



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 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).¹ 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.² 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-

R. Scott Frey

Department of Sociology, Anthropology, and Criminal Justice

University of North Florida

Jacksonville, FL 32224-2666

rsfrey@unf.edu

<http://www.unf.edu/coas/scj/>

¹ For a sampling of the literature, see Adeola (2001), Castleman (1985a, 1995, 1999), Castleman and Navarro (1987), Clapp (1998a, 2001, 2002a, 2002b), French (2000:71–86), Frey (1995, 1997, 1998a, 1998b, 2001, 2002), and Millen and Holtz (2000). Concern has also centered on the dispersal of pollutants between the core and periphery through the air, soil, water, and other media, as well as the pollution of the global commons by the core countries (see, e.g., Bergesen and Parisi 1999; Dietz and Rosa 1997; Huq 1994; Moomaw and Tullis 1994; Redclift and Sage 1998; Roberts and Grimes 1997; Rosa and Dietz 1998).

² See, e.g., Brenner, Ross, Simmons, and Zaidt (2000), Brown (2002), Covello and Frey (1990), Kasperson and Kasperson (2001), LaDou (1998), and Millen and Holtz (2000).

JOURNAL OF WORLD-SYSTEMS RESEARCH, IX, 2, SUMMER 2003, 317–354.

Special Issue: Globalization and the Environment

<http://jwsr.ucr.edu/>

ISSN 1076–156X

© 2003 R. Scott Frey

duction 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.³ 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*⁴ (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 contention⁵ (and its

³ 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 repatriation 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.

For a further discussion, see Chen’s (1995) useful account of the evolution of EPZs and other types of free economic zones, as well as Abbott (1997), Dicken (2003), Jauch (2002), and the International Labour Organization (1998).

⁴ The term is derived from the Mexican colonial word *maquila* or the fee charged by millers to grind corn into meal (but see Brenner et al. 2000:478, note 1).

⁵ Neoliberalism is typically defined as “the package of structural adjustments, privatizations and ‘free trade’ that the first world has been imposing on the third world for the past fifteen years” (Wilson 1997:30) or as “...the hegemonic ideology of core nation-states and of the transnational elite, the means by which the subordinated are consensually dominated. The neo-liberal agenda seeks to achieve the total mobility of capital by advo-

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.⁶ 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 north-bound crossings is estimated to be over 200 million per year.⁷

cating the elimination of state intervention in the economy and regulation by individual nation-states of the activity of capital in their territories” (Marshall 1999:257). See also Casanova (1996), Chomsky (1998, 1999), Chossudovsky (1997), McMichael (2000), Otero (1996), and Polanyi (2001/1944).

⁶ See Lorey (1990) and ITESM and InfoMexico (2002) for good overviews of the border region.

⁷ 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 (OSHA) 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; Bullard 2000; Camacho 1998; Cohen 1997; Collin 1994; Heiman 1996; Mohai and Bryant 1992; Szasz and Meuser 1997).

ment to RCRA, and the 1986 Superfund Amendments and Reauthorization Act (SARA) curtailed the haphazard disposal of hazardous wastes into the air and water and increased the amount of wastes earmarked for specialized disposal (Fiorino 1995:22–99). These regulations increased industrial production costs, pushing hazardous industries to the periphery as TNCs attempted to reduce production costs.¹⁰

The effect of such regulations on the dispersion of hazardous industries to the periphery has been the subject of considerable debate.¹¹ Several researchers report that the impact of core regulation on the dispersal of hazardous industries has either been exaggerated or is ambiguous.¹² Leonard (1988), for instance, reports that there is little evidence to support the claim that increased regulation has led to the large-scale transfer of hazardous industries (“industrial flight”) to so-called “pollution havens” located in the periphery; rather, only certain aging and economically marginal production processes have been exported: benzidine-based dye production, arsenic production, asbestos processing, lead refining, battery manufacturing, and pesticide production. A subsequent U.S. Chamber of Commerce survey of U.S. firms operating in Mexico indicated that firms were not relocating to Mexico to avoid pollution abatement costs (cited in Molina 1993:226). Eskland and Harrison (1997) in an empirical study of Mexico (and three additional countries, including Cote d’Ivoire, Morocco, and Venezuela) report that pollution abatement costs had little effect on industrial country investment in Mexico and little evidence that foreign investment is in “dirty” industries. Grossman and Krueger (1993:38–42), in an important study based on data from the mid-1980s, report that the effects of pollution abatement costs in the U.S. had little effect on *maquiladora* activity in Mexico.

¹⁰ See, e.g., Castleman (1985a, 1999), Castleman and Navarro (1987), Clapp (1998a, 2001:chapter 5), Jayadevappa and Chhatre (2000), Leonard (1988), and Rock (1996).

¹¹ See, for example, Castleman (1985a, 1985b), Clapp (1998a, 2001:chapter 5), Eskland and Harrison (1997), Grossman and Krueger (1993:36ff), Jaffe et al. (1995), Leonard (1988), Levenstein and Eller (1985), Low and Yeats (1992), Mol (2001:157–165), Molina (1997:6–14), Nordstrom and Vaughan (1999), Pearson (1987), Rauscher (1997), Roberts (1998), Rock (1996), and Tobey (1990).

¹² See Jaffe et al. (1995:143–150), Jayadevappa and Chhatre (2000), Leonard (1988), and Tobey (1990). Chua (1999:408–410) and Rauscher (1997) provide good summaries of much of this work, and Clapp (2001:chapter 5) provides a critical assessment of the research.

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 200 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).¹³ 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,

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.¹⁵ 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 1992:40ff). 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; it stood at more than 1,200,000 in 2000 but it has declined somewhat due to the downturn in the U.S. economy starting in early 2000 and the movement of some jobs to China and elsewhere (Greider 2001; Hanson 2002). (See Table 1.) *Maquiladoras*—a major source of foreign exchange and employing twenty-five percent of the manufacturing labor force in the country—have not only changed in number and importance since the 1960s, but they have changed qualitatively by moving from simple assembly to manufacturing (Gereffi 1996; Hanson 2002). The present breakdown of employment by industry type is as follows: textiles (24%), electric and electronic materials and accessories (30%), wood and metallic furniture and parts (5.6%), services (22%), electric and electronic equipment and machinery (4.6%), chemical products (10.6%), food processing (2.3%), and other manufacturing (1.3%) (ITESM and InfoMexus 2002: 85). Despite the increasing sophistication of production processes in many of the newer *maquiladoras*, labor-management practices of the core country factories have not been fully transferred (Hanson 2002; Kenney et al. 1998).

¹⁵ See Pastor and Wise (1994) for a good discussion of why liberalization was undertaken.

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

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

Source: Adapted from Sklair (1993:54, 63, 68, 241) and <http://www.nafta-mexico.org>

Plant owners represent a virtual “Who’s Who” of international capital: Alcoa, BMW, Chrysler, IBM, RCA,¹⁶ 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).

¹⁶ The story of RCA’s involvement in Northern Mexico provides a fascinating tale of one company’s effort to reduce production costs (see Cowie 1999:chapters 4–7).

Table 2 – Mexico's Fifty Largest *Maquiladora* Companies, 2002

Rank 2002	Company	Employees	No. Plants in Mexico	Country of Origin	Industrial Sector
1	Delphi Automotive Systems	39478	28	USA	Automotive
2	Yazaki Corporation	14572	12	Japan	Automotive
3	Offshore International	11615	1	Mexico	Shelter Services
4	Thomson Consumer Electronics (RCA)	10874	6	USA	Electronics
5	Ford Motor Company	10024	7	USA	Automotive
6	Sony Corporation of America	9679	4	Japan	Electronics
7	Kemet Corporation	9200	8	USA	Electronics
8	Lear Corporation	8569	8	USA	Automotive
9	Alcoa Fujikura LTD	7650	8	Japan	Automotive
10	TYCO International LTD	6785	4	USA	Electronics Medical
11	A.O. Smith Corporation	6598	8	USA	Electrical
12	Carolina Coupon Clearing Inc.	6542	5	USA	Services
13	Sanmina-Sci	6300	7	USA	Electronics
14	General Electric Company	5965	7	USA	Electrical
15	Sanyo North America Group	5879	2	Japan	Electronics
16	Samsung Tijuana Park	5789	3	Korea	Electronics
17	Breed Technologies, INC	5687	9	USA	Automotive
18	Emerson Electric Co.	5678	7	USA	Electrical
19	American Industries	5332	22	Mexico	Shelter Services
20	Matsushita Electric Corp. of America	4986	4	Japan	Electronics
21	Sumitomo Wiring Electric Systems	4879	6	Japan	Electrical
22	Daewoo Industrial Co., LTD	4856	3	Korea	Electronics
23	General Instruments Corporation	4589	3	USA	Electronics
24	Seagate Technology Inc.	4582	4	USA	Electronics
25	Johnson and Johnson Company	4569	5	USA	Medical
26	TRW Incorporation	4554	5	USA	Automotive
27	Philips Electronics	4387	8	Netherlands	Electronics
28	Allegiance Corporation	4289	5	USA	Medical
29	Collectron of Arizona, Inc.	4256	3	USA	Services
30	Attel Dell Norte S.A De C.V	4238	1	USA	Electronics
31	ITT Industries	3845	4	USA	Automotive
32	Hitachi Home Electronics	3700	3	Japan	Electronics
33	Johnson Controls, Inc.	3589	7	USA	Automotive
34	Leviton Manufacturing Company	3256	4	USA	Electrical
35	Quirk Wire Co.	3120	2	USA	Electronics
36	Scientific Atlanta Incorporation	2996	1	USA	Electronics

Rank 2002	Company	Employees	No. Plants in Mexico	Country of Origin	Industrial Sector
37	Strattec Security Corporation	2879	1	USA	Automotive
38	Avery Dennison	2830	2	USA	Office Products
39	International Business Machines (IBM)	2689	1	USA	Electronics
40	Intermex Manufactura	2600	9	Mexico	Services
41	Levi Strauss & Co.	2598	2	USA	Apparel
42	Nova Link	2591	2	USA	Textile
43	Allied Signal Co.	2589	4	USA	Automotive
44	AVX Corporation	2587	2	USA	Electronics
45	Mattel Inc.	2578	1	USA	Toys
46	Honeywell Incorporation	2489	3	USA	Electronics
47	Optek-Danulat Inc.	2488	2	Germany	Medical
48	Advance Transformer Co.	2387	3	USA/Holland	Electronics
49	Hamilton Proctor-Silex Inc.	2331	3	USA	Appliances
50	Yale De Mexico S.A. De C.V.	2169	1	USA	Apparel

Source: <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 Covello 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, uninformed, 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 1996:1–156). In other words, "throughput"¹⁸ 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.¹⁹ Since reliable data do not exist on the full scope and nature of the problem in Northern Mexico, it

¹⁸. Daly's (1996:28) term for "the flow beginning with raw material inputs, followed by their conversion into commodities, and finally into waste outputs."

¹⁹. 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.

is not possible to estimate the full extent of the environmental damage (ITESM and InfoMexus 2002; Liverman et al. 1999; Pena 1997:283–296). Such damage is a potentially important problem because it can deplete important natural resources, disrupt the stability of larger ecosystems, and threaten human health (Brenner et al. 2000; Simon 1997). Effects are not only local, but global because *maquila* activities are embedded in global commodity chains stretching across time and space. Pena (1997:295) describes the situation in the following fashion:

A global ecological perspective on the maquilas leads to the inescapable conclusion that these industries are contributing to the ravages of natural resource extraction in many parts of Mexico and the rest of the world. The sources of inputs for maquila production are dispersed throughout the globe. For example, the aluminum, copper, tin, steel, ceramics, and plastics contained in maquila assembly components come from mining, milling, and fabrication in North America, Indonesia and other parts of Southeast Asia, Africa, and South America.

Consider what is actually known about environmental risks (see, e.g., Liverman et al. 1999). Water shortages have resulted from rapid population growth and increased industrial activity in the *maquila* centers (Kelly and Solis 2001). The *maquilas* have also contributed to water pollution on both sides of the border; industrial waste water is seldom treated before it is discharged into rivers, arroyos, the Gulf of Mexico, the Rio Grande, and the Pacific Ocean (ITESM and InfoMexus 2002; 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; Liverman et al. 1999; Sanchez 1990, 1991). *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 65% 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. U.S. hazardous wastes have also been transported to *maquiladoras* and recycling plants

²⁰. See Barry (1994), Davis and Perez (1989), Mumme (1999), Reed (1998), Sanchez (1990, 1991), and Varady, Lankao, and Hankins (2001) for a useful overview of the issues.

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 254,500 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).²¹

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.²² 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.²³

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.

²² See, e.g., Abbott (1997), Barry and Sims (1994), Barten et al. (1996), Brown (2002), Castleman (1985a), Frey (1998b), LaDou (1992), Levy (1995, 1998), National Research Council (1991), and Pearce et al. (1994).

²³ Barry and Sims (1994), Borderlines (1998), Brenner et al. (2000), Gallagher (2002), Kochan (1989), Kourous (1998), Moure-Eraso et al. (1994, 1997:591, 596), Multinational Monitor (1995), Pena (1997:296–303), Sanchez (1991), Reed (1998), Simon (1997:chapter 8), and Warner (1990) provide a good review of the situation.

Current research indicates that the rate of nonfatal occupational injuries and illnesses among *maquiladora* 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.²⁴ 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 (1992:8), 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 1992:8). And

²⁴ Eskenazi et al. (1993), 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.²⁵

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 ben-

²⁵ See Daly's (1996:chapters 10 and 11) discussion of the costs of free trade.

²⁶ One is reminded of a comment by Chomsky (1998:357) 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.

efits.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 neo-liberalism (Grossman and Kruger 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,

²⁷ See, e.g., Abbott (1997), Cravey (1998), Kopinak (1996), Kourous (1998), LaBotz (1994), Park (1993), Tiano (1987, 1994), and Wright (1999).

²⁸ Cevallos (2003), Fernandez-Kelly (1989), Human Rights Watch (1999), Kenney et al. (1998), Moure-Eraso et al. (1997), Parikh (1998), and Pena (1997) provide good summaries of what is known. For an excellent discussion of the life histories of women working in the *maquiladoras* of Tijuana, see Prieto (1997).

²⁹ 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)³⁰ 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:

- (1) 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.
- (2) 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...
- (3) 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 a 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). 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.

119), for instance, indicates that “industrial air pollution is outstripping trade-led economic growth in Mexico.”

Stoddard (1991) has qualified such views by noting that *maquiladoras* vary considerably in their developmental consequences and many *maquiladoras* are far better than many domestic facilities in the formal and informal sectors. And ecological modernization theorist Arthur Mol (2001:127–130) suggests the environmental provisions and side agreements of NAFTA provide the institutional basis for improvements in the future. But a crucial fact remains: the *maquiladora* industry has had little impact on Mexico’s economic development beyond the creation 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 *maquila* 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 1/4th instead of 1/12th 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 research³² 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

³² Others have also presented such findings, including Dietz and Rosa (1997), Roberts and Grimes (1997), and the World Bank (1992).

problems (Grossman and Krueger 1993).³³ For proponents of neo-liberalism, and their ecological modernization counterparts (Mol 2001), the benefits will outweigh the costs in the future.

The problem with Grossman and Krueger’s argument is that they assume that the cross-national relationship between aggregate economic output and environmental degradation is a result of intracountry changes in consumption, values, regulation, and technology resulting from affluence. But as Rosa and Dietz (1998:436) note:

A less optimistic explanation is that the new international division of labor has shifted the most environmentally disruptive activities to the least affluent nations, leaving relatively clean service industries in the most affluent nations. Reduced environmental impact from industries in the affluent nations is thus an artifact occurring for other reasons; the impacts are still taking place, but have been shifted to politically less powerful locations.

Roberts and Grimes (1997, 1999:67) also dismiss the modernization implications of the environmental Kuznets curve; they assert that the curve is not a historical trend but a temporary pattern confined to the 1980s (Roberts and Grimes 1999: 67). Arrow et al. (1995:520) make similar arguments and note that the existence of the inverted-U curve (which they correctly note does not exist for resource stocks) “...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.”³⁴ 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 amounts 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 (NAAEC) 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."³⁵ 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.

See Mol (2001:chapter 7, especially pp. 163–164) who draws a different conclusion from the existing research.

³⁵ These and other recommendations are discussed in Caldwell (2002), Carter et al. (1996), Castleman (1995), Clapp (2001:chapter 6), French (2002), Gallagher (2002), Garcia-Johnson (2000:chapter 5), LaDou (1998:1720–1722), Liverman et al. (1999: 621–637), Lofstedt and Sjostedt (2001), Millen and Holtz (2000:213–219); Mol (2001: chapters 5 and 7), Moure-Eraso et al. (1997:598–599), Permanent Peoples' Tribunal on Industrial Hazards and Human Rights (1996), Roberts (1996, 1998), Roht-Arriaza (1995), Sanchez (2002), and Varady and Suk (1996).

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; Daly 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

³⁶ See, e.g., Chomsky (1999), Chossudovsky (1997), Clapp (1998a:103–104, 2001: chapters 6 and 7), Gould et al. (1996:chapter 5), McMichael (2000), Sanchez (2002:1382, 1385–1389), and Tilly (1995).

³⁷ A special type of what Arrighi, Hopkins, and Wallerstein (1987) and Wallerstein (2002) refer to as anti-systemic movements.

³⁸ See, e.g., Bacon (2001), Levy (1995:80–82), Merideth and Brolin (1995), and Zabin (1997).

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 activists 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 Karliner (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 Sjustedt (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.

REFERENCES

- Abbott, Jason. (1997). "Export Processing Zones and the Developing World." *Contemporary Review* 270:232–237.
- Adeola, Francis O. (2001). "Environmental Injustice and Human Rights Abuse: The States, MNCs, and Repression of Minority Groups in the World System." *Human Ecology Review* 8:39–59.
- Anderson, Sarah and John Cavanagh. (1996). *NAFTA's First Two Years: Myths and Realities*. Washington, D.C.: Institute for Policy Studies.
- Anderson, Sarah, John Cavanagh, and Sandra Gross. (1998). *NAFTA's Corporate Cadre: An Analysis of the USA-NAFTA State Captains*. Washington, D.C.: Institute for Policy Studies.
- Andrews, Richard N. (1999). *Managing the Environment, Managing Ourselves: A History of American Environmental Policy*. New Haven, CT: Yale University Press.
- Arrighi, Giovanni, Terrence K. Hopkins, and Immanuel Wallerstein. (1999). *Anti-Systemic Movements*. London: Verso.
- Arrow, Kenneth, Bert Bolin, Robert Costanza, Partha Dasgupta, Carl Folke, C.S. Holling, Bengt-Owe Jansson, Simon Levin, Karl-Goran Maler, Charles Perrings, and David Pimentel. (1995). "Economic Growth, Carrying Capacity, and the Environment." *Science* 268:520–521.
- Bacon, David. (2001). "Unions without Borders." *The Nation* (January 22):20–24.
- Barkin, David. (1991). "State Control of the Environment: Politics and Degradation in Mexico." *Capitalism, Nature, Socialism* 2:86–108.
- Barry, Tom and Beth Sims. (1994). *The Challenge of Cross-Border Environmentalism*. Albuquerque, NM: Resource Center Press.
- Barten, Françoise, Suzanne Fustukian, and Sylvia de Haan. (1996). "The Occupational Health Needs of Workers: The Need for a New International Approach." *Social Justice* 23:152–163.
- Beck, Ulrich. (1992). *Risk Society: Towards a New Modernity*. London: Sage.
- Beck, Ulrich. (1999). *World Risk Society*. Malden, MA: Blackwell.
- Bergesen, Albert J. and Laura Parisi. (1999). "Ecosociology and Toxic Emissions." Pp. 43–58 in *Ecology and the World-System*, edited by Walter L. Goldfrank, David Goodman, and Andrew Szasz. 1999. Westport, CT: Greenwood Press.
- Bloom, David E. and David Canning. (2000). "The Health and Wealth of Nations." *Science* 287:1207–1209.
- Bogard, William. (1989). *The Bhopal Tragedy*. Boulder, CO: Westview Press.
- Boli, John and George M. Thomas. (1997). "World Culture in the World Polity: A Century of International Non-Governmental Organizations?" *American Sociological Review* 62:171–190.

- Boone, Christopher and Ali Modarres. (1999). "Creating a Toxic Neighborhood in Los Angeles County: A Historical Examination of Environmental Inequity." *Urban Affairs Review* 35:163–188.
- Borderlines. (1998a). "Colonias: Problems and Prospects." *Borderlines* 6 (May). <http://www.americaspolicy.org/borderlines/>.
- Borderlines. (1998b). "Community Health in the Borderlands: An Overview." *Borderlines* 6 (May). <http://www.americaspolicy.org/borderlines/>.
- Bowden, Charles. (1998). *Juarez: The Laboratory of Our Future*. New York: Aperture Press.
- Brecher, Jeremy, Tim Costello, and Brendan Smith. (2001). *Globalization from Below: The Power of Solidarity*. Boston: South End Press.
- Brenner, Jack, Jennifer Ross, Janie Simmons, and Sarah Zaidt. (2000). "Neoliberal Trade and Investment and the Health of Maquiladora Workers on the U.S.-Mexico Border." Pp. 261–290, 478–486 in *Dying for Growth: Global Inequality and the Health of the Poor*, edited by Jim Yong Kim, Joyce V. Millen, Alec Irwin, and John Gersham. Monroe, ME: Common Courage Press.
- Brown, Garrett D. (2002). "The Global Threats to Workers' Health and Safety on the Job." *Social Justice* 29:12–25.
- Bryant, Bunyan, editor. (1995). *Environmental Justice: Issues, Policies, and Solutions*. Washington, D.C.: Island Press.
- Bullard, Robert D. (2000). *Dumping in Dixie: Race, Class, and Environmental Quality*. (Third Edition.) Boulder, CO: Westview Press.
- Caldwell, Douglas Jake. (2002). "Civil Society and the Environment: An Environmentalist's Agenda for Sustainable Trade and Investment in the Americas." Pp. 291–305 in *Greening the Americas: NAFTA's Lessons for Hemispheric Trade*. Cambridge, MA: The MIT Press.
- Camacho, David E. (1998). *Environmental Injustices, Political Struggles: Race, Class, and the Environment*. Durham, NC: Duke University Press.
- Cameron, Maxwell and Brian W. Tomlin. (2002). *The Making of NAFTA: How the Deal Was Done*. Ithaca, NY: Cornell University Press.
- Carruthers, David V. (1996). "Indigenous Ecology and the Politics of Linkage in Mexican Social Movements." *Third World Quarterly* 17:1007–1028.
- Carter, Dean E., Carlos Pena, Robert Varady, and William A. Suk. (1996). "Environmental Health and Hazardous Waste Issues Related to the U.S.-Mexico Border." *Environmental Health Perspectives* 104:590–594.
- Casanova, Pablo Gonzales. (1996). "Globalism, Neoliberalism, and Democracy." *Social Justice* 23:39–48.
- Castleman, Barry I. (1985a). "The Double Standard in Industrial Hazards." Pp. 60–89 in *The Export of Hazard*, edited by Jane H. Ives. Boston: Routledge and Kegan Paul.
- Castleman, Barry I. (1985b). "Response to Levenstein-Eller Critique." Pp. 90–93 in *The Export of Hazard*, edited by Jane H. Ives. Boston: Routledge and Kegan Paul.
- Castleman, Barry I. (1995). "The Migration of Industrial Hazards." *International Journal of Occupational and Environmental Health* 1:85–96.

- Castleman, Barry I. (1999). "Global Corporate Policies and International 'Double Standards' in Occupational and Environmental Health." *International Journal of Occupational and Environmental Health* 5.
- Castleman, Barry I. and Vincent Navarro. (1987). "The International Mobility of Hazardous Products, Industries and Wastes." *Annual Review of Public Health* 8: 1–19.
- Cavanagh, John. (1992). "Free Trade as Opportunity." Pp. 1–11 in *Trading Freedom: How Free Trade Affects Our Lives, Work, and Environment*, edited by John Cavanagh, John Gersham, Karen Baker, and Gretchen Helmke. San Francisco: Institute for Food and Development Policy.
- Cavanagh, John, John Gersham, Karen Baker, and Gretchen Helmke, editors. (1992). *Trading Freedom: How Free Trade Affects Our Lives, Work, and Environment*. San Francisco: Institute for Food and Development Policy.
- Cevallos, Diego. (2003). "Mexico: Toll of Murdered Young Women Tops 300." *CorpWatch*, February 20. <http://www.corpwatch.org/news/pnd.jsp?articleid=5632>.
- Chen, Xiangming. (1995). "The Evolution of Free Economic Zones and the Recent Development of Cross-National Growth Zones." *International Journal of Urban and Regional Research* 19:593–621.
- Chomsky, Noam. (1998). "Free Trade and Free Markets: Pretense and Practice." Pp. 356–370 in *The Cultures of Globalization*, edited by Fredric Jameson and Masao Miyoshi. Durham, NC: Duke University Press.
- Chomsky, Noam. (1999). *Profits Over People: Neoliberalism and Global Order*. New York: Seven Stories Press.
- Chossudovsky, Michel. (1997). *The Globalization of Poverty: Impacts of IMF and World Bank Reforms*. Penang, Malaysia: Third World Network.
- Chua, Swee. (1999). "Economic Growth, Liberalization, and the Environment: A Review of the Economic Evidence." *Annual Review of Energy and Environment* 24: 391–430.
- Ciccantell, Paul and Stephen G. Bunker, editors. (1998). *Space and Transport in the World-System*. Westport, CT: Greenwood Press.
- Clapp, Jennifer. (1998a). "Foreign Direct Investment in Hazardous Industries in Developing Countries: Rethinking the Debate." *Environmental Politics* 7:92–113.
- Clapp, Jennifer. (1998b). "The Privatization of Global Environmental Governance: ISO 14000 and the Developing World." *Global Governance* 4:295–316.
- Clapp, Jennifer. (2001). *Toxic Exports: The Transfer of Hazardous Wastes from Rich to Poor Countries*. Ithaca, NY: Cornell University Press.
- Clapp, Jennifer. (2002a). "Piles of Poisons." *Alternatives Journal* 28:25–26.
- Clapp, Jennifer. (2002b). "The Distancing of Waste: Overconsumption in a Global Economy." Pp. 155–176, 348–353 in *Confronting Consumption*, edited by Thomas Princen, Michael Maniates, and Ken Conca. Cambridge, MA: MIT Press.
- Clark, Robert P. (1998). "Bulk Flow Systems and Globalization." Pp. 196–209 in *Space and Transport in the World-System*, edited by Paul Ciccantell and Stephen G. Bunker. Westport, CT: Greenwood Press.

- Cobb, John B., Jr. (1995). "A Just and Sustainable Economic Order." *Journal of Social Issues* 51:83–100.
- Cohen, Maurie J. (1997). "The Spatial Distribution of Toxic Chemical Emissions: Implications for Nonmetropolitan Areas." *Society and Natural Resources* 10:17–41.
- Cooney, Paul. (2001). "Political Challenges at the Frontier of Neoliberalism: The Mexico-US Border Region." Paper presented at the annual meeting of the Union of Radical Political Economists, New Orleans, LA.
- Council on Scientific Affairs. (1990). "A Permanent U.S.-Mexico Border Environmental Health Commission." *Journal of the American Medical Association* 253:3319–3321.
- Covello, Vincent T. and R. Scott Frey. (1990). "Technology-Based Environmental Health Risks in Developing Countries." *Technological Forecasting and Social Change* 37:159–179.
- Cowie, Jefferson. (1999). *Capital Moves: RCA's Seventy-Year Quest for Cheap Labor*. Ithaca, NY: Cornell University Press.
- Cravey, Altha J. (1998). *Women and Work in Mexico's Maquiladoras*. Lanham, MD: Rowman and Littlefield.
- Daly, Herman. (1993). "The Perils of Free Trade." *Scientific American* 262:50–57.
- Daly, Herman. (1996). *Beyond Growth: The Economics of Sustainable Development*. Boston: Beacon Press.
- Davis, Allyn M. and Rene Altamirano Perez. (1989). "Hazardous Waste Management at the Mexican-U.S. Border." *Environment, Science, Technology* 23:1208–1210.
- Dicken, Peter. (2003). *Global Shift: Transforming the World Economy*. (Fourth Edition.) New York: Guilford Press.
- Dietz, Thomas, R. Scott Frey, and Eugene A. Rosa. (2001). "Risk Assessment and Management." Pp. 272–299 in *The Environment and Society Reader*, edited by R. Scott Frey. Needham Heights, MA: Allyn and Bacon.
- Dietz, Thomas and Eugene A. Rosa. (1997). "Effects of Population and Affluence on CO₂ Emissions." *Proceedings of the National Academy of Sciences, USA* 94:175–179.
- Dreiling, Michael. (1998). "Remapping North American Environmentalism: Contending Visions and Divergent Practices in the Fight over NAFTA." Pp. 218–247 in *The Struggle for Ecological Democracy: Environmental Justice Movements in the United States*, edited by Daniel Faber. New York: The Guilford Press.
- The Economist. (1991). "Let Them Eat Pollution." *The Economist* (February 8):66.
- The Economist. (1999). "Citizens' Groups: The Non-Governmental Order." *The Economist* (December 11):20–21.
- Eskeland, Gunnar S. and Anne E. Harrison. (1997). *Moving to Greener Pastures?: Multinationals and the Pollution-Haven Hypothesis*. Policy Research Working Paper 1744. Washington, D.C.: The World Bank.
- Eskenazi, Brenda, Sylvia Guendelman, Eric P. Elkin, and Monica Jasis. (1993). "A Preliminary Study of Reproductive Outcomes of Female Maquiladora Workers in Tijuana, Mexico." *American Journal of Industrial Medicine* 24:667–676.
- Evans, Peter. (2000). "Fighting Marginalization with Transnational Networks: Counter Hegemonic Globalization." *Contemporary Sociology* 29:230–241.

- Fatemi, Khosrow, editor. (1990). *The Maquiladora Industry: Economic Solution or Problem?* New York: Praeger.
- Fernandez-Kelly, Maria Patricia. (1983). *For We Are Sold, I and My People: Women and Industry in Mexico's Frontier*. Albany: State University of New York Press.
- Fiorino, Daniel J. (1995). *Making Environmental Policy*. Berkeley: University of California Press.
- Foster, John Bellamy. (1995). "The Global Policies of the United States Are Environmentally Unjust." Pp. 100–107 in *Environmental Justice*, edited by Jonathan S. Petrikin. San Diego, CA: Greenhaven Press.
- Foster, John Bellamy. (2002a). "The Ecological Tyranny of the Bottom Line: The Environmental and Social Consequences of Economic Reductionism." Pp. 26–43 in *Ecology Against Capitalism*, by John Bellamy Foster. New York: Monthly Review Press.
- Foster, John Bellamy. (2002b). "Let Them Eat Pollution: Capitalism in the World Environment." Pp. 60–68 in *Ecology Against Capitalism*, by John Bellamy Foster. New York: Monthly Review Press.
- French, Hilliary. (1993). *Costly Tradeoffs*. Washington, D.C.: Worldwatch.
- French, Hilliary. (2000). *Vanishing Borders: Protecting the Planet in the Age of Globalization*. New York: W.W. Norton.
- French, Hilliary. (2002). "Reshaping Global Governance." Pp. 174–198, 246–254 in *State of the World 2002*, edited by Linda Starke. New York: W.W. Norton.
- Frey, R. Scott. (1995). "The International Traffic in Pesticides." *Technological Forecasting and Social Change* 50:151–169.
- Frey, R. Scott. (1997). "The International Traffic in Tobacco." *Third World Quarterly* 18: 303–319.
- Frey, R. Scott. (1998a). "The Hazardous Waste Stream in the World-System." Pp. 84–103 in *Space and Transport in the World-System*, edited by Paul Ciccantell and Stephen G. Bunker. Westport, CT: Greenwood Press.
- Frey, R. Scott. (1998b). "The Export of Hazardous Industries to the Peripheral Zones of the World-System." *Journal of Developing Societies* 14:66–81.
- Frey, R. Scott. (2001). "The International Traffic in Leaded Gasoline." Paper presented at the annual meeting of the American Sociological Association, Anaheim, CA.
- Frey, R. Scott. (2002). "The International Traffic in Heavy Metals." Paper presented at the annual meeting of the American Sociological Association, Chicago, IL.
- Frumkin, Howard, Mauricio Hernandez-Avila, and Felipe Espinosa Torres. (1995). "Maquiladoras: A Case Study of Free Trade Zones." *Occupational and Environmental Health* 1:96–109.
- Gabriel, Ana Maria Perez. (1990). "Mexican Legislation Affecting the Maquiladora Industry." Pp. 207–216 in *The Maquiladora Industry: Economic Solution or Problem?*, edited by Khosrow Fatemi. New York: Praeger.
- Gallagher, Kevin P. (2002a). "Industrial Pollution in Mexico: Did NAFTA Matter?" Pp. 119–141 in *Greening the Americas: NAFTA's Lesson for Hemispheric Trade*, edited by Carolyn L. Deere and Daniel C. Esty. Cambridge, MA: The MIT Press.

- Gallagher, Kevin P. (2002b). "Fast Track: Fix It or Nix It." *Crossborder Updater* (January 23). <http://www.americaspolicy.org>.
- Garcia-Johnson, Ronnie. (2000). *Exporting Environmentalism: U.S. Multinational Chemical Corporations in Brazil and Mexico*. Cambridge, MA: The MIT Press.
- George, Susan. (1992). *The Debt Boomerang: How the Third World Debt Harms Us All*. Boulder, CO: Westview Press.
- Gereffi, Gary. (1996). "Mexico's 'Old' and 'New' Maquiladora Industries: Contrasting Approaches to North American Integration." Pp. 85–106 in *Neoliberalism Revisited: Economic Restructuring and Mexico's Political Future*, edited by Gerardo Otero. Boulder, CO: Westview Press.
- Gereffi, Gary and L. Hempel. (1996). "Latin America in the Global Economy: Running Faster to Stay in Place." *NACLA Report on the Americas* 29:18–27.
- Gereffi, Gary and Miguel Korzeniewicz, editors. (1994). *Commodity Chains and Global Capitalism*. Westport, CT: Greenwood Press.
- Gould, Kenneth A., Allan Schnaiberg, and Adam S. Weinberg. (1996). *Local Environmental Struggles: Citizen Activism in the Treadmill of Production*. New York: Cambridge University Press.
- Greider, William. (2001). "A New Giant Sucking Sound." *The Nation* (December 31): 22–24.
- Grossman, Gene M. and Alan B. Krueger. (1993). "Environmental Impacts of a North American Free Trade Agreement." In *The Mexico-U.S. Free Trade Agreement*, edited by Peter M. Garber. Cambridge, MA: MIT Press.
- Grossman, Gene M. and Alan B. Krueger. (1995). "Economic Growth and the Environment." *The Quarterly Journal of Economics* 110:350–377.
- Guendelman, Sylvia and Monica Jasis Silberg. (1993). "The Health Consequences of Maquiladora Work: Women on the U.S.-Mexico Border." *American Journal of Public Health* 83:37–44.
- Guendelman, Sylvia, Steven Samuels, and Martha Ramirez. (1998). "Women Who Quit Maquiladora Work on the U.S.-Mexico Border: Assessing Health, Occupation, and Social Dimensions in Two Transnational Electronics Plants." *American Journal of Industrial Medicine* 33:501–509.
- Hanson, Gordon H. (2002). "The Role of Maquiladoras in Mexico's Export Boom," Unpublished manuscript.
- Hart, John Mason. (2002). *Empire and Revolution: The Americans in Mexico Since the Civil War*. Berkeley: University of California Press.
- Harvey, David. (1996). *Justice, Nature and the Geography of Difference*. Malden, MA: Blackwell.
- Hays, Samuel P. (2000). *A History of Environmental Politics Since 1945*. Pittsburgh, PA: University of Pittsburgh Press.
- Heiman, Michael K. (1996). "Race, Waste and Class: New Perspectives on Environmental Justice." *Antipode* 22:111–121.

- Hogenboom, Barbara. (1996). "Cooperation and Polarisation Beyond Borders: The Transnationalisation of Mexican Environmental Issues During the NAFTA Negotiations." *Third World Quarterly* 17:989–1005.
- Human Rights Watch. (1999). "No Guarantees: Sex Discrimination in Mexico's Maquiladora Sector." Pp. 31–35 in *The Maquiladora Reader: Cross-Border Organizing Since NAFTA*. Philadelphia, PA: American Friend Service Committee.
- Huq, Saleemui. (1994). "Global Industrialization." Pp. 107–113 in *Industrial Ecology and Global Change*, edited by R. Socolow, C. Andrews, F. Berkhout, and V. Thomas. Cambridge: Cambridge University Press.
- International Labour Organization. (1998). *Labor and Social Issues Relating to Export Processing Zones*. Geneva: International Labour Organization.
- ITESM and InfoMexus/Instituto Tecnológico y de Estudios Superiores de Monterrey and Instituto de Información Fronteriza México-Estados Unidos. (2002). *Report on Environmental Conditions and Natural Resources on Mexico's Northern Border*. Mexico City: National Institute of Ecology.
- Jacotti, M., G. Reed and M. Winfield. (2001). *The Generation and Management of Hazardous Wastes and Transboundary Hazardous Waste Shipments between Mexico, Canada, and the United States, 1999–2000*. Austin: Texas Center for Policy Studies.
- Jaffe, Adam B., Steven R. Peterson, Paul R. Portney, and Robert N. Stavins. (1995). "Environmental Regulation and the Competitiveness of U.S. Manufacturing." *Journal of Economic Literature* 33:132–163.
- Jauch, Herbert. (2002). "Export Processing Zones and the Quest for Sustainable Development: A Southern African Perspective." *Environment and Urbanization* 14:101–113.
- Jayadevappa, Ravishankar and Sumedha Chhatre. (2000). "International Trade and Environmental Quality: A Survey." *Ecological Economics* 52:175–194.
- Johnston, Barbara and Gregory Button. (1994). "Human Environmental Rights Issues and the Multinational Corporations: Industrial Development in the Free Trade Zone." Pp. 206–215 in *Who Pays the Price: The Sociological Context of Environmental Crisis*. Washington, D.C.: Island Press.
- Karliner, Joshua. (1997). *The Corporate State: Ecology and Politics in the Age of Globalization*. San Francisco: Sierra Club.
- Kasperson, Jeanne K. and Roger E. Kasperson. (2001). "Border Crossings." Pp. 207–243 in *Transboundary Risk Management*, edited by Joanne Linnerooth-Bayer, Ragnar E. Lofstedt, and Gunnar Sjostedt. London: Earthscan.
- Keck, Margaret and Kathryn Sikkink. (1998). *Activists Beyond Borders: Advocacy Networks in International Politics*. Ithaca: Cornell University Press.
- Kelly, Mary and Arturo Solis, with George Kourous. (2001). "The Border's Troubled Waters." *Borderlines* 9 (November). <http://www.americaspolicy.org/borderlines/>.
- Kenney, Martin, W. Richard Goe, Oscar Contreras, Jairo Romero, and Mauricio Bustos. (1998). "Learning Factories or Reproduction Factories?: Labor-Management Relations in the Japanese Consumer Electronics Maquiladoras in Mexico." *Work and Occupations* 25:269–304.

- Kochan, Leslie. (1989). *The Maquiladoras and Toxics: The Hidden Costs of Production South of the Border*. Washington, D.C.: AFL-CIO.
- Kopinak, Kathryn. (1996). *Desert Capitalism: Maquiladoras in North America's Western Industrial Corridor*. Tucson: University of Arizona Press.
- Kourous, George. (1998). "Occupational Health and Safety in the Maquiladoras." *Borderlines* 6 (August). <http://www.americaspolicy.org/borderlines/>.
- Kuznets, Simon. (1955). "Economic Growth and Income Inequality." *The American Economic Review* 45:1-28.
- LaBotz, D. (1994). "Manufacturing Poverty." *International Journal of Health Services* 24: 403-408.
- LaDou, Joseph. (1992). "The Export of Hazardous Industries to Newly Industrialized Countries." *Polish Journal of Medicine and Environmental Health* 5:223-226.
- LaDou, Joseph. (1998). "International Occupational and Environmental Health." Pp. 1715-1724 in *Environment and Occupational Medicine*, edited by William Rom. Philadelphia, PA: Lippincott-Raven.
- Landrigan, Philip and Anjali Garg. (2002) "Vulnerable Populations." Pp. 257-271 in *Life Support: The Environment and Human Health*, edited by Michael McCally. Cambridge, MA: MIT Press.
- Leonard, H. Jeffrey. (1988). *Pollution and the Struggle for the World Product*. New York: Cambridge University Press.
- Levenstein, Charles and Stanley W. Eller. (1985). "Exporting Hazardous Industries." Pp. 51-59 in *The Export of Hazard*, edited by Jane H. Ives. Boston: Routledge and Kegan Paul.
- Levy, Barry S. (1995). "Health and Social Effects of Worldwide Economic Transformation: Focus on Occupational and Environmental Health." *Social Justice* 22:77-84.
- Lipschutz, Ronnie. (1992). "Reconstructing World Politics: The Emergence of Global Civil Society." *Millennium* 21:389-420.
- Liverman, Diana M., Robert G. Varady, Octavio Chavez, and Roberto Sanchez. (1999). "Environmental Issues Along the United States-Mexico Border: Drivers of Change and Responses to Citizens and Institutions." *Annual Review of Energy and Environment* 24:607-643.
- Lofstedt, Ragnar E. and Gunnar Sjostedt. (2001). "Transboundary Environmental Risk Management in the New Millennium: Lessons for Theory and Practice." Pp. 305-323 in *Transboundary Risk Management*, edited by Joanne Linnerooth-Bayer, Ragnar E. Lofstedt, and Gunnar Sjostedt. London: Earthscan.
- Logan, Bernard I. (1991). "An Assessment of the Environmental and Economic Implications of Toxic-Waste Disposal in Sub-Saharan Africa." *Journal of World Trade* 25:61-76.
- Lorey, David E, editor. (1990). *United States-Mexico Border Statistics Since 1900*. Los Angeles: UCLA Latin American Center Publications.
- Low, Patrick and Alexander Yeats. (1992). "Do 'Dirty' Industries Migrate?" Pp. 89-103 in *International Trade and Environment*, edited by Patrick Low. Washington, D.C.: World Bank.

- McCally, Michael, editor. (2002). *Life Support: The Environment and Human Health*. Cambridge, MA: MIT Press.
- Manning, Robert, Steven Lawson, and Lesley Frymier. (1999). "Navigating the Confluence of Two Streams of Social Research: Contingent Valuation and Normative Standards." *Human Ecology Review* 6:35-48.
- Marshall, Brent K. (1999). "Globalization, Environmental Degradation and Ulrich Beck's Risk Society." *Environmental Values* 8:253-275.
- McMichael, Philip. (2000). *Development and Social Change: A Global Perspective*. (Second Edition.) Thousand Oaks, CA: Pine Forge Press.
- Melville, Elinor G.K. (1994). *A Plague of Sheep: Environmental Consequences of the Conquest of Mexico*. Cambridge: Cambridge University Press.
- Merideth, Emily and Garrett Brown. (1995). "The Maquiladora Health and Safety Support Network: A Case Study of Public Health Without Borders." *Social Justice* 22:85-88.
- Meservy, Darlene, Anthony J. Suruda, Donald Bloswick, Jeffrey Lee, and Mark Dumas. (1997). "Ergonomic Risk Exposure and Upper-Extremity Cumulative Trauma Disorders in a Maquiladora Medical Devices Manufacturing Plant." *Journal of Occupational and Environmental Medicine* 39:767-773.
- Michalowski, R.J. and R.C. Kramer. (1987). "The Space between Laws: The Problem of Corporate Crime in a Transnational Context." *Social Problems* 34:34-53.
- Millen, Joyce and Timothy H. Holtz. (2000). "Dying for Growth, Part I: Transnational Corporations and the Health of the Poor." Pp. 177-223, 463-472 in *Dying for Growth: Global Inequality and the Health of the Poor*, edited by Jim Yong Kim, Joyce V. Millen, Alec Irwin, and John Gersham. Monroe, ME: Common Courage Press.
- Millen, Joyce V., Evan Lyon, and Alec Irwin. (2000). "Dying for Growth, Part II: The Political Influence of National and Transnational Corporations." Pp. 225-243, 472-476 in *Dying for Growth: Global Inequality and the Health of the Poor*, edited by Jim Yong Kim, Joyce V. Millen, Alec Irwin, and John Gersham. Monroe, ME: Common Courage Press.
- Mitchell, Robert Cameron and Richard T. Carson. (1989). *Using Surveys to Value Public Goods: The Contingent Valuation Method*. Washington, D.C.: Resources for the Future.
- Moghadam, Valentine M. (1999). "Gender and Globalization: Female Labor and Women's Mobilization." *Journal of World-Systems Research* <http://jwsr.ucr.edu> 5: 301-314.
- Mohai, Paul and Bunyan Bryant, editors. (1992). *Race and the Incidence of Environmental Hazards*. Boulder, CO: Westview Press.
- Mol, Arthur. (2001). *Globalization and Environmental Reform: The Ecological Modernization of the Global Economy*. Cambridge, MA: The MIT Press.
- Molina, David J. (1993). "A Comment on Whether Maquiladoras Are in Mexico for Low Wages or to Avoid Pollution Abatement Costs." *Journal of Environment and Development* 2:221-241.

- Moonmaw, William and Mark Tullis. (1994). "Charting Development Paths." Pp. 157–172 in *Industrial Ecology and Global Change*, edited by R. Socolow, C. Andrews, F. Berkhout, and V. Thomas. Cambridge: Cambridge University Press.
- Moure-Eraso, Rafael, Meg Wilcox, Laura Punnett, Leslie Copeland, and Charles Levenstein. (1994). "Back to the Future: Sweatshop Conditions on the Mexico-U.S. Border. I. Community Health Impact of Maquiladora Industrial Activity." *American Journal of Industrial Medicine* 25:311–324.
- Moure-Eraso, Rafael, Meg Wilcox, Laura Punnett, Leslie MacDonald, and Charles Levenstein. (1997). "Back to the Future: Sweatshop Conditions on the Mexico-U.S. Border. II. Occupational Health Impact of Maquiladora Industrial Activity." *American Journal of Industrial Medicine* 31:587–599.
- Multinational Monitor. (1995). "Border Health Hazards." *Multinational Monitor* (April):22–23.
- Mumme, Stephen P. (1988). "Complex Interdependence and Hazardous Waste Management along the US-Mexico Border." Pp. 223–237 in *Dimensions of Hazardous Waste Politics and Policy*, edited by C.E. Davis and J.P. Lester. Westport, CT: Greenwood.
- Mumme, Stephen P. (1998). "Environmental Policy and Politics in Mexico." Pp. 183–203 in *Ecological Policy and Politics in Developing Countries: Economic Growth, Democracy, and the Environment*, edited by Uday Desai. Albany: State University of New York Press.
- Mumme, Stephen P. (1999). "NAFTA's Environmental Side Agreement." *Borderlines* 7 (October) <http://www.americaspolicy.org/borderlines/>.
- National Research Council. (1991). *Environmental Epidemiology: Public Health and Hazardous Wastes*. Washington, D.C.: National Academy Press.
- Nauman, Talli. (2003). "Mexico's Right-to-Know Movement." *Citizen Action in the Americas* (February 2003). http://www.americaspolicy.org/citizen-action/series/04-rtk_body.html
- Nordstrom, Hakan and Scott Vaughan. (1999). *Trade and the Environment*. Geneva, Switzerland: World Trade Organization.
- O'Neill, Kate. (2000). *Waste Trading among Rich Nations: Building a New Theory of Environmental Regulation*. Cambridge, MA: MIT Press.
- Ostrosky-Wegman, Patricia and Maria E. Gonsebatt. (1996). "Environmental Toxicants in Developing Countries." *Environmental Health Perspectives* 104 (Supplement 3): 599–602.
- Otero, Gerardo, editor. (1996). *Neoliberalism Revisited: Economic Restructuring and Mexico's Political Future*. Boulder, CO: Westview Press.
- Parikh, Jagdish. (1997). "Sex Discrimination in Mexican Maquiladora." *Human Rights Watch* (18 June).
- Park, K. (1993). "Women and Development." *Comparative Politics* 25:122–145.
- Pastor, Manuel and Carol Wise. (1994). "The Origins and Sustainability of Mexico's Free Trade Policy." *International Organization* 48:459–489.
- Peach, James and James Williams. (1999). "Borderlands Demographic Trends." *Borderlines* 7 (August). <http://www.americaspolicy.org/borderlines/>.

- Pearce, N., E. Matos, H. Vainio, P. Boffetta, M. Kogevinas, editors. (1994). *Occupational Cancer in Developing Countries*. Lyon, France: International Agency for Research on Cancer.
- Pearson, Charles. (1987). "Environmental Standards, Industrial Relocation, and Pollution Havens." Pp. 113–128 in *Multinational Corporations, the Environment, and the Third World*, edited by Charles Pearson. Durham, NC: Duke University Press.
- Pena, Devon. (1997). *The Terror of the Machine: Technology, Work, Gender, and Ecology*. Austin: University of Texas Press.
- Permanent Peoples' Tribunal on Industrial Hazards and Human Rights. (1996). "Charter of Rights Against Industrial Hazards." *Social Justice* 23:167–181.
- Perry, D. M., R. Sanchez, and W.H. Glaze. (1998). "Binational Management of Hazardous Waste: The Maquiladora Industry in the US-Mexico Border." *Environmental Management* 14:441.
- Polanyi, Karl. (2001/1944). *The Great Transformation: The Political and Economic Origins of Our Time*. Boston, MA: Beacon Press.
- Price-Smith, Andrew T. (2001). *The Health of Nations: Infectious Diseases, Environmental Change and the Effects of National Security and Development*. Cambridge, MA: The MIT Press.
- Prieto, Norma Iglacion, translated by Michael Stone and Gabrielle Winkler. (1997). *Beautiful Flowers of the Maquiladora: Life Histories of Women Workers*. Austin: University of Texas Press.
- Princen, Thomas and Matthias Finger. (1994). *Environmental NGOs in World Politics: Linking the Local and the Global*. London: Routledge.
- Rauscher, Robert. (1997). *International Trade, Factor Movements, and the Environment*. Oxford: Clarendon Press.
- Redclift, Michael and Colin Sage. (1998). "Global Environmental Change and Global Inequality: North/South Perspectives." *International Sociology* 13:499–516.
- Reed, Cyrus. (1998). "Hazardous Waste Management on the Border: Problems with Practices and Oversight Continue." *Borderlines* 6 (July). <http://www.americaspolicy.org/borderlines/>.
- Roberts, J. Timmons. (1996). "Global Restructuring and the Environment in Latin America." Pp. 187–210 in *Latin America in the World-Economy*, edited by Roberto Patricio Korzeniewicz. Westport, CT: Greenwood Press.
- Roberts, J. Timmons. (1998). "Emerging Global Environmental Standards: Prospects and Perils." *Journal of Developing Societies* 14:144–163.
- Roberts, J. Timmons and Peter E. Grimes. (1997). "Carbon Intensity and Economic Development 1962–1991: A Brief Exploration of the Environmental Kuznets' Curve." *World Development* 25:191–198.
- Roberts, J. Timmons and Peter E. Grimes. (1999). "Extending the World-System to the Whole System: Towards a Political Economy of the Biosphere." Pp. 59–83 in *Ecology and the World-System*, edited by Walter L. Goldfrank, David Goodman, and Andrew Szasz. Westport, CT: Greenwood.
- Rock, Michael. (1996). "Pollution Intensity of GDP and Trade Policy: Can the World Bank Be Wrong?" *World Development* 24:471–479.

- Roht-Arriaza, Naomi. (1995). "Shifting the Point of Regulation: The International Organization for Standardization and Global Lawmaking on Trade and the Environment." *Ecology Law Quarterly* 22:479–539.
- Rosa, Eugene A. and Thomas Dietz. (1998). "Climate Change and Society: Speculation, Construction and Scientific Investigation." *International Sociology* 13:421–455.
- Rotella, Sebastian. (1998). *Twilight on the Line: Underworlds and Politics at the U.S.-Mexico Border*. New York: W.W. Norton.
- Rothman, Dale S. (1998). "Environmental Kuznets Curves—Real Progress or Passing the Buck?: A Case for Consumption Based Approaches." *Ecological Economics* 25: 177–194.
- Sanchez, Roberto A. (1990). "Health and Environmental Risks of the Maquiladora in Mexicali." *Natural Resources Journal* 30:163–186.
- Sanchez, Roberto A. (1991). "Environment: Mexican Perspective." Pp. 302–335 in *U.S.-Mexican Industrial Integration*, edited by Sidney Weintraub. Boulder, CO: Westview Press.
- Sanchez, Roberto A. (2002). "Governance, Trade, and the Environment in the Context of NAFTA." *American Behavioral Scientist* 45:1369–1393.
- Schwartz, Scott. (1987). "The Border Industrialization Program of Mexico." *Southwest Journal of Business and Economics* 4:1–51.
- Simmons, P.J. (1998). "Learning to Live with NGOs." *Foreign Policy* 112 (Fall):82–96.
- Simon, Joel. (1997). *Endangered Mexico: An Environment on the Edge*. San Francisco: Sierra Club Books.
- Sklair, Leslie. (1993). *Assembling for Development: The Maquila Industry in Mexico and the United States*. (Second Edition.) San Diego: Center for U.S.-Mexico Studies, University of California.
- Sklair, Leslie. (1998). "Social Movements and Capitalism." Pp. 291–311 in *The Cultures of Globalization*, edited by Frederic Jameson and Masao Miyoshi. Durham, NC: Duke University Press.
- Smith, Geri. (2002). "Race to the Bottom, Second Leg: The Decline of the Maquiladora." *Transnationale* (April 29). <http://www.transnationale.org>
- Sonnenfeld, David A. and Arthur P.J. Mol. (2002). "Ecological Modernization, Government, and Globalization?" *American Behavioral Scientist* 95:1456–1461.
- Stern, David I. (1998). "Progress on the Environmental Kuznets Curve?" *Environment and Development Economics* 3:173–196.
- Stoddard, Ellwyn R. (1991). "Border Maquila Ownership and Mexican Economic Benefits: A Comparative Analysis of the 'Good,' the 'Bad,' and the 'Ugly.'" *Journal of Borderlands Studies* 6:23–30.
- Suro, Roberto. (1994). *The New York Times* (May 31):18.
- Swaney, James A. (1994). "So What's Wrong with Dumping in Africa?" *Journal of Economic Issues* 28:367–377.
- Szasz, Andrew and Michael Meuser. (1997). "Environmental Inequalities: Literature Review and Proposals for New Directions in Research and Theory." *Current Sociology* 45:99–120.

- Tiano, S. (1994). *Patriarchy on the Line: Labor, Gender, and Ideology in the Mexican Maquila Industry*. Philadelphia: Temple University Press.
- Tilly, Charles. (1995). "Globalization Threatens Labor's Rights." *International Labor and Working-Class History* 47:1–23.
- Tobey, James A. (1990). "The Effects of Domestic Environmental Policies on Patterns of World Trade." *Kyklos* 43:191–209.
- United Nations Industrial Organization. (1980). "Export Processing Zones in Developing Countries." *UNIDO Working Paper on Structural Change*, 19.
- Urrea, Luis Alberto. (1993). *Across the Wire: Life and Hard Times on the Mexican Border*. New York: Doubleday.
- U.S. General Accounting Office. (1991). *U.S.-Mexico Trade: Some U.S. Wood Furniture Firms Relocated from the Los Angeles Area to Mexico*. Washington, D.C.: U.S. General Accounting Office.
- Varady, Robert G., Helen Ingram, and Leonard Milich. (1995). "The Sonoran Pimeria Alta: Shared Environmental Problems and Challenges." *Journal of the Southwest* 37: 102–122.
- Varady, Robert, Patricia Romero Lankao, and Katherin Hankins. (2001). "Managing Hazardous Materials Along the U.S.-Mexico Border." *Environment* 43:22–36.
- Wackernagel, Mathis and William Rees. (1996). *Our Ecological Footprint: Reducing Human Impact on the Earth*. Philadelphia, PA: New Society Publishers.
- Wallerstein, Immanuel. (2002). "New Revolts Against the System." *New Left Review* 18 (November–December):29–39.
- Warner, Judith Ann. (1990). "The Sociological Impact of the Maquiladoras." Pp. 183–197 in *The Maquiladora Industry: Economic Solution or Problem?*, edited by Khosrow Fatemi. New York: Praeger.
- Wheeler, David and Ashoka Mody. (1992). "International Investment Location Decisions: The Case of US Firms." *Journal of International Economics* 33:57–76.
- Wilkin, Peter. (2000). "Solidarity in a Global Age: Seattle and Beyond." *Journal of World-Systems Research* <http://jwsr.ucr.edu/> 6:20–65.
- Williams, Heather L. (1999). "Mobile Capital and Transborder Labor Rights Mobilization." *Politics and Society* 27:139–166.
- Wilson, David L. (1997). "Do Maquiladoras Matter?" *Monthly Review* 49 (October): 28–34.
- Wilson, Patricia. (1992). *Exports and Local Development: Mexico's New Maquiladoras*. Austin: University of Texas Press.
- World Bank. (1992). *World Development Report 1992: Development and the Environment*. New York: Oxford University Press.
- World Resources Institute. (1996). *World Resources, 1996–97*. New York: Oxford University Press.
- World Resources Institute. (1998). *World Resources, 1998–99: A Guide to the Global Environment*. New York: Oxford University Press.
- Wright, M.W. (1999). "The Politics of Reproduction: Gender, Nationality, and Value in a Mexican Maquiladora." *Environment and Planning A* 31:1601–1617.

- Yearley, Steven. (1996). *Sociology, Environmentalism, Globalization: Reinventing the Globe*. London: Sage.
- York, Richard, Eugene A. Rosa, and Thomas Dietz. (2003). "Footprints on the Earth: The Environmental Consequences of Modernity." *American Sociological Review* 68: 270–300.
- Zabin, C. (1997). "Nongovernmental Organizations in Mexico's Northern Border." *Journal of Borderland Studies* 12:41–65.