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Roberto A. Sanchez

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ROBERTO A. SÁNCHEZ*

Health and Environmental Risks of the Maquiladora in Mexicali

The fast growth of the maquiladoras in the border region has triggered big hopes for regional development. However, whether or not this can be achieved remains an open question. The complex industrial structure which characterizes the border and the lack of a clear policy for regional development could be major obstacles to development. Furthermore, there has not been a global evaluation of the potential benefits and risks of the industrialization process via maquiladoras. Major attention has been given to the creation of employment, but other economic, social, and environmental issues essential for development have been left aside.

For years there have been allegations of occupational hazards in the maquiladoras.¹ Nevertheless, little empirical evidence is available on this problem.

Attention has shifted recently to hazardous waste emissions from the maquiladoras. The debate is centered on whether the maquiladoras should be considered major generators of hazardous waste or not, but once again little data is available on this issue. A major obstacle has been the reluctance of the maquiladoras to provide any information on their emissions of hazardous waste. Nevertheless, this question is critical for the border given the huge growth of the maquiladora industry in the last five years.

This paper studies some of the environmental risks related to the maquiladoras, with the basic hypothesis being that the maquiladora does generate significant amounts of hazardous waste under conditions that are an environmental risk. To validate this hypothesis, empirical evidence is first provided of the use of hazardous materials in the maquiladora, and then possible controls are studied which can be applied to the potential waste resulting from these materials.

THE MAQUILADORA INDUSTRY IN MEXICO

In the context of Mexico's current economic crisis and external debt, the maquiladora industry is considered by a large group of Mexico's

*Senior Research Fellow, El Colegio de la Frontera Norte.

1. For a broader discussion, see S. Arenal, *Sangre Joven: La Maquiladora por Dentro* (1986) (México, Editorial Nuestro Tiempo); J. Carrillo & M. Jasis, *La Salud y la Mujer Obrera en las Plantas Maquiladoras* (1983) (mimeo); N. Iglesias, *La Flor mas Bella de la Maquiladora* (1985) (CEFNOEX-SEP, Mexico); J. Carrillo & A. Hernandez, *Mujeres Fronterizas en la Industria Maquiladora* (1985) (CEFNOEX-SEP); C. Denman, *Salud de Obreras de la Maquiladora: el Caso de Nogales, Sonora* (1988) (mimeo).

public officials to be a top priority to the national economy. They foresee the maquiladora as a reliable source for much needed foreign currency, employment, and regional development.

To a certain extent the maquiladora has fulfilled these expectations, and is currently the healthiest industrial sector in Mexico's economy. Until 1988, there were more than 1,300 maquiladora plants in the country, employing approximately 330,000 people, and generating 1.6 billion U.S. dollars in foreign exchange.²

The operation of the maquiladora is based on items 806.30 and 807.00 of the United States Tariff Schedule, which allow the import of goods and services into the United States to pay duty only on the value added in Mexico. Mexico's use of items 806.30 and 807.00 has considerably increased in the last three years.³

The maquiladora boom (Fig. 1) can be attributed to several types of potential advantages to U.S. or other foreign firms with significant labor costs: 1) significant cost savings in labor, services, and other operation costs, particularly after the 1982 peso devaluation; 2) 100 percent ownership by foreign firms; 3) proximity to the United States; 4) lower transportation and communication costs; 5) possibility of management and technical personnel living in the United States; 6) greater control over day-to-day operations; 7) fiscal incentives; and 8) potential access to Mexican and Latin American markets.⁴

The majority of the maquiladora plants in Mexico are U.S. owned or controlled, either through foreign subsidiaries operating in the country, or through subcontracts to U.S. corporations. Ninety percent of the maquiladora output is for the U.S. market.⁵ In the past, most of the U.S.-controlled maquiladoras were subsidiaries of medium-sized multinational enterprises, but, in the last few years, an increasing number of the larger corporations have maquiladoras in Mexico.

Currently, 88 percent of the maquiladoras in Mexico are located in northern Mexican border cities. Although the number of maquiladoras in inland cities has grown in the last three years, they account for only 12 percent of the total number of maquiladoras.

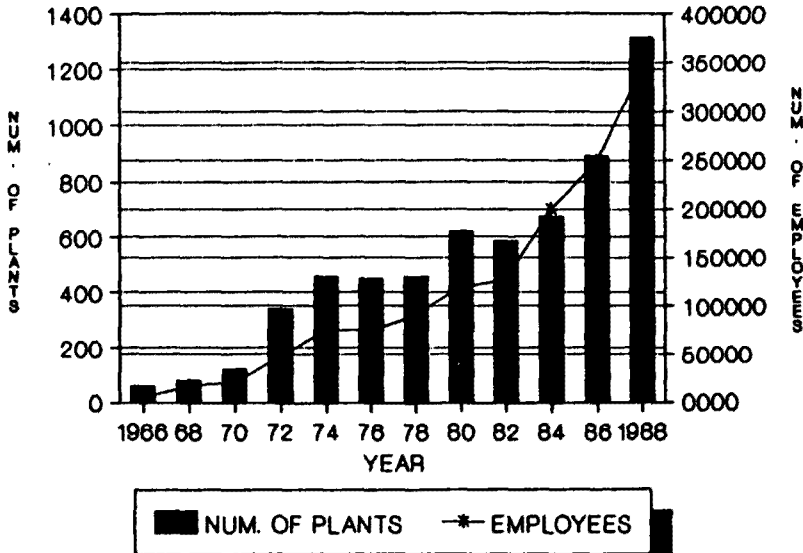
The distribution of maquiladoras along the border changed during the 1980s. Historically, the maquiladoras tended to be located in the eastern border area: Ciudad Juárez, Nuevo Laredo, Reynosa, and Matamoros. This path was modified during the boom years of the maquiladora (1982 to 1988). The number of maquiladoras in the western border area (Tijuana,

2. INEGI, *Avance de Informacion Economica* (1988).

3. United States International Trade Commission, *The Use and Economic Impact of Tsus Items 806.30 and 807.00 2053* (1988) (USITC Publication).

4. N. Clement & S. Janner, *Location Decisions Regarding Maquiladora/In-bond Plants Operation in Baja California, Mexico*, San Diego State Univ., Inst. of Regional Studies of the Californias, Border Issues Ser. No. 3 (1987).

5. Grunwald, *Internationalization of Industry: U.S.-Mexico Linkages*, in *The U.S. and Mexico: Borderland Development and the National Economies* (Gibson & Corona ed. 1985).



SOURCE: COLEF, based on Instituto Nacional de Estadística Geografía e Informática, (INEGI), various publications.

FIGURE 1. The Maquiladora Industry in Mexico Plants and Employment, 1966-1988.

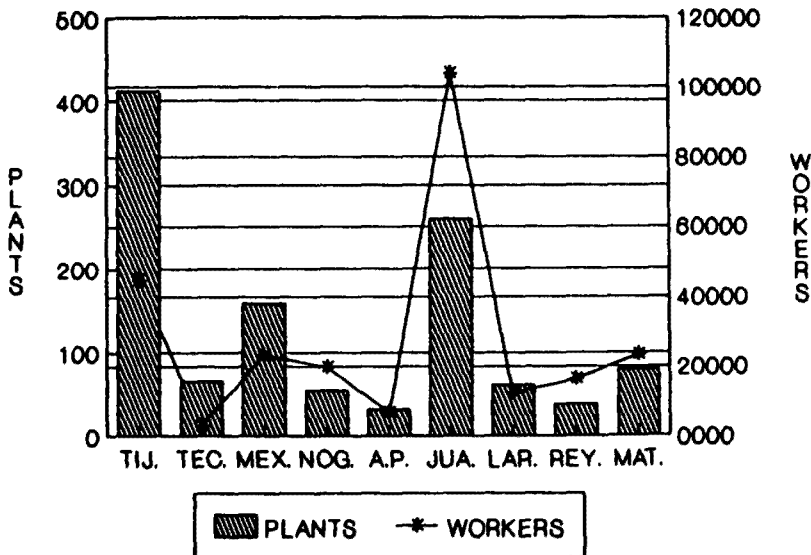
Tecate, Mexicali, Nogales, and Agua Prieta) has continuously increased since 1982⁶ (Fig. 2).

Ciudad Juárez is the most important maquiladora center in Mexico. This city accounted for 20 percent of all maquilas and 35 percent of total maquila employment in 1987. Tijuana ranked second, accounting for 32 percent of total maquila establishments but only 12 percent of total maquila employment. Matamoros is ranked third with almost six percent of all plants and 12 percent of the total employment in the maquiladoras. Mexicali ranked fourth followed by Nogales, Nuevo Laredo, and Reynosa.⁷

The variety of Mexico's assembly activities has increased in the last years. The goods assembled or manufactured range from simple operations, such as the sorting of U.S. retail store coupons, to sophisticated electronic equipment, such as toys, sporting goods, auto parts, etc. The most significant changes in the types of maquiladoras that are being operated have taken place in the last few years. Currently, electronic

6. R. Sánchez, *Directorio Industrial de la Frontera Norte (1988)* (COLEF, Tijuana, B.C.).

7. Maquila operations in other smaller border cities—Tecate, Ensenada, Agua Prieta, Piedras Negras, Ciudad Acuña—are also growing. These cities are increasingly being considered as attractive alternative locations for new corporations due to the saturation of the labor market in the bigger cities (Fig. 2).



SOURCE: DIRECTORIO INDUSTRIAL DE LA FRONTERA NORTE, COLEF, 1988.

FIGURE 2. Mexican Border Maquiladora Industry, 1988.

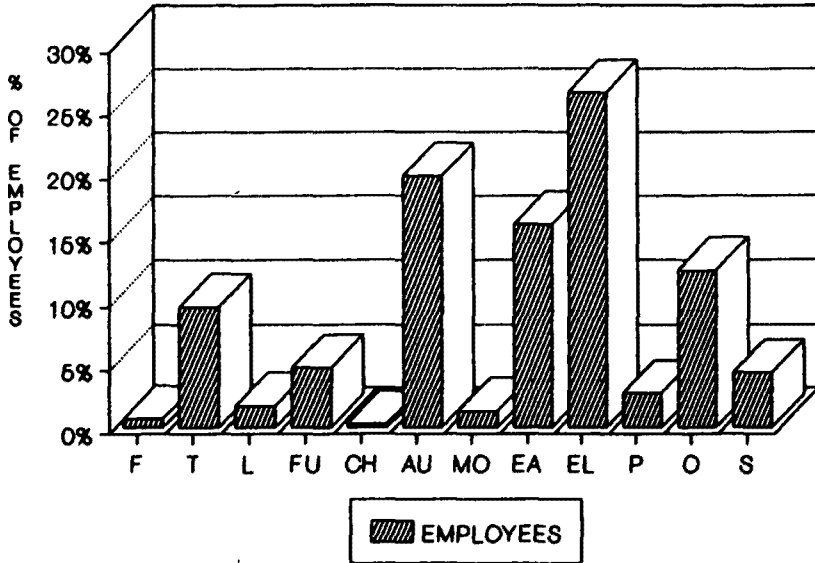
materials and equipment continue to make up the prominent sector of the maquiladora industry (24 percent of the total employment), with auto parts comprising the second most important sector (17 percent), followed by electric materials and equipment. The surge in production in other sectors such as plastics, wood furniture, mechanical parts, and leather goods, has diversified the maquiladora structure in Mexico (Fig. 3).⁸

A wide variety of products is currently assembled by maquiladoras in Mexico: plastic bags and shoes; a wide range of toys; medical materials; sporting goods; an increasing number of auto parts; mechanical tools; motors; metal and wood furniture; and a wide variety of electric and electronic parts and equipment, from harness and cables to transistors, radios, televisions, refrigerators, telecommunications equipment, computer parts, and semiconductors.

The advantages of the maquiladora operation have exceeded the expectations of some corporations, and as a result they have relocated complete lines of production to Mexico. The manufacture of refrigerators, color televisions, toys, tennis racquets, and a wide variety of final goods is becoming commonplace in the Mexican maquiladoras.

Some of the maquiladoras have undergone a technological transformation. High-tech operations are becoming more common in some subsidiaries of multinational corporations. Frequently, the same plant combines

8. *Id.*



SOURCE: COLEF, based on *Avance de Informacion Economica, 1988* (INEGI).

SYMBOLS IN CHART
(For Figures 3, 4, 6)

- | | |
|---|--|
| F = FOOD PRODUCTS | E = PARTS AND ELECTRIC EQUIPMENT |
| T = TEXTILE | EL = ELECTRONICS |
| L = LEATHER GOODS | P = TOYS AND SPORTING GOODS (PLASTICS) |
| FU = FURNITURE (WOOD AND METAL) | O = OTHER SECTORS |
| CH = CHEMICAL INDUSTRY | S = SERVICES |
| AU = AUTOPARTS | |
| M = PARTS AND MECHANICAL EQUIPMENT (NON ELECTRIC) | |

FIGURE 3. Percentages of Employment for Industry Group in Mexico's Maquiladora Industry, 1988.

labor-intensive lines of production with other highly automated lines. Nevertheless, small maquiladoras, mostly subcontractors, still rely on simple labor-intensive assembly operations. The above characteristics emphasize the dualism in the maquiladora: on one hand, very simple labor-intensive assembly operation prototypical of the 1960s, and on the other hand the high-tech assembly and manufacturing operations.⁹

A series of environmental problems began to be disclosed in the last two years. The center of attention has been the generation of hazardous waste by the maquiladoras. Although this problem has attracted wide

9. For a broader discussion, see J. Carrillo, *Transformaciones de la Industria Maquiladora de Exportacion: Una Nueva Fase?*, in CIDE, *Estados Unidos y Mexico: Nuevas Visiones, Viejos Problemas*, Cuadernos Semestrales No. 20 (1986) (Mexico); B. Gonzalez & R. Barajas, *Las Maquiladoras: Ajuste Estructural y Desarrollo Regional*, Documentos de Trabajo, Fundacion F. Ebert (1988).

press attention, few studies have been carried out.¹⁰ Even the Secretaría de Desarrollo Urbano y Ecología (SEDUE), the agency in charge of environmental protection in Mexico (the U.S. EPA equivalent), does not have a broad inventory of sources of waste and waste generated by the maquiladoras. The empirical data available suggest the generation of considerable volume of hazardous waste by the maquiladoras. The data also suggest the illegal disposal or treatment of this waste in Mexico. Nevertheless, basic questions remain unanswered: How much waste is actually generated? Where are the sources located? What type of waste is generated? What is its toxicity? What is its final fate and its pollution effects?

The importance of the problem has drawn the attention of the Mexican government. The new domestic environmental legislation, introduced in December 1987,¹¹ embodies general measures to control hazardous waste. An international agreement signed between Mexico and the United States in November 1986, controls transboundary exports of hazardous waste, including waste generated by U.S. maquiladoras in Mexico.¹² According to the agreement, the maquiladora must return its waste generated in Mexico back to the United States. EPA and SEDUE seek closer coordination to close loopholes in both countries for better enforcement of the existing legislations. However, as of 1989 few effective improvements have been achieved.

A major issue is the new reglamento for hazardous waste control just recently enforced in May 1989.¹³ The reglamento closes the still existing loopholes in the Mexican environmental legislation, and establishes strict controls for domestic industry and the maquiladoras. Nevertheless, a critical factor will be enforcement. To overcome the lack of resources from SEDUE, the new reglamento calls for a broader participation of municipalities, allowing for the creation of "comites ecologicos" to act as watchdogs.

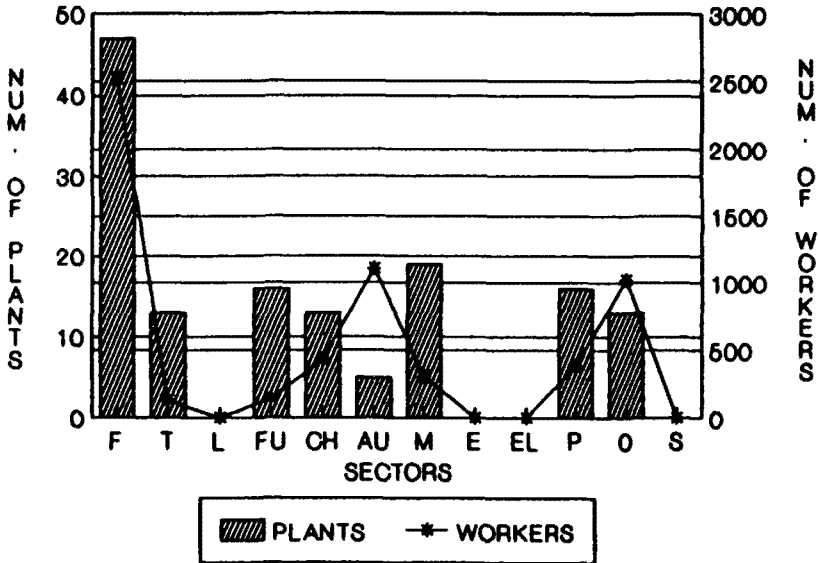
How effective this control will be is an open question, but the maquiladoras have reacted positively as never before. The National Maquiladora Association and SEDUE have sponsored several seminars to inform maquiladora managers on the new legislation. The Border Trade

10. The only references to my knowledge available at this time are the studies carried out by R. Kamp & M. Gregory, *Hazardous Materials Inventory of Agua Prieta, Sonora Maquiladoras* (1988) (Border Ecology Project, mimeo); R. Sánchez, *El Desecho de Sustancias Toxicas y Peligrosas de Origen Industrial en la Frontera Norte* (forthcoming) (COLEF, Tijuana).

11. Secretaría de Desarrollo Urbano y Ecología, *Ley General del Equilibrio Ecológico y Protección al Ambiente*, Diario Oficial (Jan. 28, 1988).

12. Anexo III al Convenio Binacional entre Los Estados Unidos de America y Los Estados Unidos Mexicanos sobre la Cooperación para la Protección y Mejoramiento del Medio Ambiente en el Area Fronteriza. Acuerdo de Cooperación entre Los Estados Unidos de America y Los Estados Unidos Mexicanos sobre Movimiento Transfronterizo de Desechos Peligrosos y Sustancias Peligrosas, Nov. 2, 1986, Washington, D.C., reprinted in 1 *Transboundary Res. Rep.*, Summer 1987, at 4 (available from University of New Mexico School of Law).

13. Secretaría de Desarrollo Urbano y Ecología, *Reglamento para el Control de Residuos Toxicos*, Diario Oficial (Nov. 27, 1988).



SOURCE: COLEF, DIRECTORIO INDUSTRIAL DE LA FRONTERA NORTE, 1988.

FIGURE 4. Domestic Industry in Mexicali, 1987.

Alliance, the Western Maquiladora Association, and other groups have begun a major campaign to provide information to their members. EPA and SEDUE will carry out joint visits to plants in Mexico as part of the information campaign.

MEXICALI'S MAQUILADORA INDUSTRY

A survey carried out by El Colegio de la Frontera Norte in 1988 in Mexicali provides a clear picture of the characteristics of the maquiladoras in this city.¹⁴ The survey covered 100 maquiladoras and it achieved a 76 percent rate of response. A proportional number of maquiladoras was selected for each of the six most important sectors: electronic parts and equipment (10 plants); mechanical auto parts (25 plants); textiles (17 plants); electric parts and equipment (10 plants); wood furniture (1 plant); and plastics (9 plants). The maquiladoras were asked to identify their type of operation—subcontractors, subsidiaries, or shelters—and the origin of their capital. The following paragraph contains the most significant results.

Approximately 52 percent of the plants in the survey were subcontractors and 46 percent were subsidiaries. Surprisingly, only two percent of the maquiladoras were shelter operations. Between these two large groups are several significant differences. The larger plants are subsidi-

14. A. Mercado, J. Negrete & R. Sanchez, *Capital Internacional y Relocalización Industrial en la Frontera Norte de México* (forthcoming) (COLEF).

aries of corporations in California or elsewhere in the United States. The smaller plants are subcontractors to California companies. The average number of workers per plant in the subsidiaries group was 234, while the subcontractor maquiladoras employ an average of only 54 workers per plant. Although most of the subcontractors employ less than 50 workers per plant, it was surprising to find that almost 30 percent of these plants had between 100 and 300 workers per plant. Almost 43 percent of the subcontractors were in the textile sector, 28 percent in the mechanical auto parts sector, 14 percent in the electrical parts and equipment sector, 12 percent in the electronic parts and equipment sector, six percent in plastics, and only three percent in wood furniture.

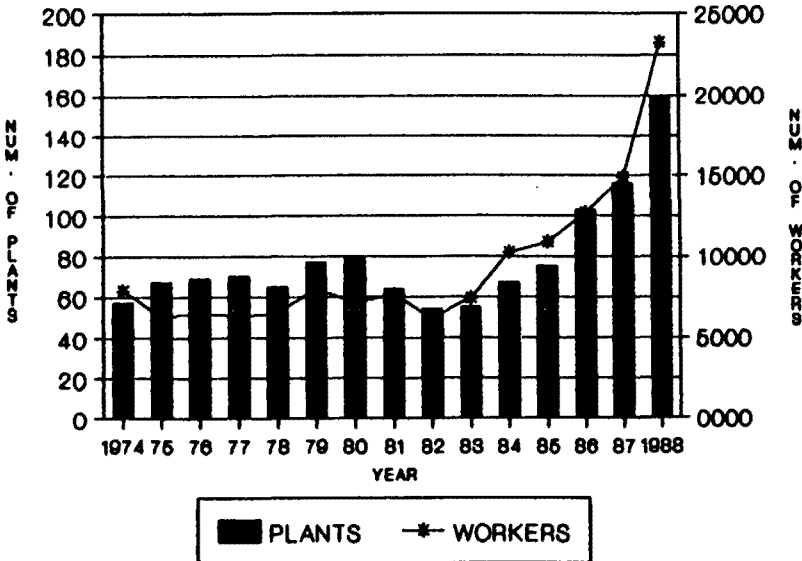
Subsidiaries, on the other hand, tend to concentrate more on the higher level of employment. Almost 45 percent of the plants had over 300 workers per plant (two of them had more than 1000 workers); about 20 percent had between 100 and 300 workers per plant; and 35 percent had less than 100 workers per plant. About 42 percent of these maquiladoras are in the mechanical auto parts sector, 21 percent are in plastics, 19 percent are in electronic parts and equipment, 12 percent are in electric parts and equipment, and only six percent are in the textile sector.

There is another difference between the subsidiaries and the subcontractors. While the distribution per sector of the subcontractor maquiladora tends to specialize in products with a low technological ingredient (apparel, cables, electric motors, metal processing), the subsidiaries concentrate on products with a higher technological ingredient (computer parts, motor parts, telecommunication parts and equipment, sporting goods, toys).

Environmental problems caused by the maquiladoras are due mainly to their generation of hazardous waste. For years this problem was overseen by the federal and state governments in Mexico, and very little attention was paid to the disposal of hazardous waste from the maquiladoras.¹⁵ In 1986, the agency in charge of environmental control in Mexico—SEDUE—began to tackle this problem. Nevertheless, SEDUE's actions have been hindered by three major obstacles: 1) an absence of data on the type and amount of waste generated by the different types of maquiladoras; 2) unsuitable legislation that offered little legal support for the control of hazardous waste; and 3) lack of economic resources and manpower to enforce effective controls.

SEDUE implemented two actions to master these obstacles. First, it carried out a national survey on industrial emissions mandatory for all industry in Mexico including the maquiladoras. Second, it proposed new

15. Mexico has paid national attention to hazardous waste only in the last three years. The lack of control in the maquiladoras was not exclusive of this industry. It was a global failure of the Mexican environmental legislation and its enforcement.



SOURCE: Estadística de la Industria Maquiladora de Exportación 1974-1985 and Avances de Información Oportuna 1986-1988, (INEGI).

FIGURE 5. Maquiladoras in Mexicali (1974-1988).

environmental legislation—Ley General del Equilibrio Ecológico y Protección al Ambiente—approved by the Mexican Congress in December 1987 and enforced in March 1988. The new legislation provided a global legal framework for new regulations for the control of hazardous waste published in November 1988.

In spite of the support of the new legislation, not all of SEDUE's efforts have been successful. The national survey on industrial emissions had a poor response from the maquiladoras. Additionally, Mexico's economic crisis has aggravated SEDUE's scarce resources and manpower. An additional problem is the lack of legal facilities in the border region (as well as in the rest of the country) to dump, treat, or recycle hazardous waste.

GENERATION OF HAZARDOUS WASTE BY THE MAQUILADORAS OF MEXICALI

Data on the type and volume of waste generated by the maquiladoras in Mexicali is very scarce. The maquiladora industry is unwilling to provide any direct information on this matter, and SEDUE has only incomplete records on industrial emissions from the maquiladoras. Hence this paper utilizes data on imports of hazardous materials from the ma-

quiladoras used in their operations. It is safe to assume that most of the hazardous materials used by the maquiladoras are imported from the United States (98 percent of all the maquiladora inputs in Mexico are imported). A sample of 34 plants was taken from the maquiladora records of the Secretaría de Comercio y Fomento Industrial (SECOFI).¹⁶ The selection of industries was based on three variables: 1) the importance of that sector in the overall industrial structure of Mexico; 2) the size of the plant; and 3) the potential use of hazardous materials in their industrial process. All of the plants fall into five sectors: plastics; electric equipment and parts; electronic parts and equipment; mechanical auto parts; and metal parts. Table 1 reviews the general characteristics of these plants, and Table 2 presents a list of the type and amount of hazardous materials imported.

The results in Table 1 and Table 2 can be summarized as follows:

- 1) A variety of hazardous materials are imported. The sample recorded 117 different hazardous materials imported every year. Given the number of different products (54) assembled or manufactured by these plants, however, the number of hazardous materials is not very high. This can be explained by the fact that the maquiladora tends to use similar assembly and manufacturing techniques. The assembly of similar products by different plants frequently use the same industrial process, and often the same type of input.¹⁷
- 2) The number of hazardous materials by plant differs widely. While some plants declared up to 36 different types of hazardous materials, others declared only one. Several reasons can explain these disparities between plants: differences in the products assembled and the type of industrial process; size of the industry; type of maquiladora (subcontractor, shelter, or subsidiary). Another issue to be considered is the small but growing number of maquiladoras buying part of their hazardous materials in Mexico (two of the maquiladoras in our sample). This could be due either to cheaper prices in Mexico for the same material, or as a strategy to avoid complying with the Mexican legislation and Annex III of the binational agreement. By law, the waste resulting from the imported hazardous materials in the maquiladora must return to the United States.¹⁸
- 3) There are three basic groups of hazardous materials used by the

16. The Secretaría de Comercio y Fomento Industrial (SECOFI) regulates the maquiladora operation and controls all imports to Mexico.

17. For instance, the assembly of circuit boards, one of the most popular products in the maquiladoras, uses basically the same type of hazardous materials: welding material (lead and zinc), flux, epoxy, freon, and 1,1,1 trichloroethane.

18. The number of dealers of hazardous materials in Mexico is small. However, it could grow rapidly if the use of hazardous materials in the maquiladoras also increases.

TABLE 1. Structure of the Maquiladora Sample.

PLANTS	TYPE	CAPITAL	VOLUME OF MATERIAL		SIZE CODE	# OF HAZ.	NO.OF PROD.	SECTOR
			LTS.	KG.				
1	SUB. C	100% NAL.	1040	4400	II	6	1	AUTOM
2	INV. DI	100% EXT.	2524	880	III	6	5	ELE
3	INV. DI	98% EXT. 2% NAL.	15000	0	II	2	1	ELE
4	INV. DI	100% EXT.	107760	3500	V	20	1	PLAST
5	SUB. C	49% EXT. 51% NAL.	8900	0	II	4	1	METAL
6	SUB. C	100% NAL.	4600	10000	I	3	1	METAL
7	INV. DI	100% EXT.	50750*	0	IV	8	2	ELE
8	SUB. C	100% NAL.	11125	0	III	6	2	METAL
9	SUB. C	100% NAL.	17180	0	IV	10	2	ELECT
10	SUB. C	100% EXT.	156500**	24000	V	6	1	METAL
11	INV. DI	100% EXT.	0	255000	II	4	1	METAL
12	INV. DI	100% EXT.	420	0	IV	2	1	AUTOM
13	INV. DI	100% EXT.	148500	0	V	8	3	ELECT
14	INV. DI	100% EXT.	97225	4520	V	13	3	ELECT
15	INV. DI	100% EXT.	109250	5	V	32	7	ELE
16	SUB. C	100% NAL.	20346	57999	V	23	4	ELECT
17	INV. DI	100% EXT.	90068	24864	V	17	2	ELECT
18	SUB. C	100% EXT.	900	300	IV	3	1	ELE
19	INV. DI	100% EXT.	39250	7000	V	16	7	ELE
20	INV. DI	100% EXT.	289463	0	V	12	7	ELECT
21	INV. DI	100% EXT.	2700	0	V	2	5	METAL
22	SUB. C	100% NAL.	80	2380	II	6	1	METAL
23	INV. DI	100% EXT.	95	0	III	2	1	ELE
24	INV. DI	100% EXT.	225930	422900	V	19	1	ELECT
25	INV. DI	90% EXT. 10% NAL.	4750	0	III	3	1	METAL
26	INV. DI	100% EXT.	557100	2079000	V	14	1	AUTOM
27	SUB. C	100% NAL.	695	0	II	9	2	ELECT
28	SUB. C	100% NAL.	0	3900000	II	1	1	METAL
29	SUB. C	100% NAL.	25200	0	II	3	1	METAL
30	SUB. C	100% NAL.	0	2721000	II	4	1	METAL
31	INV. DI	100% EXT.	9000	74500	IV	6	1	PLAST
32	INV. DI	100% EXT.	2405	711	III	5	1	PLAST
33	INV. DI	100% EXT.	63000	0	V	3	1	PLAST
34	INV. DI	100% EXT.	1850	0	II	3	3	PLAST

SOURCE: COLEF, SAMPLE IN THE MAQUILADORA OF MEXICALI, 1988.

* 18.9% NAL.

** 4.5% NAL.

maquiladora: a) a wide range of solvents (alcohols, freons, cetones, and aromatic hydrocarbons); b) acids and alkaline substances; c) heavy metals. The toxicity and characteristics of these materials vary considerably.¹⁹ The potential generation of waste from these materials depends on two main factors, the type of industrial process in which they are used, particularly for their application (manual or automatic), and the chemical and physical properties of the material (solubility in water, molecular weight, melting point, etc.).

19. Tlv 50 is considered a basic reference standard for comparing toxicity in these materials.

TABLE 2. Hazardous Materials in the Maquiladoras.

Material	Volume	Material	Volume
Aceite con Tinta	625 lts.	Aceite Hidraulico	57680 lts.
Acetato Butyl I	1080 lts.	Acetileno	15700 kg
Acetona	42640 lts.	Acido Acelerador 730	1080 lts.
Acido Borico	648 kg	Acido Clorhidrico	13550 lts.
Acido Cloroacetico	5 lts.	Acido con Amoniac	6000 lts.
Acido Cromico	140 kg	Acido Fluoborico	4488 kg
Acido Fluorhidrico	800 lts.	Acido Hidroclorhidrico	1011 lts.
Acido Muriatico	2718 lts.	Acido Nitrico	7488 lts.
Acido Removedor	1000 lts.	Acido Sulfurico	565086 lts.
Adhesivos Liquidos	5000 lts.	Agente Organico (Modacrilic-Daynel)	17000 kg
Agente Organico (Solka-Flock)	17000 kg	Alcohol Clorometilico	6000 lts.
Alcohol Etilico	400 lts.	Alcohol Isopropilico	74849 lts.
Alcohol Metanol	1020 lts.	Amonia Liquida	160 lts.
Anticongelante	5000 lts.	Anticorrosivo	4200 lts.
Barniz y Laca	4925 lts.	Base para Pintado	840 lts.
Bright Starter	8000 lts.	Carburo Siliconado en Polvo (SIC)	4400 kg
Catalizador G	300 lts.	Catalizadores	1000 lts.
Chatarra de Aluminio	490 tons.	Chatarra de Bronce	27 tons.
Chatarra de Cobre	2177 tons.	Chatarra de Plomo	27 tons.
Cianuro de Niquel	25 lts.	Cianuro de Potasio	20 lts.
Ciclohexano	1000 lts.	Cloretano	10000 lts.
Cloroetileno de Methyl	3000 lts.	Cloruro de Etileno	200 lts.
Cloruro de Metileno	30500 lts.	Cloruro de Niquel	80 lts.
Cobrizador Quimico "A"	1206 lts.	Cobrizador Quimico "B"	1206 lts.
Colodion	1200 lts.	Deoxidezer	1200 lts.
Desgrasador Liquido	7200 lts.	Diclorodifluoroetano (Gas Congelante)	800 botes
Diluyente	13550 lts.	Epoxy	91700 lts.
Estano Liquido	300 lts.	Ether	480 lts.
Fijadores Quimicos	2000 lts.	Fluorato de Estano	1080 kg
Fluorato de Plomo	348 kg	Fluoro de Carbono FC-72	300 lts.
Fluorocarbon	2250 lts.	Flux	116780 lts.
Foam Liquido	60 lts.	Freon	24163 lts.
Gas Argon	800000 kg	Gas Argon con CO ₂	800 cilindro
Gas Freon	6000 lts.	Gas Helio	800 cilindro
Hidroxido de Potasio	350 kg	Hidroxido de Sodio	450 kg
Kester 5211 (Limpia Metales)	100 lts.	Laquer	864 lts.
Limpiador para Sellos	960 lts.	Liquido Antioxidante	6900 lts.
Liquido para Tratamiento de Alambre (Tetra Etch)	2300 lts.	Metanol	3238 lts.
Metil-Etil-Cetona	46000 lts.	Metileno	60 lts.
Mezcla para Pulir	10000 kg	Mezclas Quimicas para Soluciones	3000 lts.
Morchem (CMB)	208 lts.	NAFTA	500 lts.
Naftalina	726 lts.	Nitrogeno	800 cilindro
Nitrogeno Liquido	388455 lts.	O.C. Chem IPA	208 lts.
Oakike (NST)	208 lts.	Oakike 166	208 lts.
Oxido de Aluminio	53000 kg	Oxido de Plomo	1600000 kg
Pastas Adhesivas	8000 lts.	Pastas Siliconadas	5600 lts.
Pegamento Mex	25794 lts.	Peroxidos	5450 lts.
Persulfato	4794 lts.	Pintura Compuesta	37850 lts.
Plomo en Polvo	60000 kg	Poliuretano Liquido	48000 lts.

TABLE 2, continued.

Material	Volume	Material	Volume
Preparaciones Quimicas		Preparaciones Quimicas para Absorber	
(Sellador para Encapsular)	648 lts.	y Filtrar Agua	2000 lts.
Propanol	2055 lts.	Pyrol-M	22000 lts.
Quimicos Suavisadores de Agua	1000 lts.	Quimicos Varios	3000 lts.
Resina Epoxica	754246 kg	Resina Poliester	18000 lts.
Sellador	200 lts.	Silicato de Sodio	1000 lts.
Soldadura Plomo-Estano	10626 kg	Solder Brightener	1050 lts.
Solucion Antisolvente	600 lts.	Solucion Limpiadora	1080 lts.
Solucion Liquida Butil	500 lts.	Solvente Despintador	336 lts.
Solvente Limpiador Plata	800 lts.	Solvente Limpiador Tintas	100 lts.
Solvente para Limpieza	2400 lts.	Solventes	52169 lts.
Solventes para Abrasivos	90 lts.	Sosa Caustica	132180 lts.
Sulfato de Cobre	1338 kg	Sulfato de Estano	700 kg
Sulfato de Niquel	760 kg	Tapa Poros	320 lts.
Thiner	9000 lts.	Tinta	5520 lts.
Tinta con Catalizadores	8112 botes	Titanio en Polvo	9500 kg
Tolueno	11200 lts.	Tricloroetano	246379 lts.
Triclorofluoretano	2764 lts.	X-FAL	567 kg
Xileno	45 lts.		

Source: COLEF, Sample in the Maquiladora of Mexicali, 1988.

- 4) Most of the hazardous materials in Table 2 were declared to be auxiliary inputs in the industrial process (basically, to treat, prepare, clean, or degrease parts during the assembly or manufacturing process). But part of the materials are also inputs to the manufacturing process. This differentiation is important because auxiliary materials are likely to generate more waste than direct inputs.²⁰ The first group includes by volume 1,1,1 trichloroethane (246,379 liters), acetone (42,640 liters), isopropyl alcohol (66,349 liters), chloromethylene (30,500 liters), epoxy (798,346 kilograms and 47,600 liters), freon (24,163 liters), flux (fluoruro de silicon amoniaco) (106,270 liters), methyl-ethyl-ketone (MEK) (46,000 liters), unidentified solvents (56,009 liters), and toluene (11,200 liters). Sulphuric acid is one of the most interesting cases in the second group (565,086 liters), together with scrap metal: copper (2177 tons), alloy (490 tons), lead (27 tons), and bronze (27 tons). Other materials in this group are lead oxide (1600 tons), and alloy oxide (53 tons).

20. A good example is 1,1,1 trichloroethane and sulphuric acid. Table 2 shows considerable amounts of both substances (246,379 liters of trichloroethane and 565,086 liters of sulphuric acid). Trichloroethane is used mainly in electronics for cleaning and degreasing, while sulphuric acid is used in the manufacture of car batteries.

In summary, we can conclude that it is clear the maquiladoras use a considerable amount and range of hazardous materials in their operations, and that the fast pace of maquiladora growth in Mexicali (there was a 30 percent increase in 1988) will considerably increase the amount of hazardous materials imported. Furthermore, the major users of hazardous materials in the sample were subsidiary plants from U.S. corporations (Table 1). These plants were also the largest plants in the sample and in the most important sectors of the maquiladora industry in Mexicali: plastics, mechanical auto parts, and electronic parts and equipment. Finally, the use of hazardous materials by the maquiladoras raises two types of problems. The generation of hazardous waste and its final disposal or treatment, and the exposure of laborers to hazardous materials during the assembly or manufacturing operations. Although both problems have the same origin, they must be treated separately.

How much of the hazardous materials imported by the maquiladoras result in hazardous waste? Only a direct statement from the company can provide detailed information on this question. Nevertheless, the following issues suggest that a considerable amount of those materials can result in hazardous waste:

- 1) Most of these materials are used as auxiliary inputs in the production process and not as direct inputs. As mentioned above, waste resulting from auxiliary materials is normally greater in quantity than waste generated by direct inputs.
- 2) The intrinsic labor-intensive characteristic of the maquiladora implies that the application of hazardous materials, used as auxiliary components, is most of the time applied manually. The generation of waste in manual applications is higher than in automatic applications.
- 3) Waste resulting from degreasing, cleaning, and treating the surface of materials (solvents and acids) is often mixed with other hazardous waste (heavy metals, resins).

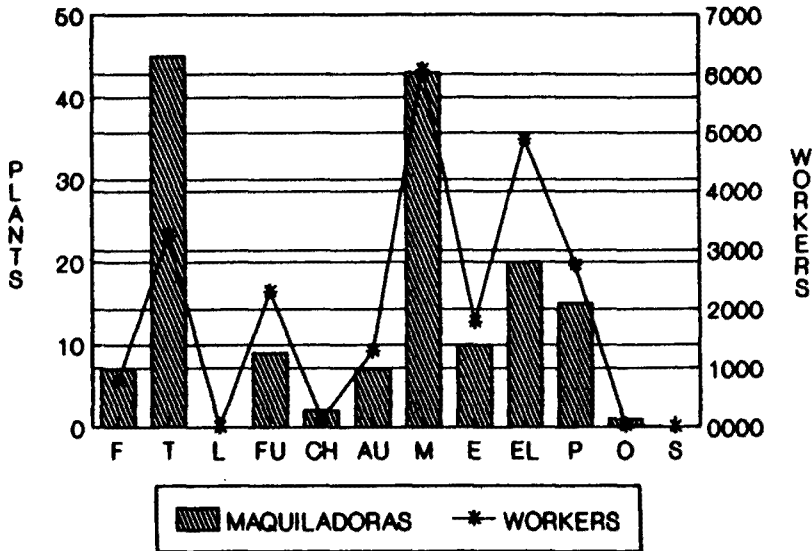
All of the issues mentioned above suggest that the maquiladoras do generate significant amounts of hazardous waste. The next logical questions are: "What is happening to this waste?" "Where is it treated or dumped?" "How much is treated or dumped and under what conditions?" "Who is responsible for it?"

DUMPING AND TREATMENT OF HAZARDOUS WASTE IN MEXICALI

Although the Mexican legislation²¹ and Annex III of the U.S.-Mexico Binational Agreement of 1983²² state that waste generated by the ma-

21. Secretaria de Desarrollo Urbano y Ecología, Decreto para el Manejo de Residuos Tóxicos de la Maquiladora, Diario Oficial (Jan. 19, 1987).

22. See *supra* note 12.



SOURCE: DIRECTORIO INDUSTRIAL DE LA FRONTERA NORTE, COLEF, 1988.

FIGURE 6. Maquiladoras by Sectors in Mexicali, 1988.

quiladoras must return to the United States, the Mexican environmental agency, SEDUE, allows the maquiladoras to treat or dump hazardous waste in Mexico if it is done by a SEDUE authorized company. The maquiladoras, therefore, have three alternatives for eliminating hazardous waste; they can export it to the United States, dump it in Mexico, or treat it or recycle it in Mexico.

EXPORTING HAZARDOUS WASTE TO THE UNITED STATES

This was the first alternative considered by the study since it was assumed that the maquiladora was complying with the Mexican legislation. EPA records on hazardous waste returned to the United States in 1987²³ showed that only 20 maquiladoras had shipped back their hazardous waste.²⁴ Only two of these were located in Mexicali. That same year there were over a thousand maquiladoras in Mexico and 116 in Mexicali.

It has been argued that more maquiladoras are sending their waste back to the United States.²⁵ This could be true to a certain extent since EPA officers, both region IX in San Francisco and International Activities in

23. Data obtained in 1988 from EPA International Office through the Freedom of Information Act.

24. SEDUE's data shows only 15 maquiladoras returning their waste to the U.S. (guías ecológicas). Paper presented by Efraim Rosales, Head of the Hazardous Waste Office in SEDUE, at the Binational Workshop on Hazardous Waste in the Maquiladora, in Tijuana, B.C. (Nov. 15-16, 1988).

25. This was frequently stressed by several Associations of Maquiladoras during various visits to plants along the border carried out by the author in 1988.

Washington, D.C., acknowledge having little data on transboundary movement of hazardous waste. This is also the case with U.S. customs.²⁶ However, it is doubtful that the total number of maquiladoras sending their waste back to the United States is much more than 20. The following issues support this hypothesis:

- 1) There is an enormous range in prices for the control of hazardous waste between Mexico and the United States. In the United States, prices range from \$200 to over \$2000 per barrel of hazardous waste (depending on the type of waste and the type of treatment). In Mexico, prices are seldom higher than \$200 per barrel recycled (currently, there is no incineration of hazardous waste in Mexico). Costs are considerably lower for dumping in approved sites and minimal when done illegally.
- 2) Until the implementation of Mexico's new environmental law, *Ley General del Equilibrio Ecológico y Protección al Ambiente*, in March 1988, and the brand new hazardous waste regulations from November 1988, Mexico lacked enough legal support to control illegal dumping or treatment of hazardous waste, including that of the maquiladoras. The former legislation, *Ley de Protección al Ambiente* from 1983, had serious deficiencies on this matter. In contrast, environmental legislation in the United States (*Resource Conservation and Recovery Act*,²⁷ *Comprehensive Environmental Response, Compensation, and Liability Act*,²⁸ *Clean Air Act*,²⁹ *Clean Water Act*,³⁰ *Toxic Substance Control Act*³¹) provides a broader legal support for controlling hazardous waste. This control is even greater in California, where the more strict State legislation for hazardous waste often sets national standards.
- 3) Penalties for violating the legislation were minimal in Mexico compared to in the United States. The new Mexican legislation imposes more severe sanctions, but the problem of enforcement still exists.
- 4) There is greater control of hazardous waste in the United States than in Mexico. In the United States, federal, state, and local agencies have considerable resources for the surveillance of this problem. In Mexico, this responsibility is concentrated in only one federal agency—SEDUE. SEDUE lacks the manpower and economic resources to implement widespread surveillance of hazardous waste

26. Presentation by EPA officials and U.S. customs officials during the Binational Seminar of Transboundary Movement of Hazardous Waste for the Maquiladora, in Tijuana, B.C. (Nov. 15, 1988) (jointly organized by EPA and SEDUE).

27. 42 U.S.C. (1982).

28. Pub. L. No. 96-510, 94 Stat. 2767 (codified as amended at 26 U.S.C. (1982 & Supp. 1986)).

29. 42 U.S.C.

30. 33 U.S.C. (1982).

31. 15 U.S.C. (1982).

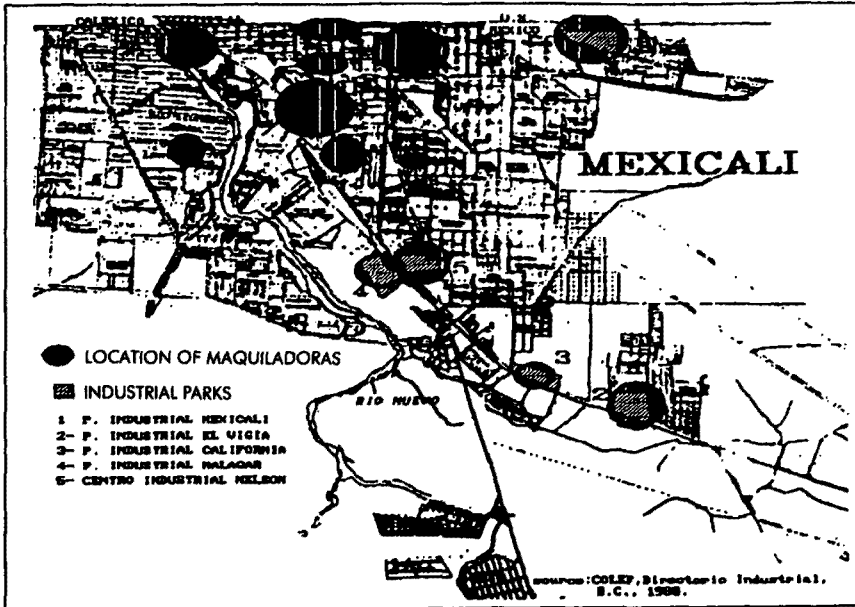


FIGURE 7. Location of Maquiladoras in Mexicali.

management procedures. Hazardous waste is a new problem to Mexico. It is not that the problem was not there before, but rather that it has obtained national attention only in the last three years. Hence SEDUE has a shortage of skilled manpower to tackle this problem at the national and regional levels. In the case of the maquiladoras, SEDUE's local delegations along the border are incapable of overseeing the increasing number of plants.³² Mexico's economic crisis has aggravated this situation even more.

- 5) Until 1988, SEDUE did not have a complete inventory of hazardous emissions from the maquiladoras (nor from domestic industry). It is uncertain if SEDUE will be able to complete this information in a short period of time. Without this basic information it is even more difficult to maintain the surveillance of hazardous waste in the maquiladoras.

Thus, it is clear why the maquiladora has apparently preferred to leave its hazardous waste in Mexico. Controls in Mexico have been considerably weaker than in the United States, and it is much easier to be caught for non-compliance in the United States than it is in Mexico. Furthermore,

32. SEDUE's delegation in Tijuana has fewer than five persons in charge of all environmental problems in the municipality. Tijuana had over 400 maquiladoras in 1988. There is a similar situation in Mexicali, where fewer than five persons watch out for all environmental problems in the city.

even in the event that a company were caught for non-compliance in Mexico, penalties would be less severe than in the United States.

RECYCLING HAZARDOUS WASTE IN MEXICO

Although Mexico achieved in 1988 an important step in the direction of the control of hazardous waste through the new environmental legislation, there are still important obstacles to overcome. One problem is that there is a small number of legitimate facilities for treating hazardous waste in Mexico. For example, according to SEDUE, there were only six companies authorized to treat or recycle hazardous waste in Mexico at the end of 1988.³³ These plants are located as follows: one in Querétaro; one in El Estado de México (near Mexico City); one in Ciudad Juárez; one in Mexico City; one in Monterrey; and one in Tijuana. There are no legal recycling facilities in Mexicali operating under a federal permit. There is, however, a recycling company in Cerro Prieto (south of Mexicali) operating under a state permit. According to SEDUE's state officials in Mexicali, this company is allowed to recycle only oil, and it has no formal business relationship with the maquiladoras. However, informal sources mentioned that this plant also recycles waste for some maquiladoras.

The nearest recycling facility for the maquiladoras in Mexicali is in Tijuana. The company is operating under the name of Tratamientos Industriales de Tijuana, S.A. (TITISA). This company (domestic capital) is associated with Chemical Waste Management. Although TITISA has not begun commercial operations yet (February 1989), the company states they will begin receiving waste from the maquiladoras in the first quarter of 1989. Their waste stream approved by SEDUE are chlorinated solvents, freon, alcohols, and cetones. Currently TITISA states they have already contracted services with 24 maquiladoras, 20 of them in Tijuana and only four in Mexicali.³⁴

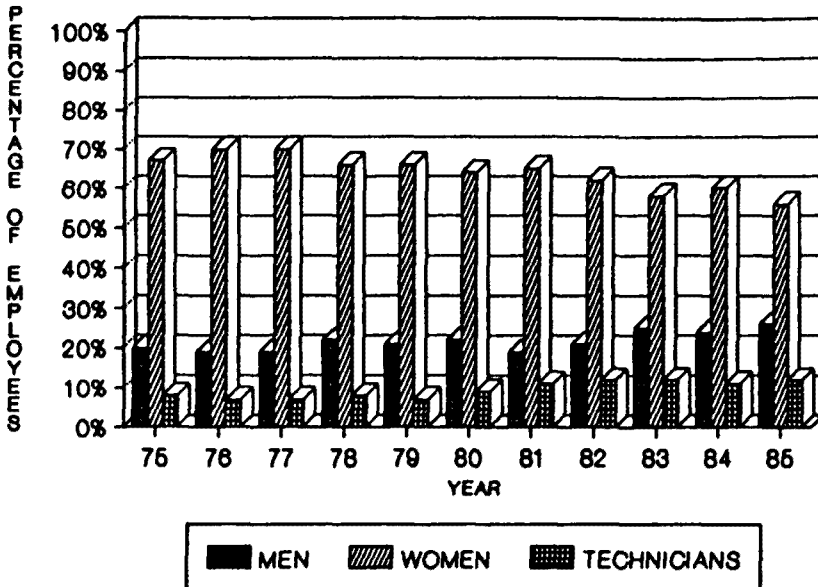
TITISA (under a subsidiary called TEESA) already has in place an incinerator (rotary kiln) and plans to begin operations in July of 1989. SEDUE has already approved the operation of the incinerator.

Until the end of 1988, the other five recycling companies authorized by SEDUE in Mexico provided no services for the maquiladoras in Mexicali. The distance to the closest of these companies from Mexicali is over 2000 kilometers.

Apparently then, no maquiladora in Mexicali recycled their waste in legal facilities until the end of 1988. There is a small but growing number

33. Paper presented by Arq. René Altamirano, Director of the Office for Prevention and Control of Pollution of SEDUE, at the Binational Workshop on Hazardous Waste from the Maquiladora, in Tijuana, B.C. (Nov. 15-16, 1988).

34. Telephone interview with H.E. Davidson, General Manager of TITISA (Dec. 13, 1988).



SOURCE: COLEF, based on *Estadísticas de la Industria Maquiladora de Exportación 1975-1985*, (INEGI).

FIGURE 8. Labor Force Composition of Mexicali's Maquiladora Industry (1975-1985).

of recycling companies that operate under dubious circumstances in Baja California. Most of them are located in Tijuana, and only a couple of them in Mexicali. These companies operate without a legal permit from SEDUE and are not even operating on a probationary basis. Some of them have been shut down more than once by SEDUE for not complying with the legislation.

The market for these companies is the maquiladora industry.³⁵ Hence it is possible that some maquiladoras in Mexicali treat their waste through these types of companies. It is difficult to have an estimate on the actual number of maquiladoras in this situation.

DUMPING IN MEXICALI

Mexico has a significant deficit of dump sites for hazardous waste. There are only five commercial sites approved by SEDUE in the entire country: one in the state of Hidalgo near Mexico City for non-hazardous industrial waste; one in San Luis Potosi in the central part of Mexico;

35. A good example of this type of plant is Industrias Milano. This company operated a recycling plant and provided services for almost 40 maquiladoras in Tijuana. Between 1986 and 1987, the plant was shut down several times by SEDUE for lack of security measures in their operation.

one in Matamoros at the east corner of the U.S.-Mexico border; one in Nuevo Leon near Monterrey; and one in Mexicali.³⁶

SEDUE has also approved five additional dump sites to be used by their owners for the disposal of their own waste: one in Guanajuato; one in Queretaro; one in Mexico; one in Jalisco; and one in Mexicali. The site in Mexicali, 100,000 cubic meters in size, is owned by Procesadora Mexicali, S.A. (PROMEX) and was used to dump scrap metal (Fig. 9). SEDUE closed this site in 1988 due to its involvement in illegal dumping of imported hazardous metals from the United States.

The other commercial dump site in Mexicali is basically oriented to hazardous waste generated by companies producing agricultural chemicals.³⁷ There are 13 companies that supply these products in Mexicali. At least nine of these companies also manufacture around 35 agricultural chemicals.

The commercial dump site for agricultural hazardous wastes was opened in September 1979, 23 kilometers west of Mexicali on the road to Tijuana (Fig. 9). This site is known as "del Cerro del Centinela," or "Centinela Hill," and it was operated by SEDUE. The site was designed to provide a dump site for waste from the agricultural chemical dealers in the area. In 1988, SEDUE closed this facility because it reached its total capacity. A new site was supposed to be opened by then, but its construction has not yet begun. According to SEDUE officials in Mexicali, very little maquiladora waste from Mexicali was dumped in this site.³⁸

The security conditions in the Centinela Hill dump are questionable. This dump was constructed before Mexico implemented any standards for this type of facility, and before hazardous waste was considered a serious problem. The site has no lining, no monitoring, and there is no environmental impact report on its potential impacts. However, state officials from SEDUE said they plan to monitor possible pollution resulting from this site particularly in the Laguna Salada (Fig. 9).

The new dump site for agricultural chemical waste will be located 26.5 kilometers southwest of Mexicali on the road to San Felipe (Fig. 9), and it will have a capacity of 90,000 cubic meters. The project has already been approved by SEDUE. This site will accept primarily agricultural hazardous waste and only a limited amount of waste from the maquiladoras. The construction and operation of the site will be carried out by

36. See *supra* note 32.

37. The economic importance of agriculture in Mexicali, one of the most important agricultural areas in Mexico, explains the number of producers and quantity of agrochemicals used in this region. For a more detailed description on the agricultural area of Mexicali and the use of agrochemicals, see J. Román & L. Gálvez, *Los Agroquímicos: su Impacto en el Medio Ambiente y la Salud Humana. Valle de Imperial y Mexicali* (forthcoming) (COLEF).

38. Interview with several SEDUE officials in Mexicali (Sept. 1988).

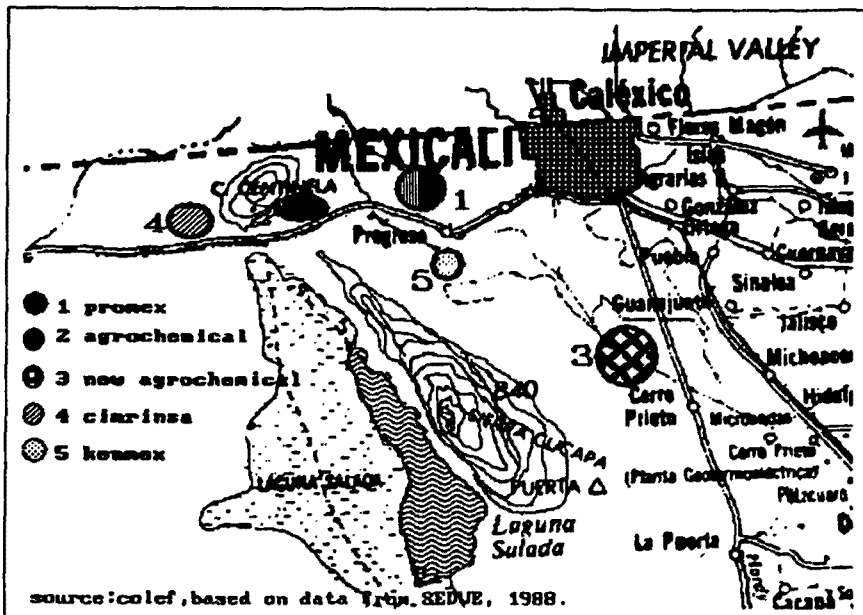


FIGURE 9. Dump Sites in the Mexicali Area.

an association of agrochemical dealers in Mexicali under the supervision of SEDUE.

SEDUE also approved a project for dumping industrial hazardous waste coming from the maquiladoras (although it has not given final approval to the construction). The site would be located 34.5 kilometers west of Mexicali on the road to Tijuana and would have a capacity of 60,000 cubic meters (Fig. 9). Construction and operation of the site will be carried out by a company called CIMRISA, under the supervision of SEDUE. SEDUE plans to demand a pre-treatment of waste before it is dumped.

South of Mexicali (114 kilometers) there is a waste isolation site for 120 tons of radioactive metal. The concrete deposit was constructed in 1984 specifically for that purpose and has been closed ever since.

Kenmex, an important maquiladora, plans to construct a deposit exclusively for waste (fiberglass) generated by the company in Baja California. The site will be 10.5 kilometers west of Mexicali and will have a capacity of 30,000 cubic meters. SEDUE has approved the concept, but the site has not been constructed (Fig. 9).

There are no other legal dump sites in the Mexicali area, or in Baja California. However, there are complaints of illegal dumping of hazardous

waste from the maquiladoras in the region. One of these sites is located at MEXACO, a recycling company in Cerro Prieto, south of Mexicali (Fig. 9). Informal sources claim that MEXACO has stored solvents and acids coming from the maquiladoras. According to SEDUE, the company has no dumping permit.³⁹ It is presumed that more illegal dumping of hazardous waste has been carried out for years in the region by other parties.

CONCLUSIONS

In this paper, the hypothesis that the maquiladoras do generate significant amounts of hazardous waste and that this waste remains in Mexico was addressed. The empirical data presented on the use of hazardous materials in the maquiladoras, and on the lack of evidence that the waste resulting from these materials is re-exported to the United States, validates this hypothesis. This poses three types of problems: 1) the potential generation of hazardous waste from these materials and its impact on the environment; 2) the exposure of workers to hazardous materials in the work place; and 3) the threat to public health and safety by the storage on site of hazardous materials and hazardous waste by the maquiladoras for prolonged periods of time within the urban area. These problems are of critical importance for the border cities. They might also have meaningful binational consequences for Mexico and the United States.

It is also evident that these problems require urgent attention, given the accelerated pace of growth of the maquiladora industry in Mexicali. The huge investment of international capital in the maquiladoras, basically U.S. capital, puts forth other questions. How to cope with double standards that U.S. corporations follow for environmental protection and occupational health in their operations in the United States as contrasted with the maquiladoras in Mexico? Who should be made liable for transboundary environmental damage on both sides of the border caused by maquiladora subsidiaries of U.S. corporations? Who should be made liable for occupational diseases in maquiladora subsidiaries of U.S. corporations? Who should be liable for environmental and health effects of illegal dumping by maquiladora subsidiaries of U.S. corporations?

The hazardous waste problem in Mexicali is aggravated by the lack of facilities to treat it, recycle it, or dump it in a legal and secure manner. Since most of the maquiladoras are not re-exporting their waste to the United States and facilities to control it are scarce and deficient, it can be assumed that most of the generated waste until now has been illegally dumped or recycled in the Mexicali area. How much has been dumped, where, and under what conditions is difficult to know.

39. Information provided unofficially by SEDUE's staff (Oct. 1988).

Perhaps the most important question is what will happen from now on with the maquiladora waste since the current trend is an increase in waste generation parallel to the fast pace of growth in the number of maquiladora plants.

Furthermore, the relocation of "dirty industry" to the maquiladoras to avoid stricter controls on hazardous waste and occupational health in the United States appears to be increasing as well. The following factors back up this hypothesis: 1) new enforcement of federal regulations in the United States establish a rigorous rule on dumping of hazardous waste; 2) closure of commercial dump sites continues; 3) there is a small number of commercial incinerators; and 4) the "not in my back yard" syndrome exists in communities all over the country, and particularly in California.

All these issues increase the cost and the possibilities of getting rid of hazardous waste in the United States and force the relocation of industries. Industrial relocation via maquiladoras is open even to small U.S. companies, in contrast with the traditional relocation of multinational corporations to the Third World.⁴⁰ This is the case with California and Baja California (Mexicali, Tijuana, and Tecate). Most of the maquiladoras in these cities are subsidiaries or subcontractors to small and middle size companies in California.⁴¹

New evidence has begun to appear that certain industries, particularly those affected by stricter environmental regulations in California (the furniture industry in the Los Angeles area, and the chroming industry and the electronic industry in Southern California are good examples), are relocating part or all of their operations to the maquiladoras in Baja California. Data presented in this paper stress the growing importance of environmental issues in the relocation of the maquiladoras. Ten percent of the surveyed maquiladoras in Mexicali considered environmental regulations to be among the main factors in the decision to leave the United States, and 17 percent considered it a factor of importance. On the selection of Mexicali, almost 13 percent of the maquiladoras considered weaker environmental legislation in Mexico a main factor for relocation and another 13 percent considered it a factor of importance.⁴²

SEDUE and EPA have addressed this problem to a certain extent. A binational workshop on hazardous waste in the maquiladoras was organized jointly by both agencies in November 1988 in Tijuana. The workshop successfully brought together the maquiladoras, recycling companies in both countries, and U.S. and Mexican officials dealing with this problem (EPA, SEDUE, Customs, State and Local officials in border communities in both countries, etc.). Although the workshop was a major

40. Castleman, *Multinational Corporations in Developing Countries*, in *Multinational Corporations, Environment and the Third World Business Matters* (C. Pearson ed. 1987).

41. See *supra* note 13.

42. *Id.*

step toward improving communications across the border and enforcing tighter controls on hazardous waste in the maquiladoras, it must be considered only a very initial move. In fact, one of the major results of the workshop was the public recognition by public officials (EPA, SEDUE, and Customs) of their lack of control and information on this issue. A great deal of cooperation and communication between the two countries must be developed in order to avoid major effects of this problem on both sides of the border.

Finally, it is important to stress the urgent need for short term actions to control hazardous waste from the maquiladoras. The problem is not only growing quantitatively but also qualitatively. The type and toxicity of hazardous waste from the maquiladoras in Mexicali is increasing as the on-coming maquiladoras diversify their products. Further delays to take effective action to control hazardous waste from the maquiladoras in Mexicali could lead, in a very short time, to dangerous situations for the environment and public health on both sides of the border.