Abstract

Transnational corporations appropriate "carrying capacity" for the core by transferring the core's hazardous products, production processes, and wastes to the peripheral countries of the world-system. An increasingly important form of this reproduction process is the transfer of core-based hazardous industries to export processing zones (EPZs) located in a number of peripheral countries in Africa, Asia, and Latin America and the Caribbean. A specific case is examined in this paper: the transfer of hazardous industries to the maquiladora centers located on the Mexican side of the Mexico-U.S. border. Maquiladoras provide an excellent case for examining what is known about the causes, adverse consequences, and political responses associated with the transfer of core-based hazardous production processes to the EPZs of the periphery.

The Transfer of Core-Based Hazardous Production Processes to the Export Processing Zones of the Periphery: The Maquiladora Centers of Northern Mexico

R. Scott Frey

The bourgeoisie has only one solution to its pollution problems: it moves them around.

Saying adapted from Frederick Engels, cited in Harvey (1996:366)

Some of the core's hazardous products, production processes, and wastes are transferred to the peripheral zones of the world-system by transnational corporations (TNCs). Since few peripheral countries have the ability to adequately assess and manage the risks associated with such hazards, TNC export practices are increasing the health, safety, and environmental risks facing many peripheral countries. Increasingly, many impoverished peripheral states (seeking to attract industry and foreign currency, and promote economic development) have contributed to the risk transfer problem by establishing export processing zones (EPZs). These so-called "free zones" have few regulatory restrictions on pro...
production practices and offer many other concessions to TNCs. Cost-conscious TNCs have responded by moving production facilities to hundreds of EPzs located in more than sixty countries in Africa, Asia, and Latin America and the Caribbean. In effect, TNCs are appropriating carrying capacity for the core by transferring ("distancing") the core's hazards or anti-wealth to the EPzs of the periphery.

I provide a provisional mapping of the general contours of the problem by examining what is known about a specific case: the transfer of hazardous industries to the maquiladora centers located on the Mexican side of the Mexico-U.S. border. The maquiladoras (mostly foreign-owned factories using imported materials) provide an excellent case for examining the causes, consequences, and political responses associated with the transfer of core-based hazardous production processes to EPzs located in the periphery. Discussion of this specific case proceeds in five steps. A brief description of the Mexico-U.S. border area is presented in the next section. The major political and economic forces driving the transfer of hazardous industries to cities located on the Mexican side of the border are then charted. The extent to which the location of hazardous industries has increased health, safety, and environmental risks and contributed to other problems in Northern Mexico is examined next. An effort is then made to critically evaluate the increasingly privileged neoliberal contention (and its more sophisticated counterpart, ecological modernization theory) that the transfer of the core's hazardous production processes to the periphery is beneficial to both the core and the periphery. Emerging political responses to the problem are briefly and critically examined in the final section.

THE MEXICO-U.S. BORDER REGION

The U.S. and Mexico share a border that stretches nearly 2,100 miles from the Pacific Coast to the Gulf of Mexico. The border cuts across four U.S. states (California, Arizona, New Mexico, and Texas) and six Mexican states (Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas). The border region, defined as including 60 miles of territory on either side of the border, consists of approximately 250,000 square miles of land.

More than 12 million people were estimated to reside in the border area in 2000: 7 million on the U.S. side and over 5 million on the Mexican side (ITESM and InfoMexus 2002; Peach and Williams 1999). Over 70 percent of the population resides in 14 twin cities; the largest being San Diego-Tijuana, with a population of over 4.5 million. The population of the region has more than doubled since 1980, creating severe pressure on the existing physical infrastructure and the environment. This has taken several forms, including inadequate drinking water, poor sewage services, insufficient housing, improper garbage disposal, and air and water pollution. Colonias (unincorporated poor settlements) with inadequate infrastructure and squalid conditions are growing along the border at the rate of 10 percent per year and contain a population estimated to be over 1.5 million (Borderlines 1998a; ITESM and InfoMexus 2002). Economic and other disparities between the two sides of the border are great; the average per capita income on the U.S. side is more than ten times that of Mexico (ITESM and InfoMexus 2002). The border is one of the "hottest growth zones" in North American and one of the busiest in the world; the average number of legal northbound crossings is estimated to be over 200 million per year.7

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5 EPzs are special geographic zones, providing favorable investment and trade concessions to capital. Concessions include tax holidays, exemptions from labor and environmental regulations, provision of infrastructure, duty free export and import and the free reparation of profits. The United Nations Industrial Development Organization (1980:6) defines an EPZ as: "...a relatively small, geographically separated area within a country, the purpose of which is to attract export-oriented industries, by offering them especially favourable investment and trade conditions as compared with the remainder of the host country. In particular, the EPzs provide for the importation of goods to be used in the production of exports on a bonded duty free basis."


7 See Lorey (1990) and ITESM and InfoMexico (2002) for good overviews of the border region.

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For excellent discussions of life on the Mexican side of the border, see Berry and Sims (1994), Bowden (1998), Rotella (1998), Simon (1997:chapter 8), and Urrea (1993).
Most of the border region consists of high altitude desert. The region includes three major desert systems (the Sonora, Mojave, and Chihuahua), separated by three mountain ranges (the Sierra de Juaven, the Sierra Madre Occidental, and the Sierra Madre Oriental). Irrigation and rapid population growth in this semi-arid region have placed high demands on the limited water supplies. Surface water is the major source of water for most border cities.8

THE POLITICAL ECONOMY OF THE TRANSFER OF HAZARDOUS INDUSTRIES TO THE MAQUILADORA CENTERS

Political and economic forces operating at the intranational, international, and supranational levels promote the transfer of core-based hazardous industries to the periphery.9 In an effort to expand markets and curb production costs, many core-based TNCs have moved hazardous production facilities to sites located in Northern Mexico and elsewhere in the periphery. The Mexican state, like the states of many other peripheral countries, has pursued export-oriented industrial policies to attract industry. In turn, various international organizations such as the World Bank, the International Monetary Fund (IMF), and the World Trade Organization (WTO) multilateral trading system have enacted policies promoting and supporting TNC practices and the export-oriented industrial policies of the Mexican and other peripheral states.

In the Core

Scientific and public concern with the health, safety, and environmental risks of industrial production emerged as an important issue during the 1970s and has continued in the core countries (Andrews 1999:chapter 12; Hays 2000; O'Neill 2000). This concern gave rise to a host of regulations. Early U.S. efforts included the National Environmental Policy Act (NEPA) of 1969, the Occupational Health and Safety Act (OSH) of 1970, the Federal Water Pollution Control Act of 1972, the 1976 Toxic Substances Control Act, and the Resource Conservation and Recovery Act (RCRA) of 1976. Subsequent legislation such as the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as Superfund), the 1984 amend-

8. For further discussion of the border region, see Brenner et al. (2000), Frumkin, Hernandez-Avila and Torres (1995), ITESM and InfoMexus (2002), and Liverman, Varady, Chavez and Sanchez (1999).

9. Similar processes underlie the distribution of hazards within the core countries and elsewhere (see, e.g., Boone and Modarres 1999; Bryant 1995; Ballard 2000; Camacho 1998; Cohen 1997; Collin 1994; Heiman 1996; Mol and Bryant 1992; Szasz and Meuser 1997).
Molina (1993), in a follow up study to the Grossman and Krueger (1993) study, reports that during the 1980s as U.S. pollution abatement costs increased, U.S. maquiladora investment increased dramatically. A 1991 U.S. Government Accounting Office study found that several Los Angeles furniture manufacturers relocated to Mexico after the establishment of stringent air pollution restrictions in California (Sanchez 1990; U.S. General Accounting Office 1991). It is also interesting to note that many of the U.S. corporations lobbying for the North American Free Trade Agreement (NAFTA) were major polluting industries (Anderson, Cavanagh, and Gross 1993). Or consider the case of General Telephone and Electronics (GTE) Corporation:

In the mid-1980s more than 300 workers from GTE’s Albuquerque, New Mexico plant, many of them suffering from several forms of cancer they claimed were brought on by exposure to workplace solvents, sued the company. During the resolution of the lawsuit, GTE moved the most hazardous section of the plant just across the border to Juarez, Mexico” (Karliner 1997: 155).

And, more recently, Clapp (2001: chapter 5, 2002a) and Rothman (1998) have argued that much of the work reporting little relationship between environmental regulation and industrial relocation is deeply flawed because it is based on old data and fails to take into account all environmental costs.

Factors other than health and environmental regulations have certainly contributed to the movement of industries (hazardous and otherwise) to Northern Mexico and other peripheral countries (Dicken 2003; Rauscher 1997; Wheeler and Mody 1992). These include international economic conditions such as exchange rates and comparative resource endowments; tax avoidance; labor, energy, and transport costs; domestic markets; and overall business investment conditions. The spatial dispersion of hazardous industries also reflects a much larger economic globalization process in which spatial and temporal constraints have been dramatically reduced through advances in transport and communication technologies, as well as supranational organizational and institutional innovations that TNCs played a part in establishing (Ciccantell and Bunker 1998; Dicken 2003; Marshall 1999; Millen, Lyon, and Irwin 2000:233–241). This, in turn, is energized by a resource and energy system that is increasingly global in nature (Clark 1998).

Whatever the relative importance of these interrelated forces, the point is that core-based TNCs have found it economically advantageous and increasingly possible to transfer hazardous industrial activities to the border cities of Northern Mexico and export processing zones located elsewhere in the world. Production costs are relatively low in Mexico because of low wages, cheap resources and energy; low taxes and other subsidies; and limited state control of the environment and the health, safety, and well-being of its citizens. Reduced costs in Mexico enhance the competitiveness of TNCs and promote capital accumulation. In other words, capital flows to peripheral countries like Mexico having what Daly (1996:153) calls an “absolute advantage” in industrial production.

In the Periphery

Faced with poverty and the resulting political pressures, debt and structural adjustment pressure from the International Monetary Fund and the World Bank, low agricultural and mineral commodity prices, and a world-system marginalizing them economically and politically, many peripheral states have pursued export-oriented policies in an effort to attract industry from the core (see Dicken 2003). In fact, many peripheral countries are so anxious to industrialize that they are willing to accept almost any industry offered: hazardous or otherwise. Nowhere is this pattern more pervasive than in Mexico.

The history of economic ties between the U.S. and Mexico is complicated and conflicted (Hart 2002). During World War II, for instance, a large number of Mexican workers replaced U.S. workers serving in the armed services. The Bracero Program of 1942 legalized this migration, allowing Mexican workers to migrate to the U.S. to perform temporary agricultural work and railroad construction. The U.S. government canceled the program in 1964. Several hundred thousand workers returned to Mexico, increasing unemployment and overcrowding in the border cities (Sklair 1993).

The Mexican state established the Border Industrialization Program (BIP) in 1965 to cope with the economic problems along the border (Schwartz 1987). The purpose of the program was to promote industrialization, employment, and new technology imports and management practices. Maquiladoras were allowed to import equipment, components, and raw materials duty free for assembly and export to the U.S. and other countries.14 Cheap labor, lax regulation, generous tax incentives, and close proximity to the U.S. consumer market drew many TNCs, initially from the U.S. and later from Canada, Taiwan, Japan, Mexico, South Korea, and fifteen other countries, including Germany, France, Holland,

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13. These include deregulation and privatization of the economy, removal of trade restrictions, wage compression, and liberalization of controls on capital movement.

14. A 1962 U.S. customs regulation, Item 807.00 of the Tariff Schedule of the United States, allowed U.S. companies to export U.S. materials to other countries for assembly and reimport the product and pay only duty on value added to the product.
Italy, Sweden, Spain, Australia, Singapore, Ireland, Finland, England, Malaysia, Columbia, Belgium, and Argentina. The program was expanded to the non-border areas (except for three cities: Mexico City, Guadalajara, and Monterrey) after 1972 (Gabriel 1990; Sklair 1993:chapter 3).

The number of maquiladoras grew steadily during the 1960s and 1970s. Growth expanded dramatically in the mid-1980s when the Mexican state liberalized trade and enacted other measures in an effort to deal with serious economic problems. Mexico entered the General Agreement on Tariffs and Trade (GATT) in 1986, liberalizing trade restrictions and opening the country to the global economy. The state abandoned many policies that restricted TNC activities, reduced protectionist tariffs, curbed labor unions, limited minimum wage increases, and promoted the maquila industry in diverse ways (Wilson 1992:4off). Labor costs were reduced significantly (making Mexican wages some of the lowest in the world) when the peso was devalued repeatedly during the 1980s and the early to mid-1990s as the Mexican state attempted to meet its debt obligations under IMF-sponsored structural adjustment (George 1992:24-28; Wilson 1992).

The number of maquiladoras grew dramatically in the 1990s, increasing from 1,818 in 1990 to 3,486 in early 2000. More than eighty percent of all maquiladoras are located in the northern border area of Mexico. Employment doubled during the 1990s and the early to mid-1990s as the Mexican state attempted to meet its debt obligations under IMF-sponsored structural adjustment (George 1992:24-28; Wilson 1992).

Plant owners represent a virtual “Who’s Who” of international capital: Alcoa, BMW, Chrysler, IBM, RCA, General Motors, ITT, DuPont, Hughes Aircraft, Eastman Kodak, Canon, Wal-Mart, JVC, Sara Lee, Zenith, Xerox, Sony, Motorola, General Electric, Toshiba, Ford, United Technologies, Mattel Toys, Matsushita, Hitachi, and other lesser known U.S., Canadian, European, Japanese, South Korean, and other TNCs. (See Table 2 for a listing of the 50 largest companies and the nature of their production processes.) Various consumer products are produced for export, including furniture for several U.S. companies, auto parts for Chrysler, high-tech electronic components and computer disks for Sony, Ford automobiles, Foster Grant sunglasses, hospital gowns for Kimberly Clark, and garage door openers for Sears. Maquila plants also produce hazardous wastes and other substances that are not managed effectively and contaminate the air, water, and soil, as well as put workers and others at risk of death, disease, and injury (e.g., Clapp 2002a; Liverman et al. 1999; Mumme 1999), but more on this below. Some of the TNCs have introduced health, safety, and environmental standards that are equivalent to those of the developed countries, but many TNCs have not introduced such standards (Castleman 1995, 1999; see also Garcia-Johnson 2000:chapter 5).

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**Table 1** — Number of Maquiladora Plants and Employees in Mexico by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Plants</th>
<th>Number of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>72</td>
<td>4,000</td>
</tr>
<tr>
<td>1970</td>
<td>160</td>
<td>20,000</td>
</tr>
<tr>
<td>1975</td>
<td>454</td>
<td>62,200</td>
</tr>
<tr>
<td>1980</td>
<td>620</td>
<td>119,600</td>
</tr>
<tr>
<td>1985</td>
<td>760</td>
<td>212,000</td>
</tr>
<tr>
<td>1990</td>
<td>1,818</td>
<td>441,000</td>
</tr>
<tr>
<td>1995</td>
<td>2,138</td>
<td>497,000</td>
</tr>
<tr>
<td>1998</td>
<td>3,107</td>
<td>1,056,783</td>
</tr>
<tr>
<td>1999</td>
<td>3,436</td>
<td>1,196,678</td>
</tr>
<tr>
<td>2000</td>
<td>3,486</td>
<td>1,216,819</td>
</tr>
</tbody>
</table>

Source: Adapted from Sklair (1993:54, 63, 68, 241) and [http://www.nafta-mexico.org](http://www.nafta-mexico.org)
### Table 2 - Mexico's Fifty Largest Maquiladora Companies, 2002

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Employees</th>
<th>No. Plants in Mexico</th>
<th>Country of Origin</th>
<th>Industrial Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delphi Automotive Systems</td>
<td>39478</td>
<td>28</td>
<td>USA</td>
<td>Automotive</td>
</tr>
<tr>
<td>2</td>
<td>Yazaki Corporation</td>
<td>14572</td>
<td>12</td>
<td>Japan</td>
<td>Automotive</td>
</tr>
<tr>
<td>3</td>
<td>Offshore International</td>
<td>11615</td>
<td>1</td>
<td>Mexico</td>
<td>Shelter Services</td>
</tr>
<tr>
<td>4</td>
<td>Thomson Consumer Electronics (RCA)</td>
<td>10874</td>
<td>6</td>
<td>USA</td>
<td>Electronics</td>
</tr>
<tr>
<td>5</td>
<td>Ford Motor Company</td>
<td>10024</td>
<td>7</td>
<td>USA</td>
<td>Automotive</td>
</tr>
<tr>
<td>6</td>
<td>Sony Corporation of America</td>
<td>9679</td>
<td>4</td>
<td>Japan</td>
<td>Electronics</td>
</tr>
<tr>
<td>7</td>
<td>Komet Corporation</td>
<td>9200</td>
<td>8</td>
<td>USA</td>
<td>Electronics</td>
</tr>
<tr>
<td>8</td>
<td>Lear Corporation</td>
<td>8569</td>
<td>8</td>
<td>USA</td>
<td>Automotive</td>
</tr>
<tr>
<td>9</td>
<td>Acore Fujikura LTD</td>
<td>7650</td>
<td>8</td>
<td>Japan</td>
<td>Automotive</td>
</tr>
<tr>
<td>10</td>
<td>TYCO International LTD</td>
<td>6785</td>
<td>4</td>
<td>USA</td>
<td>Electronics Medical</td>
</tr>
<tr>
<td>11</td>
<td>A.O. Smith Inc.</td>
<td>6598</td>
<td>8</td>
<td>USA</td>
<td>Electrical</td>
</tr>
<tr>
<td>12</td>
<td>Carolina Coupon Clearing Inc.</td>
<td>6542</td>
<td>5</td>
<td>USA</td>
<td>Services</td>
</tr>
<tr>
<td>13</td>
<td>Sanmina-Sci</td>
<td>6300</td>
<td>7</td>
<td>USA</td>
<td>Electronics</td>
</tr>
<tr>
<td>14</td>
<td>General Electric Company</td>
<td>5965</td>
<td>7</td>
<td>USA</td>
<td>Electrical</td>
</tr>
<tr>
<td>15</td>
<td>Sanyo North America Group</td>
<td>5879</td>
<td>2</td>
<td>Japan</td>
<td>Electronics</td>
</tr>
<tr>
<td>16</td>
<td>Samsung Tijuana Park</td>
<td>5789</td>
<td>3</td>
<td>Korea</td>
<td>Electronics</td>
</tr>
<tr>
<td>17</td>
<td>Brent Technologies, INC</td>
<td>5687</td>
<td>9</td>
<td>USA</td>
<td>Automotive</td>
</tr>
<tr>
<td>18</td>
<td>Emerson Electric Co.</td>
<td>5678</td>
<td>7</td>
<td>USA</td>
<td>Electrical</td>
</tr>
<tr>
<td>19</td>
<td>American Industries</td>
<td>5332</td>
<td>22</td>
<td>Mexico</td>
<td>Shelter Services</td>
</tr>
<tr>
<td>20</td>
<td>Matsushita Electric Corp. of America</td>
<td>4986</td>
<td>4</td>
<td>Japan</td>
<td>Electronics</td>
</tr>
<tr>
<td>21</td>
<td>Sumitomo Wiring Electric Systems</td>
<td>4879</td>
<td>6</td>
<td>Japan</td>
<td>Electrical</td>
</tr>
<tr>
<td>22</td>
<td>Daewoo Industrial Co., LTD</td>
<td>4856</td>
<td>3</td>
<td>Korea</td>
<td>Electronics</td>
</tr>
<tr>
<td>23</td>
<td>General Instruments Corporation</td>
<td>4589</td>
<td>3</td>
<td>USA</td>
<td>Electronics</td>
</tr>
<tr>
<td>24</td>
<td>Seagate Technology Inc.</td>
<td>4582</td>
<td>4</td>
<td>USA</td>
<td>Electronics</td>
</tr>
<tr>
<td>25</td>
<td>Johnson and Johnson Company</td>
<td>4569</td>
<td>5</td>
<td>USA</td>
<td>Medical</td>
</tr>
<tr>
<td>26</td>
<td>TRW Incorporation</td>
<td>4554</td>
<td>5</td>
<td>USA</td>
<td>Automotive</td>
</tr>
<tr>
<td>27</td>
<td>Philips Electronics</td>
<td>4387</td>
<td>8</td>
<td>Netherlands</td>
<td>Electronics</td>
</tr>
<tr>
<td>28</td>
<td>Allegiance Corporation</td>
<td>4289</td>
<td>5</td>
<td>USA</td>
<td>Medical</td>
</tr>
<tr>
<td>29</td>
<td>Collection of Arizona, Inc.</td>
<td>4256</td>
<td>3</td>
<td>USA</td>
<td>Services</td>
</tr>
<tr>
<td>30</td>
<td>Allied Dell Norte S.A De C.V</td>
<td>4238</td>
<td>1</td>
<td>USA</td>
<td>Electronics</td>
</tr>
<tr>
<td>31</td>
<td>ITT Industries</td>
<td>3845</td>
<td>4</td>
<td>USA</td>
<td>Electronics</td>
</tr>
<tr>
<td>32</td>
<td>Hitachi Home Electronics</td>
<td>3700</td>
<td>3</td>
<td>Japan</td>
<td>Electronics</td>
</tr>
<tr>
<td>33</td>
<td>Johnson Controls, Inc.</td>
<td>3589</td>
<td>7</td>
<td>USA</td>
<td>Automotive</td>
</tr>
<tr>
<td>34</td>
<td>Leviton Manufacturing Company</td>
<td>3256</td>
<td>4</td>
<td>USA</td>
<td>Electrical</td>
</tr>
<tr>
<td>35</td>
<td>Quirk Wire Co.</td>
<td>3120</td>
<td>2</td>
<td>USA</td>
<td>Electronics</td>
</tr>
<tr>
<td>36</td>
<td>Scientific Atlanta Incorporation</td>
<td>2996</td>
<td>1</td>
<td>USA</td>
<td>Electronics</td>
</tr>
</tbody>
</table>

Source: [http://www.maquilaportal.com](http://www.maquilaportal.com)

The North American Free Trade Agreement (NAFTA), an executive agreement reached in August 1992 and enacted on January 1, 1994, has set the stage for the removal of most remaining tariff barriers in Mexico over the next decade (Cameron and Tomlin 2002). Maquila activity has grown rapidly under NAFTA and it is expected to continue, though there has been a slow down recently as noted above (Hanson 2002). More TNCs will likely locate production facilities in the interior of Mexico to take advantage of lower production costs, but plant growth will continue along the border region.

### Adverse Consequences

Hazardous industrial production can damage the environment and adversely affect human health through occupational exposure and environmental dispersion of hazardous wastes and substances in the soil, water, and air or large-scale failures such as explosions and fires. Numerous undesirable social and economic consequences are also associated with hazardous industries, including staggering economic costs and an inequitable distribution of costs and benefits.¹⁷

¹⁷ Corvello and Frey (1990), LaDou (1998), Liverman et al. (1999), McCally (2002), Pearce et al. (1994), and World Resources Institute (1998:51–72) provide a good overview of the issues.
Peripheral countries like Mexico are particularly vulnerable to the risks posed by hazardous industries because of a young, poorly-trained, uninformined, undernourished, and unhealthy workforce (Kourous 1998; Lanrigan and Garg 2002; Ostrosky-Wegman and Gonsebatt 1996). Other problems exist, including limited public awareness of the risks associated with hazards, weak and tightly controlled labor unions, politically unresponsive state agencies, and inadequate risk assessment and management capabilities (Meredith and Brown 1995; Pena 1997:28ff; Sanchez 2002). In addition, organized environmental activism is limited because potential participants have little time for such activity since they work six days a week and there are few channels through the courts or legislature for effective public participation (Barkin 1991; Mumme 1998). Structural adjustment reforms and trade liberalization as well as the general processes of globalization have compounded the problem by increasing some of the problems mentioned above and reducing the state's right/ability (or “infrastructural power” according to Tilly [1995:14]) to regulate the domestic market, the environment, and the health and safety of workers (Casanova 1996; Millen and Holtz 2000). The problem is compounded by the fact that hazardous industries are located in rapidly growing cities or "boom towns" faced with many health, safety, and environmental risks and inadequate infrastructure and services in terms of health care, housing, water, electricity, sewage and drainage, and garbage collection and disposal (Brenner et al. 2000; Liverman et al. 1999; World Resources Institute 1996–156). In other words, "throughput" is greater than the regeneration and absorptive capacities of the Mexican border cities.

Environmental Risks

Emissions of toxic substances, the improper disposal of hazardous wastes and materials, and the rapid population growth and increased human activity associated with the growth of maquiladoras contribute to the risk of environmental damage. Environmental damage takes numerous forms: soil contamination, soil erosion, groundwater pollution and depletion, biodiversity loss, contamination of rivers and coastal regions, air pollution, threats to plant and animal health and survival, and changes and variability in climate (Pena 1997:283–296; Simon 1997:chapter 8). Air pollution is also a serious problem, for ozone, sulfur dioxide, carbon monoxide, and nitrogen dioxide are high on both sides of the border (ITESM and InfoMexus 2002; Pena 1997:283–296). Maquiladoras generate a substantial amount of hazardous waste (including solvents such as trichloroethylene, acids, heavy metals like lead and nickel, paints, oils, resins, and plastics) that goes untreated and is unaccounted for, despite fairly stringent laws in the U.S. and Mexico. (20) Despite the existence of a binational agreement (the La Paz Agreement) requiring U.S. companies to return wastes associated with the use of toxic materials, only 25% of such wastes were returned and 64% of such wastes were unaccounted for in either the U.S. or Mexico in the 1990s (Perry, Sanchez, and Glaze 1998). The situation is worse now because as of January 1, 2001 NAFTA no longer requires TNCs to return waste to the U.S. Hazardous wastes have also been transported to maquiladoras and recycling plants.

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33. Daly's (1996:28) term for "the flow beginning with raw material inputs, followed by their conversion into commodities, and finally into waste outputs."
34. Human impact on the environment in the border region has a long history. See Melville (1994) for a fascinating account of the adverse environmental consequences associated with the introduction of European grazing animals in 16th Century Mexico.
for storage and abandoned or dumped illegally in the desert and other locations (Clapp 2002a; Reed 1998; Simon 1997:208ff). The most recent estimates are that the waste flow from the U.S. to Mexico (230,417 tons in 1996 and 244,500 tons in 1999) was 20 to 30 times more than waste shipped to the U.S. from Mexico (Jacott, Reed, and Winfield 2001; Reed 1998).

### Human Health Risks

Occupational and environmental exposure to the hazards posed by industry and the attendant health consequences are not fully known (Brenner et al. 2000; Carter et al. 1996; ITESM and InfoMexus 2002; Liverman et al. 1999). Given the experiences of the core countries and reports from many peripheral countries, hazardous industries pose a serious threat. Those exposed are at a high risk of death, disease, and injury because of their increased susceptibility to various site-specific cancers, skin irritation, respiratory problems, neurobehavioral problems, reproductive risks such as birth defects and miscarriages, genetic changes and damage to the immune system, and acute and chronic damage to specific body organs. In addition, those living near hazardous facilities are at increased risk of death and injury from fires and explosions (Levy 1995).

Since reliable data do not exist on the occupational and environmental exposure to the routine, fugitive, and accidental emissions of hazardous substances from maquiladoras, it is not possible to estimate the actual number of deaths or cases of disease and injury that can be attributed to them. It is quite clear, given what we know about the environmental risks discussed above, that health problems linked to the maquila plants are pervasive. Air pollution and groundwater and surface water contamination have been documented at many points along the border. Hazardous waste management is also a severe problem, for many plants dump and store hazardous wastes in a haphazard fashion. Industrial accidents and the adverse health and safety conditions facing maquila workers and the inhabitants of colonias surrounding the plants are serious.

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21 The problem is so serious that the Sierra Club estimated in 1993 that it would cost over 20 billion dollars to clean up hazardous wastes along the border (cited in Cobb 1995:88). The current clean-up cost would be substantially higher.


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Current research indicates that the rate of nonfatal occupational injuries and illnesses among maquila workers is substantially higher than that of U.S. workers (Brenner et al. 2000:274–275). Adverse health effects (including low birth weight infants, stress, fatigue, headaches, cumulative trauma disorders, and the like among maquila workers) have been reported by several researchers. Noncommunicable diseases are also a problem, for mortality rates for general cancer and several site-specific cancers (including trachea, bronchitis, and lung) as well as congenital anomalies are higher along the Mexican border than for the country as a whole (Brenner et al. 2000:285). Numerous incidents have been reported, but none more dramatic than the cluster of 50 anencephalic babies born in the Brownsville, Texas-Matamoros, Mexico area (19 in Brownsville and 31 in Matamoros) in the early 1990s (Suro 1992).

Infant mortality and age-adjusted general mortality rates on the Mexican side of the border are not only higher than rates on the U.S. side but higher than rates for Mexico as a whole (Brenner et al. 2000:280–287). Differences are even greater for rates of mortality and/or morbidity for infectious diseases such as tuberculosis, hepatitis A, typhoid fever, dengue, and so on. In fact, "...Mexico's border states account for only one-sixth of that country's population but, according to recent data from the Secretary of Health, produced 61 percent of the TB cases reported in Mexico during the first ten weeks of 1998" (Borderlines 1998b:1). Such disparities can be attributed to the rapid population growth and limited infrastructure development and unmet service needs in the border cities along the Mexican side of the border (Brenner et al. 2000).

The health problems posed by the maquila plants (and the rapid population growth and related factors associated with increased maquila activity) are so serious that the Council on Scientific Affairs (1990:3320) of the American Medical Association concluded that "environmental monitoring and disease incidence data...point out that the public and environmental health...is rapidly deteriorating and seriously affecting the health and future vitality on both sides of the border." John Cavanagh (1992:28), an analyst at the Washington D.C. based Institute of Policy Studies, noted: "...exposure of workers to dangerous toxic substances, and contamination of drinking water with industrial pollutants have turned the Mexican side of the border into an environmental wasteland and industrial slum." The National Toxics Campaign has described the border as "...a two-thousand mile long Love Canal" (cited in Cavanagh 1992:28) and

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24 Eskenazi et al. (1992), Meservy et al. (1997), and Moure-Eraso et al. (1997), but see Guendelman and Silberg (1993) and Guendelman et al. (1998).
things have not improved since the implementation of NAFTA (Gallagher 2002; Sanchez 2002).

**Economic Costs**

The costs associated with the cleanup of contaminated sites and improperly disposed wastes in Mexico are high. The treatment and compensation of the victims of hazardous exposures are potentially very costly. Destruction of marine life, biodiversity, soil, water and air quality, and other natural resources is also likely to be costly. This is a particularly important issue because water is such a scarce commodity in this semi-arid region. Reductions in human health are costly, and they can impede future economic growth (Bloom and Canning 2000; Price-Smith 2001). These and other tangible and intangible economic costs associated with the transfer of hazardous industries appear to be substantial. 26

**Social Costs**

Contrary to Beck’s (1992, 1999) “risk-society” hypothesis, the bulk of the costs or risks associated with the transfer of hazardous production facilities to Mexico (and other peripheral countries for that matter) are distributed in an uneven fashion (Brenner et al. 2000), representing a pattern of “risk discrimination” (Kasperson and Kasperson 2001). Most benefits go to the core-based TNCs who control production and marketing of products and the profits of their sale, while Mexico bears most of the costs (Cooney 2001; Pena 1997; Sklair 1993). 26 Losses within Mexico are distributed in an unequal fashion: some groups (especially the state and local capital) are able to capture the benefits and other groups (especially those marginalized by gender, age, class, race/ethnicity, and geographic location, including maquiladora workers, colonia dwellers, and other poor residents) bear the costs (e.g., Brenner et al. 2000; Pena 1997; Simon 1997:chapter 8). Wages are low, averaging twelve dollars a day. Young women employed in the maquiladoras, who represent slightly more than 50 percent of the work force currently, have borne many of the health and safety risks associated with hazardous industrial production, but they have enjoyed few, if any, of the economic benefits. 27 Women employed in the electronics industry, for instance, are routinely exposed to solvents that can cause menstrual and fertility problems, as well as cancer and liver and kidney problems. Women working in the maquiladoras also experience a variety of other adverse consequences, including discrimination in terms of hiring, wages, and promotion; routine pregnancy tests and systematic firing if found to be pregnant; sexual harassment and abuse on the job; and risk of rape and death in the early mornings when traveling to and from work. 28

Hazardous residues may move across national borders through the air, water, and food. As noted above, wastes created in the maquiladoras are regularly dispersed into the air and water and often end up in the U.S. (Varady et al. 1995). Weak regulatory standards in Mexico also give TNCs leverage in their efforts to reduce labor and other costs in the core countries. And, most importantly, future generations will bear costs and enjoy few of the benefits generated by hazardous industry. 29

**EVALUATING THE COSTS AND BENEFITS**

Are the costs associated with the transfer of core-based hazardous industries to the periphery offset by the economic and other benefits as proponents of neoliberalism (Grossman and Krueger 1993) and ecological modernization theorists (Mol 2001) suggest? This is a vexing question because it is difficult to identify, estimate, and value the costs and benefits associated with hazards in monetary terms (Dietz, Frey, and Rosa 2001). Despite suggestions and efforts to the contrary (e.g., Logan 1991), there is no widely accepted factual or methodological basis for identifying, estimating, and valuing the costs and benefits associated with the flow of core hazards to the periphery. Even if the consequences of hazardous exports could be meaningfully identified and estimated, there remains the question of valuing them in monetary terms. The usual strategy is to look to the marketplace for such a valuation, but adverse health, safety, environmental,

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26 See Daly’s (1996:chapters 10 and 11) discussion of the costs of free trade.

27 One is reminded of a comment by Chomsky (1998:257) regarding the nature of economic development experiments under colonialism and the current neoliberal project:

...the designers seem to come out quite well, though the experimental subjects, who rarely sign consent forms, quite often take a beating.


28 As several analysts have noted: "...the present generation is only a caretaker of the human genome of future generations" (cited by Ostrosky-Wegman and Gonsebatt 1996:601).
and social consequences are not traded in the marketplace. Efforts have been made to deal with this problem by using either expert judgment or public preferences (Manning, Lawson, and Frymier 1999; Mitchell and Carson 1989), but these techniques are deeply flawed (Dietz et al. 2001; Foster 2002a).

Comments contained in an often quoted 1991 memo by former World Bank Chief Economist Lawrence Summers (The Economist 1992) are worth quoting at length because they illustrate some of the difficulties and contradictory outcomes of applying traditional economic reasoning to the transfer of hazardous industries to the periphery:

Just between you and me, shouldn't the World Bank be encouraging more migration of the dirty industries to the LDCs? I can think of three reasons:

(i) The measurement of the costs of health-impairing pollution depends on the forgone earnings from increased morbidity and mortality. From this point of view a given amount of health-impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages.

(ii) The costs of pollution are likely to be non-linear as the initial increments of pollution probably have been very low cost. I've always thought that under-polluted countries in Africa are vastly under-polluted; their air quality is probably... low compared to Los Angeles or Mexico City...

(iii) The demand for a clean environment for aesthetic and health reasons is likely to have very high income-elasticity. The concern over an agent that causes a one-in-a-million chance in the odds of prostate cancer is obviously going to be much higher in a country where people survive to get prostate cancer than in a country where under-5 mortality is 200 per thousand. Also, much of the concern over industrial atmosphere discharge is about visibility of particulates. These discharges may have little direct health impact. Clearly trade in goods that embody aesthetic pollution concerns could be welfare enhancing. While production is mobile the consumption of pretty air is non-tradable.

Such reasoning undervalues nature and is based on the assumption that human life in the periphery is worth much less than in the core because of wage differentials (Foster 2002b; Swaney 1994). Although most costs are borne by the periphery and most benefits are captured by the core-based TNCs and by elites located in the periphery, the costs to the periphery are deemed minimal and

30. He is currently President of Harvard University, former Chief Economist of the World Bank, former U.S. Treasury Secretary under Clinton, and nephew of Paul Samuelson and former son-in-law of Kenneth Arrow, both winners of the Nobel Prize in economics.

acceptable because life is defined as worth so little.31 Or, as Herman Daly (1993: 57) has noted: "By separating the costs and benefits of environmental exploitation, international trade makes them harder to compare."

Even if the economic costs and benefits associated with the transfer of hazardous industries could be estimated and valued in a meaningful fashion, it is doubtful that the benefits accruing to Mexico would cover the costs. Consider, for instance, Sklair's (1993:240–266) important assessment of the maquiladora program. Using six development criteria (backward and forward linkage creation, foreign currency earnings, personnel upgrading, technology transfer, work conditions, and environmental conditions), Sklair concludes that the mix of costs and benefits of the maquiladora program is highly uncertain. He notes:

The end of the maquila industry as we know it would be extremely painful for the frontera norte and for the border communities of the U.S., but in the long-term unless the Mexican government and the TNCs can work out ways of transforming it into a more potent instrument for the development of Mexico and the advancement of its people, Mexico is better off without it" (Sklair 1993:238).

He argues that the situation is unlikely to improve under NAFTA (Sklair 1993:240–263). Other analysts (e.g., Cooney 2001; Cravey 1998; Kopinak 1996; Pena 1997:chapter 9) have drawn conclusions similar to those of Sklair (1993) or concluded that the Mexican situation is worse after NAFTA (Anderson and Cavanagh 1996; Brenner et al. 2000; Clapp 2002; Gallagher 2002).

31. For further discussion of these and related issues, see Foster (1995, 2002b) and Harvey (1996:366–369). Harvey's (1996:368) provocative comments are worth repeating at length:

Though the 'impeccable economic logic' advanced by Summers is not hard to deconstruct as the characteristic discourse of a particular kind of political-economic power and its discriminatory practices, it unfortunately approximates as a description of what usually happens. The market mechanism 'naturally' works that way. Property values are lower close to noxious facilities and that is where the poor and the disadvantaged are by and large forced by their impoverished circumstances to live. The insertion of a noxious facility causes less disturbance to property values in low income areas so that an 'optimal' lowest cost location strategy for any noxious facility points to where poor people live. Furthermore, a small transfer payment to cover negative effects may be significant to and therefore more eagerly accepted by the poor, but largely irrelevant to the rich, leading to what I long ago referred to...as the 'intriguing paradox' in which the rich are unlikely to give up an amenity at any price whereas the poor who are least able to sustain the loss are likely to sacrifice it for a trifling sum. If, as is usually the case, areas where low-income, disempowered, and marginalized others live are also zones of more political organization, and weak political resistance, then the symbolic, political, and economic logic for the location of noxious facilities works in exactly the way that Summers' memo envisages.
development decreases; this is the so-called inverted U-curve or environmental
basis for improvements in the future. But a crucial fact remains: the
environmental provisions and side agreements of NAFTA provide the institutional
ecological modernization theorist Arthur Mol (2001:127-130) suggests the envi­
ronmental degradation per unit of economic
costs of urban environmental degradation. They report that as eco­duction of jobs (many of which are unskilled, though this has begun to change
somewhat) and increased revenues from exports.
Complicating the situation is Cooney’s (2001:14) observation about the fragility of maquiladora jobs:

...Mexico is not in control of the wealth generated within the country. The question remains, therefore, as to whether maquiladora development can be counted on to provide growth in the long run. Consider a scenario where maquiladora workers demand higher wages (perhaps something closer to $14th instead of $12th of their US counterparts) or insist that health and safety standards be the same as in the US, or request that working overtime be optional. It is probable that the capital accumulated by many of these TNCs may continue their circuit elsewhere. In other words, although the surplus is generated in Mexico, it can be relocated at the time of re-investment, if the conditions do not remain sufficiently propitious for capital.

Greider (2001) and Smith (2002) have commented on the emergence of such a pattern in late 2001, noting that a number of “footloose” TNCs have been moving their production facilities from Mexico to China, Vietnam, and elsewhere.

Princeton economists Grossman and Krueger (1993) tell another story; they examined the developmental consequences of maquiladoras in environmental terms. They present findings of cross-national research suggesting the existence of a curvilinear relationship between national economic development and several measures of urban environmental degradation. They report that as eco­nomic development increases, environmental degradation per unit of economic
development decreases; this is the so-called inverted U-curve or environmental
Kuznets curve hypothesis (EKC) named after economist Simon Kuznets’s (1955) work on economic growth and income inequality. They argue that Mexico
is on the verge of such a threshold: future economic growth (especially under
NAFTA) will improve environmental management and reduce environmental

...does not constitute evidence that it will happen in all cases or that it will happen in time to avert the important and irreversible global consequences of growth. Stern (1998), in an extensive review of the exiting literature, raises

33 Grossman and Krueger (1993:48) also claim that trade liberalization under
NAFTA “may well increase Mexican specialization in sectors that create less than average levels of environmental damage.” Like many other free traders (and those embracing an ecological modernization perspective [e.g., Mol 2001; Stoddard 1991]), they argue that the older and often inefficient domestic factories (that arose under the Import Substitution Industrialization program of the past) will be replaced by more efficient and cleaner industries. This, of course, remains an open question, for Molina (1993) has presented convincing evidence that dirty industries located in the U.S. have moved to Northern Mexico.

34 Arrow et al. (1995:521) go on to note:
Economic growth is not a panacea for environmental quality; indeed, it is not even the main issue. What matters is the content of growth—the composition of inputs (including environmental resources) and outputs (including waste products). This content is determined by, among other things, the economic institutions within which human activities are conducted. These institutions need to be designed so that they provide the right incentives for protecting the resilience of ecological sys­tems. Such measures will not only promote greater efficiency in the allocation of environmental resources at all income levels, but they would also assume a sustain­able scale of economic activity within the ecological life-support system. Protecting
a host of important questions about the validity of the environmental Kuznets curve. More recently, York, Rosa, and Dietz (2003) present compelling cross-national evidence that affluence (GDP/capita) has a positive and monotonic effect on a measure of environmental impact (the ecological footprint measure developed by Wackernagel and Rees [1996]) that takes into account a country's domestic and international impact. Others (see, e.g., Nordstrom and Vaughan 1999; Rothman 1998) have drawn similar conclusions. In sum, the costs of the transfer of hazardous production processes to the periphery appear to outweigh the benefits.

"COUNTER-HEGEMONIC GLOBALIZATION": RESISTANCE THROUGH TRANSNATIONAL NETWORKS?

Efforts to curb the adverse consequences associated with the maquiladora industries in Northern Mexico and hazardous industries in EPZs located elsewhere in the periphery have taken several distinct forms: various national regulatory efforts; bilateral and multilateral environmental agreements; trade treaties such as NAFTA and attendant side agreements, including the North American Agreement on Environmental Cooperation (NAECC and the North American Agreement on Labor Cooperation (NAALC); various market-based initiatives centering on the modernization of industrial production; industry-led initiatives such as the International Organization for Standardization's ISO 14000 environmental management standards and the International Chamber of Commerce's Business Charter for Sustainable Development; and calls for various supranational bodies such as a "World Environment Organization." These efforts to globalize responsibility or "fill in the space between laws" (Michalowski and Kramer's 1987) are problematic because of noncompliance and weak implementation and enforcement capacity at the national and supranational levels, the capacity of ecological systems to sustain welfare is of as much importance to poor countries as it is to those that are rich.


resulting from fragmentation of efforts, limited resources, increased capital mobility, and the neoliberal project that frames regulation as a trade barrier.36 Several analysts have called for more stringent measures, including what some call "the renationalization of capital" (Cobb 1995; Dal 1996:145–162) or the dismantling of what Gould et al. (1996) call the "transnational treadmill of production." Implementation of these proposals appears unrealistic given the structural constraints posed by the current world-system.

What is being done to challenge the world-system? Several organizational and political changes are currently underway. Non-governmental organizations (NGOs)37 have pressured the Mexican state to develop and enforce higher standards, train public health and maquila workers, and open the policy discourse to the public about the prevalence and use of toxic materials.38 NGOs such as the Coalition for Justice in the Maquiladoras, the Maquila Solidarity Network, the Maquiladora Health and Safety Network, and the Southwest Network for Economic and Environmental Justice have begun to monitor and study actual conditions in and around the maquiladoras, as well as pressure TNCs to change operating procedures. These and other NGOs have been successful in their efforts (Bacon 2001; Keck and Sikkink 1998; Roberts 1998). Williams (1999: 150–152), for instance, presents compelling evidence that the Coalition for Justice in the Maquiladoras39 cross-border collaboration campaigns were successful in


38. Hogenboom (1996), Pena (1997:304ff), and Williams (1999), among others, discuss environmental NGO activity on both sides of the border. NGOs have become important actors on the world stage (Boli and Thomas 1997; Keck and Sikkink 1998; Simmons 1998; Smith et al. 1997; Williams 1999). In fact, Boli and Thomas (1997:187) argue that international NGOs form an emerging global proto-state. And several pundits in the post-Seattle period have referred to "NGO swarms" attacking TNCs (The Economist 1999).

39. This is a coalition of groups and individuals from Canada, Mexico, and the United States that has pursued maquiladora industries engaged in illegal and "errant" labor and environmental practices. The coalition consists of unions, human rights activists, environmentalists, religious groups, and public health interests. It has used a variety of tactics, including lobbying and testifying before various legislative and administrative
achieving goals.40 And, more recently, a coalition of Canadian, U.S., and Mexican NGOs was successful in expanding right-to-know legislation in Mexico, including the establishment of a Pollutant Release and Transfer Register that is similar to those in Canada and the U.S. (Nauman 2003).

Economic globalization and the attendant adverse consequences have clearly fostered counter-hegemonic forces or anti-systemic movements in the form of transnational networks of NGOs. The extent to which NGOs will actually curb the adverse consequences of economic globalization in Mexico and elsewhere is the subject of debate (see, e.g., Moghadam 1999; Mol 2001; Sanchez 2002, Wallerstein 2002; Wilkin 2000). Peter Evans’s (2000:240)41 comment of several years ago is particularly apt:

Is it possible that a ragtag set of activists who have managed to turn fax machines, Internet hook-ups, and some unlikely long-distance personal ties into a machinery for harassing transnational corporations and repressive local politicians might foreshadow a political process that could reconfigure the rules of the global political economy so as to foster equity, well-being, and dignity? It may be utopian to contemplate such a possibility, but it is certainly foolish not to take the elements of counter-hegemonic globalization that are already in place and push them as far as they can go.

Counter-hegemonic globalization in the form of transnational networks of NGOs may seem even more utopian in the context of 2003, but it remains one of bodies, letter writing, picketing and demonstrations, and organizing stockholders of companies operating in Northern Mexico (see, e.g., Bacon 2001; Williams 1999). See also Dreiling (1998).

40. As Keck and Sikkink (1998:200) note:

Transnational value-based advocacy networks are particularly useful where one state is relatively immune to direct local pressure and linked activists elsewhere have better access to their own governments or to international organizations. Linking local activists with media and activist abroad can then create a characteristic ‘boomerang’ effect, which curves around local state indifference and repression to put foreign pressure on local policy elites. Activists may shop the entire global scene for the best venues to present their issues, and seek points of leverage at which to apply pressure. Thus, international contacts amplify voices to which domestic governments are deaf, while the local work of large country activists legitimizes efforts of activists abroad.

41. Evans is calling for what Karlner (1997) has dubbed ‘grassroots globalization.” Sklair (1998:298–305) refers to this as “disrupting” the global capitalist system at the local level (by “disrupting the TNCs,” “disrupting the transnational capitalist class,” and “disrupting consumption”), but coordinating such disruptions globally. Others use terms such as the development of “civil society” (Lofstedt and Sjostedt 2001) or “global civil society” (Carruthers 1996; Lipschutz 1992), “post-national communities” (Beck 1999:16), and “globalization from below” (Brecher, Costello, and Smith 2001).

the most viable means for curbing the adverse consequences associated with hazardous facilities in the EPZs of the periphery. Stopping the core’s appropriation of carrying capacity is another matter, for that is embedded in the very structure of the current world-system.

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