), 8.

²⁹Instituto Nacional de Ecología, Web Page (<http://www.ine.gob.mx/dgmrar/ri/imp-exp/sld001.htm>), April 1999.

VI. MISMANAGEMENT OF HAZARDOUS WASTE AND LIMITED ENFORCEMENT

According to official data from Mexico's Federal Attorney General for Environmental Protection (PROFEPA), there have been unprecedented enforcement activities -- inspections, penalties and closures -- during the last few years in the border area. Thus, for example, in 1995, over 3,553 inspections were reportedly carried out by PROFEPA, while in 1996, nearly 3,323 inspections were held in the border area. Approximately 75% of these inspections led to penalties, and about 2% led to partial or total closures of industries.³⁰ Between January 1996 and July 1997, over 5,210 inspections were conducted, including 1,403 inspections of maquiladoras.³¹ Inspections led to partial closures at 20 maquiladoras.

HAZTRAKS has also been used for enforcement activities. Utilizing HAZTRAKS, EPA has filed 17 administrative enforcement actions against companies that do not comply with export or import regulations over the past two years, with penalties totalling \$482,000.³² Violations have included hazardous waste importers which fail to identify the hazardous waste generator, and the use of transporters without valid EPA notifications and Department of Transportation operating registrations.

These statistics, however, may present an overly rosy picture of enforcement activities on the border. For one thing, penalties in Mexico are minuscule compared to penalties in the U.S., leading to relatively small amounts that companies are fined. For another, these statistics do not represent the total number of plants inspected but the total number of inspections. Thus, PROFEPA might inspect a plant three times -- once for hazardous waste, once for air emissions and once for water pollution, for example. In addition, unannounced inspections in both the U.S. and Mexico are infrequent, providing industries time to correct or cover-up any gross mismanagement practices.

Finally, and of perhaps most importance, these statistics from PROFEPA do not reveal which plants were inspected and which were found to be non-compliant. It is very difficult in Mexico for citizens to get enforcement orders, because they are considered private matters between the government and industries, not matters of

³⁰General Directorate of Technical and Industrial Assistance, PROFEPA, as reported in *U.S. -Mexico Border XXI Program, United States-Mexico Border Environmental Indicators, 1997* (U.S. EPA: Washington, 1998), 14-15.

³¹There were 1,689 border maquilas in December 1996. INEGI, *Estadísticas de la Industria Maquiladora de Exportación, 1998*.

³² Gregg Cooke, U.S. Environmental Protection Agency, *Region 6, Enforcement Issues in the US/Mexico Border Zone, Texas-Mexico Bar Association Meeting, Mexico City, 10/23/98*.

public record, as they are in the U.S. Without this information, it is impossible to know if enforcement is leading to a cleaner environment.

Enforcement works if it serves as an incentive to industry to correct problems and where that is not possible, results in fines and forces industries to correct problems. The negative publicity resulting from an enforcement order is another incentive to industry to manage its hazardous wastes properly in the U.S. In Mexico, however, this incentive does not exist because the names of non-complying companies are not generally made public. Thus, enforcement has not appeared to correct the problem in Mexico of inadequate reporting and mismanagement of hazardous wastes.

Some specific cases help illustrate the challenges facing enforcement authorities along the U.S. – Mexico border. According to PROFEPA, there are 352 industries in Ciudad Juárez that produce hazardous waste, and all but 70 of these return their wastes to the U.S or send the waste to RIMSA, the hazardous waste landfill located near Monterrey, Nuevo León.³³ PROFEPA also alleges that the wastes at the other 70 companies do not cause a problem, because they are stored on site. But it is important to note that PROFEPA is basing its analysis on the hazardous wastes that are in fact reported in their internal tracking system, not the hazardous waste that is never reported. According to INE statistics, only 16 percent of industries in Chihuahua properly reported their generation of hazardous waste.³⁴

A 1995 analysis of Annex III compliance completed under the World Bank's Northern Border Loan Program_ reported that only half of the maquiladora firms in the Ciudad Juárez area were found in the HAZTRAKS database; of these, only one in ten shipped the expected quantity of hazardous waste back to the U.S.; and only 20 percent of the total quantity of hazardous waste estimated to be generated by these companies was, in fact, shipped back.³⁵

There is increasing evidence that a large quantity of hazardous waste around Ciudad Juárez is simply dumped in the desert. For example, in a series of stunning developments reported in the local press in 1995 and 1996, stockpiles of hazardous waste were discovered in the desert outside of Ciudad Juárez. One of these dump sites, known as El Sauzel, was located a stone's throw from an industrial park and led to enforcement actions against Polimeros de Mexico.³⁶ Such unlicensed dump

³³Antonio Gomez, "Obligadas a Gestionar Permisos," *Diario de Juárez*, febrero de 1996.

³⁴ Instituto Nacional de Ecología, Web page (<http://www.Ine.gob.mx/dgmrar>), October 1998.

³⁵IER, "A Proposal for Implementation of Hazardous Waste Management Program in the Northern Border Area of Mexico," November 1995.

³⁶Navarro, Rafael, "Siguen Utilizando Basurero Clandestino," *Diario de Juarez*, September 10, 1995.

sites are common on both sides of the border, although in the U.S. they are more often related to household waste and construction debris, not industrial waste.

Mexico's insurance and liability requirements may also discourage proper management of hazardous wastes. In the U.S., the generator of hazardous wastes is liable for the waste even after it is shipped from his facility. In Mexico, on the other hand, it is the transporter of the waste who is liable. This means that the main consideration of maquilas and other generators of hazardous waste is the cost of the transportation and disposal, not the proper management of hazardous waste once it leaves their doors. Paying a transportation company to dump it in the desert is often the easiest way to cut costs. Thus, enforcement of requirements on transporters is as important as enforcement against the industries themselves.

The Secretary of Communication and Transportation published proposed regulations on the transportation of hazardous wastes in 1993, but it wasn't until 1995 that the rules, which require insurance and special licenses, were enacted. Few haulers of hazardous waste within Mexico even carry insurance despite their liability because enforcement is lax. Furthermore, the insurance companies in Mexico have been slow to offer liability insurance and almost none of the waste haulers have complied with the provisions.

Not surprisingly, transportation spills and accidents involving hazardous waste are common. In 1995, for example, there were three accidents in Ciudad Juárez involving firms contracted by PEMEX -- the national Mexican petroleum company -- along the "Ecological Route" which despite its name passes through residential neighborhoods.³⁷ Fires are also frequent at paper, cardboard, paint shops, gasoline bulk stations as reactive or incendiary hazardous waste are handled without proper controls. Thus, a fire at Polímeros de Mexico, the same company caught dumping hazardous waste in the desert, virtually destroyed the factory. Even more surprising was that days before the fire, the company had been inspected by PROFEPA.

Abandoned factories which were closed due to enforcement activities or went bankrupt without adequately disposing of their hazardous wastes are also a problem in Ciudad Juarez and other cities along the U.S. Mexico border and demonstrate the difficulty of enforcement in a binational context. In Ciudad Juárez, the most well known example is Condados Presto, closed through enforcement action by PROFEPA. Canisters of hazardous waste and contaminated soils still lay around the grounds of this abandoned facility which made locks for export and was owned by a company located in New Jersey. Despite

³⁷Antonio Gomez, "Transportan Toxicos Entre Viviendas," *Diario de Juarez*, February 10, 1996.

the existence of warning signs, children and vandals frequently visit the abandoned factory and some canisters have been stolen.³⁸

Similarly, in Otay Mesa, the industrial area outside of Tijuana, an abandoned battery smelter was operated by Metales y Derivados SA for 12 years until it was shut down by PROFEPA in March, 1994 due to its illegal hazardous waste management. Since that time, there have been virtually no clean-up efforts, even as corrosive chemicals eat away the cinder blocks surrounding the facility.³⁹ PROFEPA claims it is up to the company, New Frontier Trading Corp. of San Diego and its owner, Jose Kahn to clean up the site. Currently, the Fourth District Court of Tijuana is considering the matter. However, the San Diego-based Environmental Health Coalition and the Tijuana-based Comité Ciudadano have recently filed a formal complaint with the Commission for Environmental Cooperation, authorized by a side agreement to NAFTA. The complaint claims that Mexico has failed to enforce its own laws by not properly ensuring the safety of the site and not asking for the extradition of Jose Kahn.⁴⁰ (Under Article 14 of the side agreement, citizens can file complaints and the CEC can decide whether to review the allegations and issue a "factual record".) Thus, in both the case of Condados Presto and Metales y Derivados, PROFEPA was able to close down these bad environmental actors, but unable or unwilling to force the parent companies to clean up the sites.

The examples here – primarily from Ciudad Juárez – demonstrate that enforcement in Mexico has not had the intended effect of ensuring the safety and welfare of public health and the environment. Even the closing of “bad apples” has only led to abandoned, contaminated waste sites which have compounded the environmental and public health problems. In addition, it is almost impossible to discern the effectiveness of what enforcement does occur because the enforcement agreements and violations are not publicized or even publicly accessible. At the heart of the problem is the lack of adequate reporting of hazardous waste generation and management by the companies themselves, the confidentiality of the information and the absence of an implementation program for the "right-to-know". These factors make the task of overseeing environmental compliance and ensuring a more just environmental management -- both for the enforcement agency and for community itself -- extremely difficult.

³⁸ Ramona Ortiz, "Roban Toxicos," *Diario de Juarez*, February 15, 1996.

³⁹ Marc Lifsher, "Groups Use NAFTA in Move to Clean Up Border Plant," *The Wall Street Journal*, October 21, 1998, CA1.

⁴⁰ *Ibid.*

VII. HOW IS HAZARDOUS WASTE MANAGED?

United States

The vast majority of hazardous waste in the U.S. is treated or disposed of on-site by the generator. For example, Texas industry, which generates more than 50% of all hazardous waste in the U.S., treated or disposed of 99% of its hazardous waste at the facility itself. Most of this waste is in liquid form, and is treated in wastewater treatment plants or injected underground in on-site wells. In fact, of the 148 million tons of hazardous waste generated by industries in Texas in 1995, only 711,200 tons went to commercial facilities either in or out-of-state.⁴¹ A small amount of waste generated in Texas is sent to Mexico for recycling. For example, in 1995, four Texas metal manufacturers facilities sent a total of 34,525 tons of hazardous waste to be recycled at a zinc recycling facility in Monterrey.⁴²

In the entire U.S., 8.72 million tons of hazardous waste is managed at off-site commercial facilities. This waste can be sent to landfills, injected underground, burned in incinerators or as fuel in cement kilns, treated or recycled. For example, in 1995, 27% -- or 2.4 million tons -- of all waste commercially treated was sent to fuel blending plants for later incineration in cement kilns (see Table VII below). All of these types of facilities are common in the border states.

⁴¹*Texas Natural Resource Conservation Commission, Needs Assessment for Hazardous Waste Commercial Management Capacity in Texas (1998 Update), January 1998)*

⁴²*Texas Natural Resource Conservation Commission, Information provided to author, 1998.*

Table VII. Management Methods of Off-site Hazardous Waste in U.S., 1995

MANAGEMENT METHOD	PERCENTAGE OF QUANTITY
Other Treatment	9.2
Fuel Blending	27.0
Incineration	7.4
Solvents Recovery	3.3
Energy Recovery	11.5
Metals Recovery	4.6
Wastewater Treatment	10.3
Stabilization	9.2
Other Recovery	0.8
Landfill	9.3
Sludge Treatment	0.0
Other Disposal	0.2
Deepwell/Underground Injection	7.1
Land Treatment/Application/Farming	0.0
TOTAL (8.72 million tons)	100.0

Source: U.S. Environmental Protection Agency, The National Biennial RCRA Hazardous Waste Report (Washington, D.C.: U.S. EPA, August 1997).

In Texas, only two landfills are currently permitted to accept commercial hazardous wastes, while one cement kiln and four incinerators are presently burning a mixture of hazardous wastes. There are also a variety of underground commercial injection facilities and treatment facilities.

Mexico

A World Bank study funded under the Northern Border Environment Loan concluded that there is sufficient excess treatment capacity in the U.S. for recovery, treatment and disposal of hazardous wastes generated in Mexico, while the demand for construction of large, fixed-site capital-intensive waste treatment and disposal facilities on the Mexican side is limited.⁴³ An INE report estimated that only 12% of the 8 million tons of hazardous waste generated in 1994 was adequately controlled.⁴⁴ As previously discussed, the lack of information and failure of companies to report makes presenting an accurate picture of how hazardous waste is managed there difficult.

⁴³ IER, "A Proposal for Implementation of Hazardous Waste Management Program in the Northern Border Area of Mexico," November 1995.

⁴⁴ INE, *Programa para la Minimización y Manejo Integral de Residuos Industriales Peligrosos en México, 1996 -2000*, p. 70.

Despite the existence of excess hazardous waste management capacity in U.S. border states, particularly Texas, Mexico has attempted to attract foreign investment in the construction of capital-intensive waste treatment and disposal facilities. In the past few years, for example, the number of hazardous waste infrastructure options within Mexico has increased dramatically. The majority of this growth has been in relatively small recycling and reuse operations, as well as in permitted on-site treatment of hazardous waste. Doubts exist about the capacity and appropriate technology of many of these facilities. Still, if INE's estimate of the capacity of on-site and commercial facilities in Mexico is accurate, Mexico currently has the facilities to treat and manage at least 27% of its hazardous waste.⁴⁵ While the infrastructure within Mexico may be inadequate, without first conducting a full hazardous waste needs assessment and without accurate and universal reporting of hazardous waste generation and management in Mexico, the need for large-scale commercial landfill and treatment centers is uncertain.

Currently, Mexico has two hazardous waste landfills, 77 recycling or reuse facilities, 5 fuel blending plants -- which send the resulting fuel to cement kilns for incineration -- 5 private hazardous waste incinerators, 18 medical waste incinerators, and 23 companies which provide on-site treatment of hazardous wastes. In addition, there are 153 facilities or companies which collect and/or transport hazardous waste from other companies and 9 additional facilities which specifically are permitted to collect PCBs. Finally, there are 45 companies authorized to store hazardous waste temporarily.⁴⁶ Most of these facilities have only been recently permitted. Annex II contains the names and addresses of the disposal and treatment facilities located in the border region.

⁴⁵ The estimate is based upon information from INE's web page (<http://www.ine.gob.mx/dgmrar/ri/infra-rip.htm>), April 1999.

⁴⁶ INE, "Distribución Geográfica de la Infraestructura para el Manejo de Residuos Industriales Peligrosos," Web Page (<http://www.ine.gob.mx/dgmrar/ri/infra-rip.htm>), April 1999.

Table VIII. Currently Permitted Infrastructure for the Management of Hazardous Waste in Mexico, 1998

Type of Treatment	No. of Facilities with permits in Mexico and in Border*	Annual Capacity in Tons	% of Total
Lubricant Recycling	18 (3)	41,314	
Metal Recycling	14 (5)	133,742	
Solvent Recycling	21 (7)	86,329	
Used Container Recycling	21 (4)	33,580	
Other Recycling	2 (0)	33	
Solvent Reuse	1 (0)	14,390 liters	
Total Reuse/ Recycling	77 (18)	294,998 plus 14,390 liters	10.3%
Fuel Blending	5 (3)	807,600	
Hazardous Waste Incineration	5 (1)	37,435	
Medical Waste Incinerators	18 (3)	15,492	
Total Incineration	28 (7)	860,527	30.0%
Treatment of PCBs	6 (0)	381,586	
Companies which offer Treatment / On-site Remediation	23 (6)	445,530	
Medical Waste Treatment	22 (4)	35,598	
Total Treatment	(32 (10))	481,128	16.7%
Hazardous Waste Landfills	4 ** (2)	1,236,540	43.0%
Total	160 (37)	2,873,193	100%

Notes: *Annex II includes a list of all the facilities with permits located in the border states.

**Two of the landfills permitted by INE were closed in 1998, including Cytrar near Hermosillo and CONFIN, near San Luis Potosí.

Source: Dirección General de Materiales, Residuos y Actividades Riesgosas, Instituto Nacional de Ecología, Web Page (<http://www.ine.gob.mx/dgmrar>), April 1999.

VIII. CURRENT AND PROPOSED HAZARDOUS WASTE MANAGEMENT OPTIONS IN MEXICO AND THE U.S. BORDER REGION

This section describes the status of current and proposed facilities designed to manage hazardous waste in the U.S. and Mexico, with a particular focus on the border states. **Map B** shows the location and status of some of the most important facilities.

Landfills in Mexico

The first industrial waste landfill to receive an operating license from Mexican authorities was RIMSA, which is located approximately 100 kilometers from Monterrey. After receiving its operating license in 1987, the facility received permission to accept hazardous waste in 1988.⁴⁷ In 1994, Waste Management Inc, the largest waste management company in the world, began providing technology and technical assistance to the company. Currently, RIMSA has treatment, recycling and fuel disposal facilities at its operations in Nuevo León in addition to final disposal. Because information in Mexico on how much waste is generated and where it is managed is so limited, exactly how much waste is managed every year by RIMSA is not known. RIMSA claims the facility is able to manage between 600,000 and 800,000 tons of hazardous waste per year⁴⁸; INE puts the figure at 1,200,000 tons per year.⁴⁹

In addition to the RIMSA facility, a hazardous waste landfill has been operating just 7 kilometers outside Hermosillo, Sonora since the mid-1980s. Originally built by the Ford Corporation to dispose of their own hazardous wastes, the plant received a five-year permit in 1988 to receive industrial and hazardous waste from the nearby industrial park. Then, in 1994, in a controversial decision, the permit was extended to include waste outside of the region. Subsequently, the Spanish firm TECMED purchased and began operating the hazardous waste landfill. Last year, the landfill began receiving shipments from Alco-Pacífico, an abandoned lead smelter located just outside of Tijuana. A transportation company, Quemetco Inc., had been discovered violating California state hazardous waste laws in transporting waste from the site into Los Angeles County and a \$2.5 million plea bargain agreement was with the Supreme Court of the County of Los Angeles. Subsequently, approximately \$2 million was turned over to the Government of Mexico in order to

⁴⁷ RIMSA, "Acerca de Nosotros," Web Page (<http://www.rimsa.com.mx/acercadenosotros/>), 1998.

⁴⁸ Cyrus Reed, "Proposed Landfill Draws Fire from Farmers, Environmentalists," *Borderlines* (Vol. 5, No. 9), September 1997.

⁴⁹ INE, Web Page (<http://www.ine.gob.mx/dgmrar/ri/list-ea/rubro7.htm>), April 1999.

transport the remaining waste from Alco Pacífico to Hermosillo.⁵⁰ The waste from Alco Pacífico has been associated with health impacts on children in nearby residences. In the meantime, the citizens living near Alco Pacífico have begun a class action suit against the parent company of Alco Pacífico's parent company, RSR Smelting of Dallas, Texas.

Table IX. Hazardous Waste Landfills Which Had Operating Permits in Mexico, 1998

Facility Name	Location
Ciba-Geigy	Atotonilquillo, Jalisco
CONFIN*	Guadalcazar, San Luis Potosí
RIMSA	Mina, Nuevo León
CYTRAR**	Hermosillo, Sonora

Note: *This landfill, owned by a subsidiary of Metalclad Corp., is currently closed and the subject of a trade dispute. Metalclad has announced it will not reopen the site, although it is still pursuing the trade dispute.

**This landfill had its license revoked in November of 1998. It does not appear that the site will reopen.

Source: Instituto Ecologico de Mexico, Information from web page (<http://www.ine.gob.mx/dgmrar/ri/list-ea/rubro7.htm>), April 1999.

Community groups in Hermosillo protested the removal of the waste from Tijuana to the CYTRAR landfill in Hermosillo. They pointed out that the original permit stated that the landfill was only equipped to receive waste from industries within Sonora itself and not become a national dumping site for highly contaminated waste streams. They also discovered that the municipality has never granted a land use permit for the expanded landfill and claimed that the current site does not meet NOM 055, which only permits hazardous waste landfills at least 25 km from the center of a major city. In January, 1998, the community group began blocking access to the site, until they were dislodged by police more than a month later. They then set up a presence in front of the state government palace until they were dislodged once again. Finally, they organized a mass march on October 22nd. They also brought a complaint against the Mexican government for not enforcing its laws through the Commission on Environmental Cooperation.

⁵⁰ U.S. Environmental Protection Agency and SEMARNAP, U.S. -Mexico Border XXI Program: 1997-1998 Implementation Plans and 1996 Accomplishment Report (Washington, D.C.: U.S. EPA, 1998), 62-63.

On November 2nd, 1998, INE revoked the licensing permit of CYTRAR, ordering the company to cease operations by November 20. The company is currently not operating in Mexico.⁵¹

Similarly, the landfill currently known as CONFIN in Guadalupe has been embroiled in controversy even before Metalclad Corporation purchased the site.⁵² Originally operated as a transfer station by a Mexican company called Coterin, Mexican authorities closed it when 20,000 tons of hazardous waste were discovered illegally confined in underground shafts. During the purchase of the site, Metalclad promised it would clean up the waste before constructing a landfill, but instead chose to "contain" the waste at the site. Local residents have opposed the establishment of a landfill there from the beginning, and both the state and local governments have delayed the operation of the landfill since 1995. Despite the existence of a federal operating permit, Metalclad decided to cut its losses and announced in early 1999 that it was withdrawing from the Mexican market at both the Guadalupe site and a proposed landfill near Aguascalientes, yet to receive a permit. In the meantime, the U.S. hazardous waste company is awaiting a judgement on its two-and-a-half year legal dispute with the Mexican government. In 1997, Metalclad brought suit against the Mexican government under NAFTA's foreign investment provisions.

As a response to the perceived lack of available landfills, Mexico has also been promoting the establishment of a series of CIMARIs -- Integrated Centers for Handling, Recycling and Disposal of Hazardous Waste. In theory, these waste management sites would have a full complement of disposal, fuel blending, recycling and treatment components. According to INE, the development of CIMARIs is intended to alleviate the country's lack of disposal facilities, and provide a full range of possibilities for waste treatment and recycling in a few central locations. CIMARIs are being held up as the solution to Mexico's hazardous waste management problems, with the government "assuming an open role of promotion."⁵³ According to Mexico's official program for hazardous waste management, "an environmental market is an end in and of itself to respond to the necessities of environmental protection and to reinforce the interrelation between environmental policy and economic development."⁵⁴ In 1996, INE began a public process to identify companies which could provide such technology. Currently, eight Mexican companies -- most of whom have a U.S. partner -- have been

⁵¹ Information provided by Dr. Germán Ríos Barceló, Alianza Civica, Hermosillo, Sonora.

⁵² Allen, Marlon and Dora Delgado, "Large U.S. Handler of Toxic Wastes to End Mexican Operations After NAFTA Suit," *Environment Reporter* (Vol. 29, No. 51), April 30, 1999, 2578.

⁵³ SEMARNAP, *Programa para la Minimización y manejo integral de residuos peligrosos en México, 1996 - 2000*, (Mexico City, DF: SEMARNAP, 1996), 149.

⁵⁴ *Ibid*, 151.

approved by INE as meeting the technological requirements to set up a CIMARI.⁵⁵ RIMSA in Monterrey advertises itself as a CIMARI already, although it appears to be their own title, not that of INE.

As part of the process of promoting CIMARIs, INE has also been creating a "vulnerability atlas" for the entire length of the U.S. - Mexico border. The idea is to determine the most appropriate sites for the management, treatment, storage and disposal of hazardous waste. While EPA has offered \$10,000 to Mexico to help conduct public meetings as part of the developing the vulnerability atlas, Mexico has refused the money, apparently wanting to avoid any notion that the U.S. is somehow tainting the process.⁵⁶ According to INE's Luis Wolf, one of the Border XXI Hazardous and Solid Waste Workgroup Coordinators, Mexico will use the atlas to then conduct meetings in each state to discuss appropriate locations for facilities.⁵⁷ Mexico hopes to prepare for the reality of the world post-2000, when fewer companies will be required to return waste to the U.S., and avoid public opposition to hazardous waste sites -- as has already occurred in Saltillo.

Despite the stated goal of a public process, one of the companies which has been approved as a CIMARI provider -- Servicios Ambientales de Coahuila -- proposed building a CIMARI just north of the town of General Cepada, Coahuila, between Saltillo and Torreón, near an important water reservoir and migratory bird sanctuary called the Presa de Tulillo. A \$70 million joint venture between RACT, a Utah-based management company, and CleanMex, a Tamaulipas company, the landfill and recycling facility now appears stalled due to opposition from farmers, ranchers, residents of Saltillo and Torreón and Mexico's political opposition parties. The site was supported and approved in virtual secrecy by the local municipality and a "preventative study" was approved by INE. After plans for the facility became public, INE declared that a more rigorous environmental impact statement (EIS) would be required in order for a permit to be issued. Former INE president Gabriel Quadri, who had publicly endorsed the need for such a facility, resigned in September 1998, reportedly in part because of the scandal resulting from the secrecy with which the proposed facility was whisked through the process.⁵⁸

Landfills along the U.S. Border

⁵⁵ Instituto Nacional de Ecología, Information from Web Page (<http://www.ine.gob.mx/dgmrar>), October 1998. INE has since taken this information off of their web page.

⁵⁶ Phone interview with Region IX, U.S. EPA, San Francisco, California, July 1998.

⁵⁷ Luis Wolf, Presentation at Annual Meeting on the Border Environment, Ciudad Juárez, March 3, 1997.

⁵⁸ For a good discussion of the proposed CIMARI in General Cepada, see *La Jornada Ecológica*, April 27, 1998 ("Globalización, Tráfico de Influencias y Desechos Industriales").

Currently, there are two commercial landfill receiving hazardous wastes in Texas -- Waste Control Specialist in Andrews County and Texas Ecologist in Robstown, Nueces County.⁵⁹ The landfill owned by Waste Control Specialist has also been approved to receive low-level radioactive waste from the Department of Energy. There are presently six commercial landfills which accept Class I non-hazardous waste in Texas. All of these landfills can potentially accept non-hazardous industrial waste from maquiladoras. In California, there are several landfills, some of which are near the border with Mexico, including Safety Kleen (formerly known as Laidlaw Environmental Services) in Westmorland, north of Mexicali, and Chem Waste in Azusa, near Los Angeles.⁶⁰

Plans to build additional landfills on the U.S. side of the border have resulted in binational opposition. For example, a hazardous waste landfill along the border near Spofford in Kinney County proposed by Texcor was rejected by the Texas Natural Resource Conservation Commission in 1993 after opposition from the U.S. and Mexico pointed out possible problems with the landfill, primarily due to geological faults and hydrological connections to aquifers shared by the U.S. and Mexico. (The Spofford site has since been proposed as an industrial non-hazardous waste landfill, although it has not been approved.) Similarly, Chemical Waste Management (today known as Waste Management Inc) withdrew its application for a hazardous waste landfill in Terrell County in 1994 after strong binational opposition emerged and it looked unlikely that the permit would be approved by the TNRCC.

More recently, Mexican citizens and political leaders participated in the contested case hearing process over the draft permit for the low level radioactive waste site proposed for Sierra Blanca. In July 1998, the administrative judges issued a recommendation that the project not be granted a permit due to both socioeconomic concerns and the lack of information about a geological fault located just below the site. On October 22nd, the three commissioners of the Texas Natural Resource Conservation Commission unanimously voted to deny the permit, a decision that was celebrated by citizens on both sides of the border.

Similarly, a proposed low-level radioactive waste site in Ward Valley, California, located just north of the Mexican border, was also denied. A federal judge ruled in March of 1999 that the federal government did not have to turn over a 1,000-acre lot to the state and U.S. Ecology to bury the hazardous wastes. Environmental groups and indigenous peoples from both sides of the border had attempted to prevent this facility from being constructed and the judge's decision appears to have supported their aim.⁶¹

⁵⁹ *Texas Water Commission, Texas Solid Waste Strategic Plan, 4.*

⁶⁰ *Information provided by Region IX, U.S. Environmental Protection Agency, San Francisco, Ca., 1999.*

⁶¹ *"Ruling Apparently Kills Ward Valley nuclear dump plan," Los Angeles Times.*

Finally, two companies operating in Andrews County, Texas, Waste Control Specialist and Envirocare, both are attempting to bring low-level radioactive waste to their facilities, although the studies and decisions on these applications could take many years.

Incineration of Hazardous Waste in Mexico

Mexico has encouraged the practice of blending used oils, solvents and other hazardous wastes, to be burned as alternative fuels in cement kilns.⁶² This strategy has been pushed by both the cement industries themselves, which are attempting to save money on fuels, and major hazardous waste management companies in the U.S., including Waste Management, BFI and Mobley Environmental Management. For example, BFI and Metalclad in Mexico teamed up to operate BFI Omega, which blends hazardous waste fuels for the cement industry. Similarly, Waste Management helped finance and provided technical assistance for the construction of a fuel blending plant called Ecoltec next to the Cementos Apasco plant in Ramos Arizpe and also provided technical assistance for the construction of another fuel blending plant at RIMSA's hazardous waste landfill facility. Finally, Mobley Environmental Management, jointly with CEMEX, Cementos de México, invested in a fuel blending plant known as Pro-Ambiente at the CEMEX plant in Torreón, Coahuila.

Currently, there are five fuel blending plants, with the installed capacity to blend more than 800,000 tons of hazardous waste per year (see Table X). According to information provided by Cementos de México, five of their plants burned a total of 23,000 tons of hazardous waste in 1997, while all 6 plants owned by Cementos Apasco together burned 20,000 tons of waste last year (see Table XI). Typical wastes burned included used oils and solvents as well as solid wastes such as tires.

Table X. Fuel Blending Facilities with Operating Permits in Mexico

Name of Plant	Location	Estimated Capacity (Tons/Year)
PRO-AMBIENTE	Torreon, Coahuila	48,000
ECOLTEC, S.A.	Ramos Arizpe, Coahuila	180,000
QUIMICA RIMSA, S.A.	Zapopan, Jalisco	480,000
RIMSA	Mina, Nuevo Laredo	90,000

⁶²Texas Center for Policy Studies and COSYDDHAC, *Incineración de Residuos Peligrosos en Hornos Cementeros en México: La Controversia y los Hechos*, 22 de agosto, 1998.

BFI-OMEGA, S.A.	Tenango del Valle, Mexico	9,600
TOTAL		807,600

Source: Instituto Ecologico de Mexico, Information from web page (<http://www.ine.gob.mx/dgmrar/ri/list-ea/rubro6.htm>), April 1999.

It is important to note that the permits to test burn and authorizations to burn alternative fuels in cement kilns have been made based upon an agreement with the cement industry, even though no official standard for this practice has been adopted.⁶³

While fuel blending and cement kiln incineration of wastes in Mexico so far have been limited to Mexican wastes, under article 142 of Mexico's General Environmental Law, importing hazardous waste is permitted for recycling. If burning hazardous wastes for energy recovery is considered to be a form of recycling – in Texas it is considered recycling if it involves on-site burning but not when it is a facility receiving commercial hazardous wastes -- then Mexico could import hazardous wastes for incineration as the number of cement plants seeking "alternative fuel" increase. Not surprisingly, environmental groups in both countries are generally opposed to the practice of burning hazardous wastes because it reduces incentives for waste reduction and leads to increased air pollution, including the creation of persistent toxic chemicals like dioxins.

Table XI. Cement Plants which Burned Hazardous Waste in Mexico, 1997

⁶³For a full discussion of this issue, see Texas Center for Policy Studies and COSYDDHAC, "Incineración de Residuos Peligrosos en Hornos Cementeros en México: La Controversia y los Hechos," 1998.

Cement Company	No. of Plants	No. of Plants Burning Haz. Wastes	Amount Burned in Tons, 1997
CEMEX	18	5	23,000
Apasco	6	6	20,000
Cruz Azul	2	2	17,000
Moctezuma	2	1	11,000
Cementos de Chihuahua	3	0	0
TOTAL	31	14	71,000

Notes: Each plant receives its "alternative waste" from different sources. Cementos de Chihuahua currently does not burn hazardous wastes or tires, but does have a permit to test burn hazardous wastes.

Source: Dr. Ramon Farias, Director of Energy, CEMEX, Speech Given at US-Mexican Foundation for Science Conference, Monterrey, Mexico, September 11, 1998.

In addition to incineration of hazardous waste in cement kilns, Mexico has permitted five hazardous waste incinerators. They are all relatively small and are not commercial, but belong to specific industries. Thus, the chemical giant Ciba-Geigy has capacity to burn about 2,000 tons per year in Jalisco, while Bayer de Mexico can burn up to 360 tons per year. PEMEX can incinerate up to 100 tons a day at a petrochemical plant in Veracruz. Two other incinerators were approved in 1998, including one of Aceros Nacionales (National Steel) in Tlalnepantla in the state of Mexico and one operated by Hylsa outside of Monterrey.⁶⁴

Finally, in recent years, Mexico has permitted 18 medical waste incinerators throughout the country in an attempt to take care of vast amounts of stored medical waste. Most of these plants are located in the Mexico City metropolitan area, although three have been permitted in the border area, in Matamoros, Tamaulipas, one in Monterrey, Nuevo León and one in Piedras Negras, Coahuila.⁶⁵

Incineration in the U.S.

The practice of burning "alternative fuels" in cement kilns has a long and complicated history in the U.S. Currently, for example, more hazardous waste is burned in cement kilns in the U.S. than in incinerators, which must meet tougher air

⁶⁴ INE, WebPage (<http://www.ine.gob.mx/dmrrar/ri/list-ea/rubro8.htm>), April 1999.

⁶⁵ *Ibid.*

emission standards. Thus, over 2 million tons of hazardous waste were blended for incineration at U.S. cement plants in 1995.⁶⁶ The cement plant which burns the most hazardous waste in the U.S. is TXI in Midlothian, Texas just outside of Dallas. TXI has been burning about 100,000 tons of hazardous wastes annually under an interim permit and just recently applied for and received a final permit from the Texas Natural Resource Conservation Commission. In 1996, TXI applied with the TNRCC for a RCRA Title C permit to burn hazardous wastes and change the facility from interim status to a fully permitted facility. In 1997, after residents and community organizations opposed the permit, the State Office of Administrative Hearings began a contested case hearing process to consider whether to recommend granting or denying the permit. In contesting the permit, residents cited the dangers of the chemicals emitted, which include dioxin and furans, persistent cancer-causing substances, and what they believe is evidence of health impacts to residents and farm animals. Nonetheless, the hearings examiner recommended that the permit be issued.

Fuel blending, cement kiln incineration and incineration have become more frequently used in recent years in large part because of the ban on placing liquid hazardous wastes in landfills. In addition to TXI, there are thirty hazardous waste incineration facilities located throughout Texas. Most of these hazardous waste incinerators process waste on-site from the manufacturing facilities owned by the same company. There are presently four commercial incinerators operating in Texas, while two more - American Envirotech in Houston and Houston Chemical Services in Pasadena -- are permitted, but not yet built. Another commercial facility, Olin Corporation in Jefferson County, is an industrial furnace used for sulfuric acid energy recovery.⁶⁷

Cement kilns currently do not have to meet the same standards as commercial waste incinerators.⁶⁸ The primary regulations governing cement kilns which burn hazardous wastes are the 1991 Boiler and Industrial Furnace Regulations. These regulations allow cement kilns such as TXI to burn hazardous wastes under an interim status in proximity to populations without the same safety and monitoring standards as commercial incinerators.

Full implementation of the 1990 Federal Clean Air Act will require both cement kilns and hazardous waste incinerators to install new pollution control equipment --

⁶⁶U.S. Environmental Protection Agency, *The National Biennial RCRA Hazardous Waste Report (Based On 1995 Data)*, August 1997, Exhibit 2.15.

⁶⁷Leslie Bell, *Industrial and Hazardous Waste*, Texas Natural Resource Conservation Commission, phone interview with author, October 1997, Austin, Texas.

⁶⁸Texas Air Control Board, *Final Report of Texas Air Control Board Task Force on Waste-Derived Fuels for Cement Kilns* (Austin: Texas Air Control Board, February 1993), Appendix C.

known as Maximum Achievable Control Technology -- to lower air emissions. However, the implementing regulations have yet to be finalized by EPA.

Treatment in Mexico

There is little information in Mexico on how much waste is treated on-site by companies themselves, although it is likely that it is extensive as companies seek to avoid having to send hazardous waste off-site. There are, however, commercial off-site companies which treat and reduce hazardous wastes.

RIMSA, which operates the hazardous waste landfill has some treatment capabilities. RIMSA uses oxidation, neutralization and other techniques to treat and reduce hazardous wastes before placing them in its landfill. In addition, there are two treatment facilities dedicated to hazardous waste treatment, one in Chihuahua and the other in Tijuana (See Box in Text: Innovative Technologies and Annex II).

Under the World Bank's Northern Border Environment Loan, Mexico has also assessed the possibility of providing mobile, on-site treatment service for hazardous waste management in Matamoros and Tijuana. The two-volume study concluded that without initial subsidies, these mobile hazardous waste service companies were not economically feasible because industries were not willing -- or able -- to pay the price for this type of treatment. Finally, the study concluded that hazardous waste management of this type would only work with a commitment to enforcement by Mexican authorities -- otherwise it is simpler to discharge solvents or used oils into wastewater collection systems.⁶⁹

There are many companies which treat hazardous wastes at the generation site. Most of these companies provide remediation to soils contaminated with hydrocarbons and are service providers to PEMEX, the huge parastatal oil and gas company in Mexico. Under Mexican regulations, any spill or environmental problem encountered by PEMEX is put out to bid to private companies for reclamation if PROFEPA decides it must be cleaned up. Most of these companies are located along the Gulf Coast in Veracruz and Tamaulipas or in the center of Mexico.

In addition to incineration, some medical waste in Mexico is being treated through autoclaves and other methods. This is a relatively recent development, spurred by the adoption of NOM 087, related to medical waste. Currently, 22 companies have been permitted, including 4 in the border region.

⁶⁹BCEOM, et al. *Pre-Pilot Program Implementation Study for Mobile Hazardous Waste Treatment Units: Implementation Study Report, Part 2, Submitted to World Bank, October 1995.*

Thus, there are a number of companies in recent years which have begun offering commercial treatment of hazardous waste, either at the company itself, or at major hazardous waste disposal sites like RIMSA and CYTRAR. Nonetheless, without more reporting from manufacturing companies, it is impossible to guess how much waste treatment occurs by the companies themselves, on-site. It could well be that much of the hazardous waste generated in Mexico is treated on-site.

Innovative Technology: Neutralizing and Destroying Hazardous Characteristics

A variety of new and emerging technologies can neutralize and, in some cases, even destroy the hazardous characteristics of industrial waste. One new encouraging technology is known as supercritical water oxidation. The process is simple, but expensive. Water is heated and pressurized and mixed with organic compounds, which dissolve. Later, oxygen gas is added to the mix, and harmful substances are burned away. What's left is harmless. This gigantic pressure cooker, unfortunately, is very expensive, although a team at the University of Texas at Austin has developed a working water oxidizer.⁷⁰

Other technologies currently being used in the Texas market include:

*Oxidation. Either humid air or a chemical process is used to remove organic constituents from a water-based hazardous waste stream.

*Bio-remediation. This process uses microorganisms bred to have an appetite for hydrocarbons to "eat" oil spills or even heavy metals.

*Carbon adsorption. This is a process in which toxic substances adhere to a specially treated carbon surface.

*Gas Absorption. Toxic gas is compressed under pressure and vented into a absorbing or reactive unit.

*Dechlorination. This process chemically replaces chlorine with hydrogen or hydroxide ions, leaving chlorinated substances non-toxic.

⁷⁰ *Texas Comptroller of Public Accounts, Forces of Change: Shaping the Future of Texas (Vol. 11, Part 1) (Austin: Texas Comptroller of Public Accounts, November 1993), 465.*

*Neutralization. This process either makes an acid substance less so by adding alkaline substances, or makes a basic substance more acidic by adding acid.

*Oxidation. This process adds oxygen to substances such as sulfurs, phenols or cyanides, rendering them non-hazardous.

*Precipitation. This process separates solids from a liquid waste so that the solid portion can be managed more safely.

*Vitrification. This refers to any process which uses electricity to encase products in glass. For example, electric currents can be introduced into contaminated soils at such high voltages that the soil “turns” to glass. Other similar systems that chemically or physically reduce the mobility of hazardous constituents include encapsulation and stabilization, either through the use of cement or pozzolanic material.

Treatment in the U.S.

Most hazardous waste in the U.S. is treated on-site in wastewater treatment plants. For example, in 1995, 73% of all hazardous waste was treated in this manner. In addition, that same year, another 9.2% of hazardous wastes was treated on-site through other methods such as stabilization.⁷¹ In Texas, in 1995, about 135 million tons – or 86.5% -- of hazardous waste was treated on-site in wastewater treatment plants, while another 372,000 tons was treated or recycled on-site through other recycling or treatment methods.⁷²

In addition to on-site treatment of hazardous waste, 9.2% of all wastes sent off-site in the U.S. was treated in 47 stabilization facilities in 1995, 10.1% was treated in off-site wastewater treatment plants, and another 9.2% was treated in other types of treatment facilities.⁷³ In Texas, 591,100 tons – or 38.2% -- of all waste sent off-site went to public municipal sewage treatment plants, and 12,400 tons went to 4 commercial facilities for stabilization. A small amount went to other facilities for other types of treatment.⁷⁴

⁷¹ U.S. Environmental Protection Agency, *The National Biennial RCRA Hazardous Waste Report (Based on 1995 Data)* (Washington, D.C.: U.S. EPA, August 1997), 2-4.

⁷² Texas Natural Resource Conservation Commission, *Trends in Texas Hazardous Waste Management: 1995 Update* (Austin: TNRCC, June 1997), 2.

⁷³ U.S. Environmental Protection Agency, *The National Biennial RCRA Hazardous Waste Report (Based on 1995 Data)* (Washington, D.C.: U.S. EPA, August 1997), 2-19.

⁷⁴ Texas Natural Resource Conservation Commission, *Needs Assessment for Hazardous Waste Commercial Management Capacity in Texas (1998 Update)* (Austin: TNRCC, January 1998), 7-11.

These numbers show that treatment methods such as stabilization are an important component of overall hazardous waste management in the border area and the U.S., both at manufacturing companies themselves as well as at off-site facilities. As the technology for treating and neutralizing hazardous waste continues, treatment methods should improve and become more cost-effective.

Recycling in Mexico

Recycling of hazardous wastes such as lubricants, solvents, and metals is fairly well established in Mexico. For example, Mexico has a long history of recycling lead batteries, particularly as firms in the U.S. have shut down. Sometimes this has had disastrous results, as was the case with Alco Pacifico, the maquiladora located near Tijuana.

Other facilities, however, such as a metal recycler near Monterrey, Mexico which accepts waste from such U.S. firms as Chapparral Steel in Midlothian, has operated for many years. Because Mexican law allows the importation of hazardous waste for recycling under Article 153, hazardous waste from the U.S. is accepted at these facilities.

There are currently 77 recycling facilities permitted in Mexico. A significant number are located in the border area, most of which are in the Monterrey or Tijuana metropolitan areas (see Table XII)

While there is a need for more recycling facilities in Mexico, as well as greater on-site recycling of waste streams, the existence of so many facilities points to the ability to do business in hazardous waste recycling in Mexico. The large number of used solvent and lubricant recycle operators also points to an alternative to the blending and incineration of these waste streams.

Table XII. Recycling Facilities in the Border Area and Mexico

Type of Recycling	Number in Mexico	Number in Border
Used Containers	21	4
Used and Reused Solvents	22	7
Photographic Fixer	2	0
Used Lubricants	18	3
Metal Recycling	14	5
Total	77	19

Source: INE, Web Page (<http://www.ine.gob.mx/dgmrar/ri/list-ea/rubro5.htm>), April 1999.

Recycling in the U.S.

There are three ways in which industrial waste recycling occurs: at the facility itself (on-site recycling), at commercial facilities which gather waste streams from several companies (off-site recycling), and when the waste products from one company are used as inputs in the production process of another company (often called re-use). In 1995, for example, about 17 percent of all Texas-generated hazardous wastes treated at commercial facilities was recycled.⁷⁵

Off-site recycling of some hazardous materials is difficult because of the dangerous nature of the chemicals themselves. Unlike some municipal wastes such as aluminum which are fairly easy to recycle, some hazardous chemicals are prone to ignite and can be reactive. In addition, the fear that industries have of accidents and spills during transportation or recycling operations -- and the resulting liability -- can sometimes present an obstacle to the recycling of hazardous materials off-site.⁷⁶ For many products, it is far simpler to dispose of hazardous waste off-site than to exchange it with another company or recycle it.

There is considerable debate about just what recycling is. Under Texas' Waste Reduction Policy Act, companies which burn their hazardous wastes for energy recovery in on-site boilers and industrial furnaces can count the waste as "recycled."

This approach has been criticized by some citizens living near facilities as well as environmental groups who argue that using waste as fuel is really a method of disposal and that air pollution is often created in the burning of hazardous wastes. In the TNRCC's Clean Texas Program, companies can meet part of their 50 percent reduction goal by burning waste to recover energy on-site; however, companies can not count waste burned off-site in cement kiln or other off-site "waste-to-energy" plants toward their reduction goals.

There are several key aspects of the Texas program for recycling of hazardous waste:

In 1987, the Legislature created the Resource Exchange Network for Eliminating Waste (RENEW). This program aids in the recycling of waste by matching companies which have commodities, by-products, surplus materials, or wastes with other businesses that can use these same materials as process inputs. RENEW, run by the TNRCC, serves as an information clearinghouse, classifying waste by

⁷⁵Texas Natural Resource Conservation Commission, *Trends in Hazardous Waste Management: 1995 Update* (Austin: TNRCC, June 1997), Table 4.

⁷⁶Andrew Neblett, Office of Pollution Prevention, Texas Natural Resource Conservation Commission, interview with author, July, 1994, Austin, Texas.

categories. Between 1988 and 1997, RENEW helped transfer 350,000 tons of hazardous and non-hazardous materials from those industries disposing the waste to those using them for production. These transfers helped companies save about \$2.2 million in disposal costs and \$1.6 million in direct sales.⁷⁷

In addition, the Office of Pollution Prevention and Recycling at TNRCC has assisted companies with on-site visits and workshops to push for recycling as well as source reduction. A special focus has been helping businesses develop in-house recycling programs. Another program discussed below targets maquiladoras along the Texas-Mexico border.

Pollution Prevention in the Border Region

Both the U.S. and Mexico have adopted similar waste management hierarchies. At the top of their list is source reduction and waste minimization -- in other words, either not producing the waste in the first place or minimizing the waste stream by better pollution control or internal recycling (see Box in Text: *What is Source Reduction?*). Under the binational Border XXI Program, Mexico and the U.S. agencies have formed both a Solid and Hazardous Waste as well as a Pollution Prevention Workgroup.

⁷⁷Office of Pollution Prevention and Recycling, Texas Natural Resource Conservation Commission, letter written to author, December 11, 1997, Austin, Texas.

In the U.S., the EPA nationally and the Texas Natural Resource Conservation Commission have established voluntary programs in which major industries pledge to reduce hazardous wastes or emissions of toxics by a significant percentage, and the Border XXI Program has attempted to extend this program to Mexico through a series of workshops and conferences. TNRCC has even conducted plant visits at maquiladoras in Mexico to help companies locate opportunities for source reduction. Between 1993 and 1997, TNRCC personnel along with the Mexican Attorney General for the Environment (PROFEPA) conducted site audits at 14 maquiladora factories in Mexico. The TNRCC personnel perform pollution prevention analyses and made recommendations to the Mexican officials and plant managers.⁷⁸

In Mexico, the government, with assistance from the U.S. EPA, has created the Environmental Auditing and Voluntary Compliance Program. Under this program, in return for enforcement leniency, companies inspect their plants for opportunities to reduce waste generation and emissions and improve worker safety and compliance, pursuant to an official agreement with the government. Between 1996 and 1997, 18 maquiladoras conducted environmental audits and 30 maquiladoras have formalized their plans of action as a result of the audits already conducted.⁷⁹ A similar program is the Voluntary Environmental Autoregulation Program which allows industries to inspect themselves if certain parameters are met. Another initiative is the San Diego-Tijuana WasteWiSe Project, which includes on-site assessments of industries, manuals for specific industries and links companies from both sides of the border for recycling opportunities. Moreover, as in Texas, Mexican industries must have a waste minimization plan on file, although it is unclear if this requirement is being enforced.

Nevertheless, voluntary pollution prevention programs in Mexico and the U.S., while potentially valuable, often ignore the important role that enforcement, as well as citizens and workers must play if the process is to become successful. Part of the reason voluntary source reduction programs in the U.S. work is that the costs of managing hazardous wastes are so high -- it is cheaper for companies to reduce wastes than dispose of them. This only works where enforcement is stringent and where siting and design standards for commercial disposal facilities are also rigorous.

⁷⁸ Office of Pollution Prevention and Recycling, Texas Natural Resource Conservation Commission, letter written to author, December 11, 1997, Austin, Texas.

⁷⁹ U.S. Environmental Protection Agency, "Cooperative Enforcement and Compliance Work Group 1996 Implementation Accomplishment Report," U.S. - Mexico Border XXI Program: 1997-1998 Implementation Plans and 1996 Accomplishments Report (Washington, D.C.: U.S. EPA, 1998), 63.

Moreover, in the U.S., so-called "right-to-know" laws such as the Emergency Planning and Contingency Response Act (EPCRA) have forced manufacturers to publicly report the toxic chemicals they emit and transfer under the Toxic Release Inventory (TRI) Program, which is then accessible to the public. Companies also must report annual generation and management of hazardous waste to environmental authorities, and this information is also accessible to the public.

Texas has created a program known as Clean Industries 2000, which targets the largest companies and largest generators of hazardous waste in Texas. Industries which join this program commit to carry out a plan to reduce hazardous or toxic waste by 50 percent from 1987 levels by the year 2000.

As of March, 1997, 163 companies had joined the Texas Clean Industries 2000 program, pledging to cut their hazardous waste generation by 67 percent and their Toxics Release Inventory chemical releases by 63 percent between 1987 and 2000.⁸⁰ If program participants do not successfully meet their goals, there is no penalty except for potentially being removed from the program. However, between 1987 and 1995, program participants did reduce TRI chemical releases by 75.6 million pounds, or 37 percent. These same facilities also cut hazardous waste generation by 15.3 million tons between 1992 and 1994.⁸¹ In addition, as part of the program, participants must sponsor community environmental programs and citizen communication programs. Thus, while somewhat limited, there is some citizen oversight and full access to basic data to assure companies -- and their government regulators -- are on target.

In Mexico, on the other hand, apparently even the government does not have full access to information on how much hazardous waste or toxic emissions companies are producing. If most of the waste in Mexico is unaccounted for by the enforcement agencies it may not be in the company's best interest to account for it through an auditing procedure and thus have to manage it. In fact, many companies may not have full knowledge themselves of the amount of hazardous waste being generated because they have not been forced to report it.

In addition, toxics and hazardous waste information that the government does possess is not accessible to the general public on a company-specific basis. For example, all of the agreements and documentation resulting from the environmental audit program remain confidential information. Without citizen oversight -- actually seeing how much companies generated and whether they are actually reducing waste -- effective community pressure is absent.

⁸⁰ Office of Pollution Prevention and Recycling, Texas Natural Resource Conservation Commission, letter written to author, December 11, 1997, Austin, Texas.

⁸¹ *Ibid.*

Non-governmental organizations in Mexico have been struggling for years to force the government and industry to adopt right-to-know regulations, and develop a national inventory of toxic releases and transfers, but with limited success. In recent years, Mexico has officially committed to and adopted a PRTR (known as RETC in Mexico) -- Pollutant Release and Transfer Registry -- and begun inventorying industries. First, in 1996, they conducted a voluntary pilot study in the state of Queretaro, in which 51 companies voluntarily submitted data. However, the list of pollutants was short, covering only 149 chemicals and chemical compounds -- less than a fourth of those covered in the U.S. Toxics Release Inventory Program -- and the quality of the data was suspect.⁸² More recently, during 1997, Mexico completed their first nationwide inventory. Nonetheless, the registry only covers the 15 industrial sectors which are considered federal in scope, the name of the generator is confidential, and much of the reporting has been completely optional. For example, Section IV, "Generation, Treatment and Transfers of Hazardous Waste," is optional, both for the generators of hazardous waste as well as for those who treat such waste." Mexican authorities have yet to make any of the information public and has not announced when it will do so.

⁸² Originally 80 companies were asked to voluntarily submit emissions and transfer data within the state of Queretaro; only 45 companies provided the information requested. Commission on Environmental Cooperation, *Taking Stock: North American Pollutant Releases and Transfers, 1994* (CEC: Montreal, Canada, 1997), 147.

What is Source Reduction?

Source Reduction as applied by Texas law means reducing the amount of any hazardous or non-hazardous substance entering any waste stream or released into the environment prior to recycling, treatment and/or disposal;

Waste Minimization means a practice that reduces the environmental or health hazards associated with hazardous wastes, pollutants, or contaminants. Examples may include reuse, recycling, neutralization and detoxification.

Source separation keeps hazardous waste from nonhazardous waste, preventing all the waste from being managed as hazardous waste. It does not necessarily reduce the total volume of waste, only its hazardous components.

Recycling and Re-use is the process of removing a substance from a waste and returning it to productive use. Recycling can happen at a plant, where the waste is re-used within the production process itself. Waste can also be recovered off-site. A third form of recycling is to send the waste to another industry through an inter-industry exchange. Used solvents, zinc and other metals and acids are commonly recycled.

Substitution of raw materials replaces a raw material that results in hazardous waste with one that results in less hazardous wastes or none at all.

Manufacturing process changes consist of either eliminating a process that produces waste or changing the process so that a waste is no longer produced.

Substitution of products means eliminating the use of a hazardous material. For example, by substituting creosote-preserved wood posts with concrete posts, no hazardous wastes will leach from the posts.

Source: U.S. Environmental Protection Agency, Solving the Hazardous Waste Problem: EPA's RCRA Program (Washington, D.C.: U.S. EPA, November 1986), 19; and

Texas Water Commission, Case Studies of Source Reduction & Waste Minimization by Texas Industries (Austin: Texas Water Commission, March 1992).

IX. CITIZEN RESPONSE AND INVOLVEMENT IN HAZARDOUS WASTE MANAGEMENT ISSUES

The Context of Citizen Involvement

As already highlighted in this report, citizens across the U.S. - Mexico border have become direct actors in trying to ensure the safe management of hazardous waste. Most of this citizen effort has been aimed at blocking hazardous -- and radioactive -- waste projects which are either not considered safe or have not adequately involved the public in the decision-making and planning process. Thus, over the last 8 years, proposals to build toxic waste landfills in Spofford and in Terrell County, Texas, and in General Cepada, Coahuila have been defeated or stalled. The proposed radioactive waste site in Sierra Blanca, Texas strained relationships between the state and federal governments of the U.S. and Mexico, but strengthened relations between citizens from both sides of the border, leading to its eventual defeat. Indigenous and environmental groups from both sides of the border worked hand-in-hand to defeat the proposed low-level radioactive waste site in Ward Valley, California in 1999.

This binational citizen opposition is not, as detractors would claim, simply a NIMBY -- not-in-my-backyard -- phenomena of ill-informed citizens frightened by anything with the word hazardous or radioactive attached. Instead, it has been a process of citizens informing themselves about specific waste streams and specific sites which have been ill-suited to receive these kinds of wastes.

Nonetheless, it is clear that this type of citizen involvement is out of necessity in opposition, rather than part of a process of dialogue between government, industry and the public about how best to reduce and manage hazardous wastes. There has been a need for this type of citizen participation to counter the domination by industries of the hazardous waste management decision-making process in both the U.S. and Mexico.

There is a large and profitable international waste industrial sector which has made inroads into the Mexican market through joint ventures. For example, Waste Management Inc., the largest waste management company in the world, has formed a relationship with RIMSA, which runs the largest hazardous waste landfill in Mexico and also offers treatment, recycling and a fuel blending facility at its site in

Nuevo León. Waste Management has also formed a joint venture with Cementos Apasco to build a fuel blending facility in Coahuila called Ecoltec. Cementos de Mexico formed a joint venture with a Texas waste management company to form another fuel blending facility called ProAmbiente. Another large waste management company, Laidlaw Environmental Services, which merged with both Rollins Environmental Services and Safety Kleen, has several transfer and recycling facilities in Mexico. Finally, BFI runs a hazardous waste fuel blending facility in Central Mexico which it obtained from Metalclad. Metalclad itself has attempted to operate two hazardous waste landfills, one near Aguascalientes and one in Guadalupe, San Luis Potosí. Both these proposals are not in operation due in part to citizen opposition.

These companies, along with Mexican waste management companies like RIMSA, have a direct influence on environmental policy in Mexico toward hazardous waste. First of all, they dominate advisory committees that influence the adoption of standards (NOMs). For example, in the elaboration of a draft standard to guide the incineration of hazardous wastes in cement kilns, boilers and incinerators in Mexico in 1995, membership was almost exclusively made up of government and industry representatives. Thus, 27 of the 45 participants were from industries, 4 were from business associations and 14 from government agencies. Only 1 representative from a non-governmental organization, CEMDA, the Center for Mexican Environmental Law, was present on the subcommittee. Among the industries present on the subcommittee were Cementos Apasco, Cementos de Mexico, Molten Metal Technology, RIMSA, Proambiente, Ecoltec, Celanese Mexicana, and Ciba-Geigy.

In addition to their role in the elaboration of environmental standards, industries and waste management companies in Mexico influence policy through signing environmental policy and waste management pacts with the government. For example, in 1996, Mexican environmental authorities signed an agreement with the Mexican cement companies allowing them to incinerate industrial and hazardous wastes in their kilns, with a focus on used oils and greases. The pact is controversial because it was a waste management policy decision taken without the existence of a specific standard. Moreover, although the pact specifically targets used oils and greases, and textiles contaminated with oils and greases, it allows companies to conduct test burns and seek authorization to burn other types of industrial and hazardous waste beyond used oils and greases.⁸³ It is thus a major policy decision on how to manage hazardous waste taken with no public input and which may impact public health and the environment.

⁸³ Instituto Nacional de Ecología, *Convenio INE-Industria Cementera para el reciclaje energético de combustibles alternos, (INE-Cement Industry Pact for energy recycling of alternative fuels), May 1996.*

Mexico's major policy statement on hazardous waste management continues to be its 1996 document, Program for Minimization and Integrated Management of Industrial Hazardous Wastes in Mexico, 1996 – 2000. According to the document, the major program in Mexico should be and is the establishment of CIMARIs, Integrated Centers for Disposal, Recycling and Management of Industrial Waste. Based upon this document, Servicios Ambientales de Coahuila and governmental officials from INE justified the proposed hazardous waste landfill in General Cepada, calling it the first CIMARI. But the CIMARI idea has never undergone a public process with citizen involvement and it is an idea which has been utilized by the major hazardous waste management companies to attempt to sway public and government opinion. In fact, the consulting company promoting the General Cepada landfill even paid for the publication of a second edition of the "Program for Minimization and Integrated Management of Industrial Hazardous Wastes in Mexico, 1996-2000" document since INE did not have the money to publish more than a few copies.⁸⁴ It was in their interests to promote the site as if it had emerged out of a careful government plan for adequate hazardous waste management. Similarly, RIMSA announces on its web page that it is a CIMARI, even though no governmental authority has designated them as such, and, in fact, no standard for what a CIMARI would even look like or what criteria it would have to meet has been finalized.

The CIMARI concept is one that invites outside experts and industries to use their technical and financial resources to solve Mexico's hazardous waste management crisis. The government does not have the financial resources to adequately monitor hazardous waste generation and reporting, so instead outsiders will be invited in to give industries an option – or a couple big options – to manage hazardous waste. It is this lack of resources at the governmental level along with the lack of information on hazardous waste which plays into the hands of hazardous waste management companies, while limiting citizen input into the process.

Thus, in Mexico, and to a lesser extent in the U.S., the lack of public information and the failure to report by industries which generate hazardous wastes has led to acceptance of a highly technical model of hazardous waste management at huge centers distributed throughout the country. It is a model which takes the pressure off of individual industries to minimize their wastes and takes away the ability of citizens to assist in placing that pressure on individual companies.

Current Citizen Involvement in Hazardous Waste Management Issues

⁸⁴ Jose Luis Garcia Valero, *El Falso CIMARI de General Cepada, Coahuila, La Jornada Ecologica* (Vol. 6, No. 66), 27 April, 1998, 4.

As previously mentioned, most citizen involvement in hazardous waste management issues in the border region has focussed on proposed waste sites – from General Cepeda to Sierra Blanca – which have been determined or are perceived to be unsafe. In addition, there has been concern about specific facilities such as Condados Presto, Metales y Derivados and Alco Pacífico which have left piles of contaminated wastes near residences. These citizen campaigns have been oppositional in character.

There are other means for citizen involvement beyond opposition. One of the most important is being involved in siting decisions for hazardous waste management facilities. Mexico's process for locating appropriate sites for CIMARIs supposedly involves such a public process. Several years ago, consultants were hired in Mexico to find the sites which met the geologic, hydrological, seismic, ecological and climactic conditions to establish these waste recycling, management and disposal facilities. The resulting atlas of sites, however, has never been made public, although INE continues to list the atlas as an upcoming program. In addition, as the case of General Cepeda makes clear, if such an atlas exists, it has not been used. General Cepeda was a private effort not a public effort to site such a facility.

Another opening for citizen involvement is involvement in the development of standards and regulations of hazardous waste. Thus, in the U.S., under the Administrative Procedure Act, agency decisions that set standards must go through a rule making process which usually includes a notice and comment period. Thus, before issuing a rule, the agency must publish the rule and give the public at least 30 days to comment. The agency is required to consider all nonfrivolous comments when making a final decision. Finally, some rulemaking may involve public meetings where citizen input on rules can be considered.

In addition to rulemaking under the APA, citizens can petition agencies to take action or issue regulations. In the specific case of the Resource Conservation and Recovery Act (RCRA), for example, any person may petition EPA to promulgate, amend or repeal any regulation. The agency is required to respond within a certain time period.

In Mexico, there is no specific statute which allows for public comment on proposed regulations. Nevertheless, under the process for adopting Official Mexican Standards (NOMs), both a National Standards Commission made up of government and private organizations and associations as well as individual National Standards Advisory Committees, also made up of private and public representatives are responsible for overseeing the development of standards and public comment. While this process ensures some public input into the NOM process, as already noted, industry and government are the main representatives on the committees. Once a draft NOM is published in the *Diario Oficial*, the Advisory Committees are

given an opportunity to change the NOM and respond to the public comments. Again, the result is that the industry-heavy Advisory Committees have significant opportunity to influence NOMs, while general citizens have very little. In addition, SECOFI, the Commerce and Industrial Development Secretary, also has the ability to veto a NOM if it interferes unduly with the economy.

Another area where the public is involved in environmental decision-making and site selection is in the environmental impact assessments and permit decisions. Most major projects in Mexico – such as a hazardous waste landfill – require submission of a federal EIA to INE. If INE finds the EIA to be complete, citizens have the opportunity to review and comment upon the document. The EIA process does provide an opportunity for citizens to participate, although it often happens after a siting decision has been made, rather than before. In addition, under the 1996 reforms to the LGEEPA, many projects only require a “preventative study,” rather than an EIA with its more rigorous public participation requirements.

In the U.S., only those projects requiring federal monies or permitted by a federal agency are required to perform an Environmental Impact Study, or EIS. Thus, many municipal waste and waste water projects which receive federal monies from the Environmental Protection Agency must prepare an EIS which must include a process for public input and comment. Generally, however, private hazardous waste management facilities are permitted by the state are not required to submit or conduct a federal EIS, although similar types of information are prepared for the state environmental agencies reviewing the application.

In addition to the EIS itself, most U.S. state and federal environmental statutes provide the public rights to participate in permitting procedures. Under RCRA, for example, notice of any proposed permit must be published in a local newspaper and a public hearing must be held for public comment.⁸⁵ In Texas, the public is given an additional right to become involved in a public hearing process. These hearings are not just public meetings where comments are given but actual “contested case hearings,” where members of the public have been given party status to offer evidence that a proposed draft permit does not meet the required permit criteria. An administrative law judge from an independent state agency takes the evidence and makes a recommendation to the agency decision maker. For example, citizens from both sides of the border became involved in a contested case hearing in 1997 and 1998 over the proposed radioactive waste site near Sierra Blanca, Texas, and a pair of administrative judges recommended denial to the three-member Texas Natural Resource Conservation Commission. Finally, on October 22, 1998, the TNRCC overturned the draft permit and denied the Sierra Blanca application.

⁸⁵ *Resource Conservation and Recovery Act, 42 U.S.C. sec 4974 (b).*

A third area in both the U.S. and Mexico for citizen involvement is in the actual enforcement of environmental regulations. Under most major federal environmental laws in the U.S., citizens can bring a civil action to enforce compliance with the statute. These civil suits can be brought against both the companies themselves as well as governmental agencies for failing to carry out their non-discretionary duties under the law. Some state laws also give citizens the right to bring an action to enforce or implement state environmental law. Finally, the public must be given an opportunity to comment on consent orders and settlements. Thus, under RCRA, the public must be able to comment on any settlements between the government and industry.

In Mexico, there are two main mechanisms for the public to become involved in enforcement of environmental laws. First of all, under the LGEEPA, any citizen may file a popular complaint, or *denuncia popular*, with PROFEPA for anything within federal jurisdiction that harms the environment. PROFEPA then has 30 working days to inform the complainant of any results of its investigation and any measures being taken. If the citizen does not agree with the results or measures, they may file a request to reconsider or amend the resolution, or bring a suit, known as an amparo, before a District Judge.

An amparo demand or suit is a legal action which seeks to annul, repair or suspend any governmental action which violates an individual's guaranteed rights. The complainant party must, however, show that the harm is "personal and direct" and show a legitimate or legal interest in the harm being sought to be repaired. These two provisions make it extremely difficult for citizens to pursue a legal action against governmental action or inaction since they must demonstrate both the environmental harm and a personal and direct causation with that harm. In addition, the amparo process only applies to the aggrieved party filing the suit and can not be used as part of a class action suit.

The involvement of citizens more directly in government-led enforcement cases on either side of the border is relatively unexplored. It is often the neighbors of an illegal hazardous waste site or a polluting industry who will first alert authorities to the problem. Other than this "eyes and ears" role, however, environmental enforcement officials are reluctant to request or allow citizen involvement. However, citizen groups have become increasingly professional and able to directly negotiate with industries, conduct environmental health studies and sampling programs, and provide ongoing inspection. However, such citizen involvement normally presupposes a relationship of trust between regulators and citizens that does not currently exist in many parts of the border region.

New Options for Citizen Involvement

In the U.S. citizens are beginning to negotiate directly with companies over pollution prevention, emission reductions and safety issues at the facilities themselves. Often citizen groups are negotiating with companies to form Good Neighbor Agreements between the companies and local residents. There have been numerous examples where citizen committees and Good Neighbor Agreements have helped companies identify and implement hazardous waste generation and emission reductions. Still, there have been other cases where these committees and agreements have not been effective. The key seems to be the ability of the citizens to receive accurate and timely information and the will of the companies to actually implement changes. Government involvement and oversight is also key in carrying out the agreements.

Local citizen and environmental groups which have tried to negotiate directly with companies in Mexico over source reduction and emergency planning issues, however, have had not had much success. A large part of this problem is due to the lack of accessible environmental information. While U.S. citizens have access to the Toxics Release Inventory Program data, as well as other data, citizens in Mexico do not have similar types of accessible information. For example, CEM -- Comunidad Ecologica de Matamoros -- and the surrounding residents have had little success in discussing land tenure, safety and environmental issues with Quimica Fluor, a hydrogen flouride facility partially owned by DuPont and Grupo Carso. Officially, DuPont is committed to maintaining good relations between its facilities and neighbors. Why would the same company have different environmental cooperation policies in Mexico and the U.S.?

One new option which may become available to citizens on both sides of the border is the developing agreement on Transboundary Environmental Impact Assessments (TEIA). Under Article 10:7 of the side agreement to NAFTA establishing the North American Commission for Environmental Cooperation, the three parties to NAFTA agreed to establish a system of notification for projects that could pose transboundary environmental impacts on another country as well as a process of consultation and mitigation of any environmental impact. Currently, through the CEC, Mexico, Canada and the U.S. are discussing the parameters of a Transboundary Environmental Impact Assessment, including citizen involvement, notification process and consultation. These discussions have led to the development of a set of Overarching Principles, and a draft international agreement on TEIA prepared by a panel of experts.⁸⁶

This is a relatively new area of investigation but completely necessary as government officials realize that environmental media -- air, water, soil-- do not

⁸⁶ Commission for Environmental Cooperation, "Draft North American Agreement on Transboundary Environmental Impact Assessment" (<http://cec.org/english/resources/information/pblindexe.cfm?fomat=1>), January 1999.

respect political boundaries. Nonetheless, most of the discussion on TEIA have focussed on notification between local, state and federal governments rather than individual citizens rights to participate in the process. Citizens must ensure that just as they currently have the right in both the U.S. and Mexico to review and comment during the EIA and EIS process, they will also have similar or expanded opportunities under a Transboundary Environmental Impact Assessment.

Another new opportunity for citizens living along the border is the CEC's Article 14 and 15 Complaint Submission Process. Under Article 14 of the North American Agreement on Environmental Cooperation, the CEC may consider any submission from any person or non-governmental organization that one of the Parties to the Agreement is failing to effectively enforce its environmental laws. If the submission meets certain criteria, the CEC secretariat can request a response from the Party concerned. Based upon the submission and the response, the CEC secretariat can then recommend that a factual record be prepared under Article 15. If the CEC council approves the recommendation, a factual record is prepared.

The CEC submission process offers citizens an opportunity to put an international spotlight on the failure to enforce environmental laws. Nevertheless, the submission process is extremely time-consuming and recent proposed changes to the guidelines would make it even more difficult for submissions to lead to the preparation of a factual record. In fact, thus far, only one factual record has been prepared, while 20 complaints have been submitted against the U.S., Mexico or Canada.⁸⁷ Still, the CEC process offers citizens a way of attempting to resolve environmental problems when their national government agencies are unresponsive or even hostile.

X. WHAT NEEDS TO HAPPEN: CONCLUSIONS AND RECOMMENDATIONS

⁸⁷ Commission on Environmental Cooperation, "Registry of Submissions on Enforcement Matters," (<http://www.cec.org/templates/RegistryFront.cfm?format=1&varlan=English>), December 21, 1998.

This brief report has left more questions unanswered than answered. Just how much waste is produced in the border region? We don't know. How much crosses the border? We don't know. How is waste managed, particularly in Mexico? We don't know. Is enforcement an effective deterrent and incentive? We think not, but we really don't know.

But this report did answer some basic questions about hazardous waste management along the U.S. -Mexico border. The answers we have are:

- IV. The most cost-effective waste management strategy along the border is pollution prevention at the source, not the creation of an elaborate system of hazardous waste management facilities.
- V. The attempt to locate inadequate landfills in both the U.S. and Mexico has only led to citizen opposition.
- VI. The policy to burn liquid hazardous wastes in cement kilns and the decision to encourage the establishment of "CIMARIs" -- Integrated Center for Recycling, Management and Disposal of Industrial Waste -- throughout the border are mistakes for several reasons, particularly without knowing how much waste is generated in the border region. First, new facilities for landfilling and incineration produce a disincentive to reduce waste at the source. Secondly, these technologies are still unproven and unsafe. Furthermore, there are still no final standards for either CIMARIs or the incineration of hazardous waste in cement kilns. Essentially, Mexico is proceeding down the same road as the U.S. has, promoting unproven technologies to burn and dispose of waste, rather than promoting pollution prevention.

A major conclusion of this report is that without better information on the generation and current management of hazardous wastes, it is impossible to assess whether Mexico truly needs hazardous waste disposal facilities like landfills and hazardous waste incinerators. In the U.S., every state as well as the federal EPA are required to conduct a capacity needs assessment for hazardous waste every two years.⁸⁸ In this way, states are able to better decide whether to permit new facilities to manage hazardous waste. In addition, citizens can use these capacity assessments to also determine whether or not a proposed facility is truly needed.

In order to conduct such a needs assessment, however, Mexico must begin enforcing the hazardous waste rules which require companies to report generation and transport of hazardous waste as well as how much toxic waste they emit into the air, land and water. Some of the legislation must be changed. For example the PRTR, or

⁸⁸ *Texas Natural Resource Conservation Commission, Needs Assessment for Hazardous Waste Commercial Management Capacity in Texas (1998 Update) (Austin: TNRCC, January 1998).*

RETC, should be applied to all industries not just those industries regulated by the federal environmental authorities. In addition, the section on hazardous wastes under the RETC should be obligatory, not voluntary. Finally, the names of all generators of hazardous waste and toxic emissions should not be confidential.

It is unacceptable that Mexican governmental authorities must estimate total hazardous waste based upon reporting compliance rates of 10 to 15 percent. Those companies which have not made their reports available to Mexican authorities should be fined if they refuse to comply. As a trinational organization, the CEC should pressure U.S. and Canadian companies with affiliates in Mexico to respect Mexican legislation and comply with reporting requirements.

On the U.S. side, EPA must make HAZTRAKS more effective. As identified in this report, some of the crossing points at the border do not appear to be providing all of the data to the EPA. Others – such as the Port of Houston – may not have received the needed training to provide data about imports of hazardous waste from Mexico. In addition, the database itself is cumbersome and difficult to use and should be redesigned.

Moreover, because citizens and government need good and timely information on industrial pollutant emissions and transfers in order to encourage pollution prevention, Mexico, with pressure by citizen groups and the binational working groups, must immediately push forward with plans to make the pollutant release and transfer registry (PRTR or RETC) universally applied and publicly available. Without an accessible and accurate database of individual pollutants from individual companies, there is much less incentive for industry to reduce pollution along the border. The experience in the U.S. with programs like Clean Texas 2000 is that having public information is a necessary ingredient to provide incentives for and verify real reductions.

In addition to these recommendation on information and preparation of a capacity needs assessment for the border states, we offer the following policy recommendations for the U.S. and Mexican governments:

***Mexico should immediately revoke all authorizations and permits to burn hazardous wastes in cement kilns until the technology is better understood and until an official standard, with public participation, exists;**

***Mexico should put any present applications for fuel blending facilities on hold until an official standard is developed;**

***Mexico should make an official policy decision that the burning of hazardous wastes in cement kilns is a form of disposal and not recycling and therefore no hazardous wastes can be imported into Mexico for this purpose;**

***Mexico should immediately put on hold all applications for hazardous waste landfills or CIMARIs in the border region until an official standard and a mechanism for public notice and participation are adopted and until a full hazardous waste management capacity needs assessment is conducted;**

***Mexico should make the actual names of the industries which report under the RETC and generate toxic emissions public;**

***Mexico should make Section IV -- Generation, Treatment and Transfer of Hazardous Wastes -- of the RETC obligatory (it is currently optional) and insist that all industries, whether of federal, state or local character, report their hazardous waste through this section.**

***Mexico should make enforcement orders against companies public and company specific so that citizens also know which companies are not complying with environmental regulations.**

***Mexico should concentrate enforcement efforts on PEMEX and the maquiladora industry;**

***The U.S., Mexico and Canada should make a commitment to adopt an international agreement on Transboundary Environmental Impact Assessments, including a mechanism for effective public notice and participation of citizens where hazardous waste facilities are proposed that could impact the environment and welfare of the other country;**

***The U.S. and Mexico should increase enforcement of hazardous waste regulations to assure that industry has an incentive to reduce pollution at the source and not rely upon commercial management facilities;**

***The U.S. and Mexico should respect the "right to know" environmental information;**

***The U.S. and Mexico should develop strategies to also identify emissions from mobile and area sources.**

Finally, the report finds that the positive role which citizens can bring to hazardous waste management issues has largely been ignored. While citizens will continue to serve an important role in opposing hazardous waste facilities which endanger the health and welfare of the border region -- as they have from Sierra Blanca to General Cepeda -- they have other roles: citizen inspection and enforcement; participants in formulation of hazardous waste standards and policy; negotiating with industry over pollution prevention; and involvement in transboundary environmental impact assessments.

Governmental policy on both sides of the U.S. - Mexican border should encourage this type of citizen participation. In the end, it will lead to better management of hazardous waste.

ANNEX I

The Maquiladora Export Industry in Mexico

The maquiladora industry of the northern border region of Mexico, today the region's most important economic sector, has prospered due to a policy designed to exploit the so-called comparative advantage of the region. These advantages include a relatively cheap labor supply and lesser environmental and social standards. Thus, the maquiladora industry is a series of investments in productive processes with high fiscal, environmental and social impacts and inadequate performance standards.

Officially, this industrialization phenomena was characterized as: "A program of great success for the industrialization of the northern zone was put in place, authorizing the free import of machinery and raw materials to facilitate their export as manufactured goods. The government does not doubt that this will improve the living conditions for thousands of Mexicans, as permanent sources of jobs are created."⁸⁹

The unilateral rupture of the "Braceros Agreement" in 1964 by the United States, increased the excess of labor in the border region and gave an impetus for the Mexican government to incorporate this labor into its plans for decentralizing and promoting industrialization in the north, along with its official economic policy of import substitution. Thus, in 1968, Mexico's president declared, ""Along the Northern Border, 115 plants have been authorized, with an initial capital investment of 116 million pesos. Those factories which are already operating employ 15,000 workers, who are receiving 205 million pesos each year in salaries. Some 70 plants are currently operating in the region."⁹⁰

In retrospect, the phenomena of the growth of the maquila industry, and its effects, among which is the generation of industrial toxic and hazardous wastes, can be divided into two time periods. Each time period can be examined according to economic indicators such as the number of plants, the number of employees, the value of national and imported inputs and the total value added.

⁸⁹ *First Annual Report of the Government of Gustavo Díaz Ordáz, September 1, 1965, page 23.*

⁹⁰ *Fourth Annual Report of the Government, September 1, 1968, page 111.*

The first period begins in 1965, although reliable official statistics only become available in 1978, and ends in 1990. A second period begins in 1992, following the economic and industrial crisis in the United States in 1991, which that year led to a major decline in maquiladora activity (see Figure 1 and 2 in report and Tables A and B).

As diverse authors and economists have noted, the first period is one of growth and expansion, with rises and falls in the maquiladora industrial activity. It is characterized by its enormous dependency on industrial activity within the United States, and is typified by relatively low-technology assembly plants, not the manufacturing of finished products.

The second period of maquiladora activity takes off after the 1991 crisis and continues to this day. In general, the period is marked by the increased magnitude in the number of plants, employees, value of inputs and value added. In addition, the maquiladora sector does not appear to be so dependent upon the U.S. and in fact often has an inverse relationship with U.S. industrial production.

For example, during the more recent period, the annual average growth rates (AAGRs) of the maquiladora sector correspond with declines in the AAGRs of industrial production in the United States. This inverse relationship may be due to the fact that the maquiladora industry of the last 7 years is not concentrated solely in traditional assembly and manufacturing sectors, but today includes more advanced finished products and even services. The assembly of electric and electronic machinery, equipment, articles and accessories, as well as chemical products, have declined relative to other sectors in terms of the five economic indicators examined.

During the 1991 to 1998 period, the magnitude of the maquiladora activity is much greater than the activity during the first period. Thus, while annual average growth in the number of plants is equivalent during the two periods, the yearly average of new employees is 2.2 greater in the more recent period, the value of annual imported inputs is 4.45 times greater, the value of national inputs is 3.12 times greater and the annual accumulated value added is 2.12 times greater (Table B). In other words, over the last seven years, industrial activity within the maquiladora sector has multiplied several times compared to industrial activity during the previous 12-year time period.

Despite the absolute and annual average increases during the last seven years, the average annual growth rates actually declined compared to the 1978-1990 period in each of the five indicators. Thus, the rate of growth of new plants decreased 2.07 times in the second period compared with the first, the number of employees declined 1.42 times, the value of imported inputs fell 1.27 times, and

value added declined 1.96 times. (The average annual growth rates in the value of national inputs was equivalent).

Thus, on the one hand, the total magnitude of industrial activity within the maquila sector in the northern border region has greatly increased during the last seven years. Nonetheless, average annual rate growth rates have actually declined during this more recent time period. Still, given the increased number of plants, employees, and the higher value of inputs and value added, the total generation of hazardous wastes has also likely increased during the recent period, especially given the changing manufacturing base of the maquiladora sector.

The expansion and impact of the maquiladora sector is rooted in policy decisions and industrial relocation which took place well before the North American Free Trade Agreement went into effect in 1994. In fact, even before NAFTA, the Mexican government increased incentives and infrastructure for the expansion of the maquiladora export sector throughout Mexico. The signing of NAFTA institutionalized these policies as well as an economic model which lacks basic performance standards, including those contained in international commitments and even NAFTA itself.

Thus, Mexico has the responsibility for initiating the maquiladora policy, in concert with its neighbors and other countries. NAFTA is simply the institutionalization of this policy without adequate environmental and social requirements or responsibilities for foreign and national investment.

Table A. Historical Variation of Average Annual Growth Rates (AAGR) of Four Economic Indicators of the Maquiladora Industry in Mexico

Year	AAGR No. of Plants in Border Municipalities	AAGR Employees In Border Municipalities	AAGR No. of Plants in Non-Border Municipalities	AAGR Employees in Non-Border Municipalities
75	-0.2	-11.5		
76	-1.3	10.7		
77	-1.1	5.4		
78	3.2	15.6		26.2
79	18.2	23.3	30.2	23.9
80	14.8	6.9	19.8	8.0
81	-2.4	9.6	12.0	9.8
82	-3.3	-3.0	-4.8	-3.2
83	2.6	18.7	15.4	18.4
84	12.0	32.4	42.8	33.4
85	13.1	6.2	14.0	7.0
86	17.1	17.9	44.6	20.8
86	4.0	0.6	43.4	6.2
88		18.9	31.2	-2.1
89	15.3	13.9	26.5	13.9
90	-1.1	0.7	16.2	0.7
91	8.2	1.3	15.7	1.3
92	8.5	6.6	13.0	6.6
93	0.7	5.3	12.5	5.3
94	-3.0	8.6	4.8	8.6
95	-2.9	9.9	14.5	9.9
96	9.2	12.8	25.7	12.8
97	9.9	15.4	27.5	15.4
98/p	4.4	7.2	12.1	7.2

Source: Own calculations based upon the original data in various annual reports of the Mexican government, including José López Portillo, Sept. 1, 1981; Miguel de la Madrid Hurtado, Sept. 1, 1986; Carlos Salinas de Gortari, Sept. 1, 1994; and Ernesto Zedillo, Sept. 1, 1998.

Table B. Annual Average Growth Rates (AAGR) and Annual Accumulated Averages of Five Economic Indicators of Border Maquiladora during the Time Periods 1978-90 and 1991-98*

Period	Number of Plants	Employees	Value of Imported Inputs	Value of National Inputs	Value Added
Average Annual Growth Rates					
1978-98	9.1	12.1	24.4	21.8	13.3
1978-90	11.6	13.8	26.5	22.0	16.3
1991-98	5.6	9.7	20.9	21.6	8.2
Ratio 91-98/78-90	0.48	0.70	0.79	0.98	0.50
	Total Quantity	Total Quantity	Total Quantity	Total Quantity	Total Quantity
1978-98	1,900	728,517	154,069	46,807	1,208,441
1978-90	1,096	303,617	42,852	16,590	540,269
1991-98	645	389,504	111,217	30,217	668,172
Calculation taking into account the annual average of each accumulated quantity					
	Annual Average	Annual Average	Annual Average	Annual Average	Annual Average
1978-98	95	36,426	8,109	2,464	63,602
1978-90	91	25,301	3,571	1,382	45,022
1991-98	92	55,643	15,888	4,317	95,453
Ratio 91-98/ 78-90	1.01	2.20	4.45	3.12	2.12

Note: *For the first two indicators, the time period 91-98 was used: for the last three, the time period 91-97 was used.

Fuente: INEGI, Estadísticas de la Industria Maquiladora de Exportación, Web Page (<http://dgcnesyp.inegi.gob.mx/BDINE/>), April 1999.

ANNEX II

Location of the Infrastructure for Industrial Hazardous Waste Management in Mexican Border States

Tables A and B present information about the number and location of facilities dedicated to the management of industrial and medical hazardous wastes in the northern border states of Mexico. All of this information is available through the web page of INE, the National Ecology Institute, an arm of Mexico's federal environmental agency. We hope that the citizens of the northern border region will use this information to inform themselves and make sure that these facilities are managing hazardous wastes in an appropriate way. There is no attempt here to evaluate the capacity or environmental controls of these companies.

Table A. Geographic Distribution of Infrastructure for Hazardous Waste* Management in the Mexican Border States, 1998

State	Recycling	Treatment	Incineration (**)	Final Disposal	Total
Baja California	5	3	1	0	9
Coahuila	1	1	5	0	7
Chihuahua	0	3	0	0	3
Nuevo León	12	2	3	1	18
Sonora	0	0	0	1***	1
Tamaulipas	0	3	1	0	4
TOTALES	18	12	10	2***	42

Notes: *Includes medical waste, which is considered hazardous under Mexican law.

**Includes fuel blending plants, which later send their product for incineration.

***Cytrar, a hazardous waste landfill operating near Hermosillo, was closed in November, 1998.

Some facilities engage in more than one type of hazardous waste management and thus may be counted more than once.

Source: INE, Distribución Geográfica de la Infraestructura para el Manejo de Residuos, Web Page (<http://www.ine.gob.mx/dgmrar/ri/infra-rip.htm>), April 1999.

Table B. Authorization Number, Name, Type of Management and Capacity of Hazardous Waste Management Facilities in the Northern Border States of Mexico, 1998

Authorization Number	Firm Name	Type of Treatment	Municipality	Annual Estimated Capacity
BAJA CALIFORNIA				
2-4-PS-IV-05-97	Servicios Ecológicos GAL	Used Container Recycling	Mesa de Otay (Tijuana)	?
2-4-PS-V-01-93	SOLVER	Solvent Recycling	Tijuana	21,773 Ton/Year
02-02-PS-VI-01-97	Nueva Exportadora Latina de México	Used Lubricant Recycling	Tijuana	8,015 Ton/Year
02-04-PS-V-04-97	Oxidos y Pigmentos	Metal Recycling	Tijuana	?
02-04-PS-V-03-97	Industrias P. Kay de México	Metal Recycling	Tijuana	720 Ton/Year
02-4B-PS-VIII-011-98	Bio-Infex Servicios y Tecnología	Medical Waste Treatment	Tijuana	1,080 KG/Hour
02-4B-PS-VIII-07-97	Tecnicas Medio-Ambientales Winco	Medical Waste Treatment	Tijuana	876 Ton/Year
02-4B-PS-Vi-03-98	Servicios Ecológicos GAL	Hazardous Waste Treatment	Mesa de Otay (Tijuana)	?
2-1-PS-VII-06-97	Cementos Guadalajara	Hazardous Waste Incineration in Cement Kiln	Ensenada	?

Authorization No.	Name of Firm	Type of Management	Municipality	Estimated Annual Capacity
COAHUILA				
05-27-PS-VI-01-97	Reciclado de Solventes	Solvent Recycling	Ramos Arizpe	23,040 Ton/Year
5-30-PS-V-01-93	Consorcio GHES Industrial	"On-Site" Hazardous Waste Treatment	Saltillo	4800 Ton/Year
5-27-PS-VII-03-97	Cementos Apasco	Hazardous Waste Incineration in Cement Kilns	Ramos Arizpe	13,860 Ton/Year
5-27-PS-V-03-94	Ecoltec	Preparation of Hazardous Waste for Incineration (Fuel Blending)	Ramos Arizpe	180,000 Ton/Year
5-35-PS-VI-11-96	Cementos Mexicanos	Hazardous Waste Incineration in Cement Kilns	Torreón	9,016 Ton/Year
5-35-PS-V-02-94	ProAmbiente	Preparation of Hazardous Waste for Incineration (Fuel Blending)	Torreón	48,000 Ton/Year
05-25-PS-VI-20-98	Control de Desechos Industriales y Monitoreo Ambiental	Medical Waste Incineration	Piedras Negras	?
CHIHUAHUA				
8-37-PS-06-95	Dalgety	"On-Site" Treatment of Hazardous Wastes	Ciudad Juárez	?
08-37B-PS-I-VIII-01-97	Sociedad Cooperativa de	Medical Waste Treatment	Ciudad Juárez	911 Ton/Year

	Desperdicios Industriales Joysa			
08-19-PS-VI-01-97	Carlos Fernando Chavez García	Hazardous Waste Treatment	Nombre de Diós, Chihuahua	?
Authorization No.	Name of Firm	Type of Management	Municipality	Estimated Annual Capacity
NUEVO LEÓN				
19-06-PS-IV-25-96	Barriles Metalicos	Used Container Recycling	Apodaca	2,880 Ton/Year
19-21-PS-V-04-94	Ecoquim	Used Container Recycling	Mariano Escobedo	5,400,000 Liters/Year
19-39B-PS-IV-10-98	Ing. Jorge Villanueva Gutiérrez (VILLACO)	Used Container Recycling	Monterrey	?
19-21-PS-V-04-94	Ecoquim	Solvent Recycling	Mariano Escobedo	5,400,000 Liters/Year
19-18-PS-VI-04-97	Reciclajes y Destilados de Monterrey	Solvent Recycling	García	?
19-37-PS-VII-01-93	Residuos Industriales Multiquim	Solvent Recycling	Mina	?
19-39-PS-V-02-93	Servicios de Reciclado Textiles	Solvent Recycling	Monterrey	108 Ton/Year
19-39-PS-V-06-94	Maquiladora de Lubricantes	Used Lubricant Recycling	Monterrey	460 Ton/Year
19-39-PS-I-14-95	Novaceites	Used Lubricant Recycling	Monterrey	432 Ton/Year
19-12-PS-V-07-94	Acumuladores Mexicanos	Metal Recycling	Cienaga de Flores	43,200 Ton/Year

19-39-PS-V-16-95	Procesos Químico Especializados	Metal Recycling	Monterrey	?
19-39-PS-VI-03-97	Zinc Nacional	Metal Recycling	Monterrey	20,000 Ton/Year
19-39-PS-V-13-95	Constructora y Perforadora Azteca	"On-Site" Hazardous Waste Treatment	Monterrey	48,000 Ton/Year
Authorization No.	Name of Firm	Type of Management	Municipality	Estimated Annual Capacity
NUEVO LEÓN				
19-37-PS-VII-01-93	Residuos Industriales Multiquim	Hazardous Waste Treatment	Mina	?
19-46B-GM-VII-06-98	HYLSA	Hazardous Waste Incineration	San Nicolás de la Garza	?
19-00B-PS-VI-14-98	Bio-System & Technology	Medical Waste Incineration	Monterrey	?
19-37-PS-VII-01-93	Residuos Industriales Multiquim	Preparation of Hazardous Waste for Incineration (Fuel Blending)	Mina	90,000 Ton/Year
19-37-PS-VII-01-93	Residuos Industriales Multiquim	Hazardous Waste Landfill	Mina	100,000 Ton/Year
SONORA				
26-30-PS-VII-06-96	CYTRAR	Hazardous Waste Landfill	Parque Industrial, Hermosillo	This site was closed in 1998 and is not operating.
TAMAULIPAS				

28-38-PS-V-03-97	Constructora Elyon Sadday	"On-Site" Hazardous Waste Treatment	Tampico	?
28-38-PS-V-02-97	Presión y Vacío	"On-Site" Hazardous Waste Treatment	Tampico	?
28-38-PS-V-01-94	Tecnología Especializada de Control Ambiental	"On-Site" Hazardous Waste Treatment	Tampico	42,000 Ton/Year
28-22-PS-VI-03-97	Servicios para el Control Ambiental (SECAM)	Medical Waste Incineration	Matamoros	964 Ton/Year

Source: Instituto Nacional de Ecología, Web Page (<http://www.ine.gob.mx/dgmrar/ri/list-ea/>), April 1999.