Environmental Health and Hazardous Waste Issues Related to the U.S.–Mexico Border

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Environmental health and environmental quality issues along the U.S.–Mexico border have been of concern for several years. The enactment of the North American Free Trade Agreement and the presence of the maquiladoras (foreign-owned industries using imported raw materials) have intensified those concerns recently. Efforts to assess these issues are complicated by the fact that many of the issues affecting the border region are within federal jurisdiction, but the problems are regional and local in nature. Thus, state and local governments become involved with public concerns about real and potential problems. One major problem is that environmental health data from this region are lacking, particularly from Mexico. Some new agencies such as the Border Environment Cooperation Commission, the United States–Mexico Border Health Commission, and the North American Commission on Environmental Cooperation have joined several existing agencies at the federal and state level to address environmental quality and health. Several studies have been initiated to determine air and water quality, but little is being done in the areas of hazardous waste and health assessment. Several problems are anticipated in the generation of such data, such as its format and accessibility. Data gaps and research needs are discussed. Key words: environmental health, environmental quality, hazardous waste, Mexico, NAFTA, U.S.–Mexico border. Environ Health Perspect 104:590–594 (1996)

The North American Free Trade Agreement (NAFTA) has resulted in increased trade between the United States and Mexico. With more trade, there is a growing concern about environmental health and hazardous waste issues in the two countries, particularly near the border. Americans are concerned that pollution may cross from Mexico to the U.S. and that companies expanding into Mexico may get an economic advantage from less stringent environmental enforcement; Mexicans are concerned that industrial expansion from American companies will increase hazardous waste problems. A workshop was held to address some of these problems (1); the workshop followed a previous U.S.–Mexico conference (2). This commentary attempts to put the results of that workshop in the larger context of the structures that are in place to address border environmental problems.

The workshop was co-sponsored by the National Institute of Environmental Health Sciences (NIEHS), the U.S. Environmental Protection Agency Office of Research and Development (EPA), and the Centers for Disease Control and Prevention (CDC) under the auspices of the Interagency Coordinating Committee for U.S.–Mexico Border Environmental Health, in cooperation with the Program for the Environment at the National University of Mexico (Universidad Nacional Autónoma de México, Programa Universitario de Medio Ambiente). Its goals were to assemble a cross-section of people from federal agencies, state agencies, local action groups, and universities from the United States and Mexico to present individual perspectives on the problems of hazardous waste on the border, identify current databases of environmental health and quality, and identify data gaps.

Hazardous waste at an international border presents some unique problems for citizens, regulators, and industry because of overlapping jurisdictions. International borders are under federal jurisdiction, so laws regulating the movement of hazardous waste across the border must be negotiated by treaty between the two countries and must be consistent with the laws of each country. However, hazardous waste problems usually affect local communities composed of relatively small populations and limited political power. Most often, local and state authorities are the first entities to hear about citizen concerns and are asked to intervene (3). Concerns about hazardous waste may be stimulated by observations and/or studies that may or may not be scientifically rigorous but, nonetheless, result in great concern about the potential problem or general perception of it. In most cases the issues get passed up the government ladder and must compete with other hazardous waste problems in the respective states and federal agencies. A major difficulty exists when trying to evaluate the concern or when formulating solutions because an entire new set of agencies is involved at the local, state, and federal level. For example, if there was a serious chemical spill in the Rio Grande, it might involve federal agencies from Mexico and the United States, six different state governments (four in Mexico—Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas—and two in the United States—Texas and New Mexico), and numerous border communities that are contiguous and separated only by a fence (e.g., El Paso, Texas, and Ciudad Juárez, Chihuahua).

The jurisdictional issue is further complicated by other differences between the two countries. National differences include language, economic strength, environmental awareness by the population, and public health infrastructure. As a developing nation, Mexico has had to emphasize providing basic services to its growing and largely youthful population. Problems such as nutrition, clean water, sewers, and communicable disease control have been more pressing than other environmental problems.

This particular region has unique characteristics that add to potential hazardous waste concerns. The border is an arid region where water is a precious resource and any pollution of that resource would create serious problems (4). The border region also features a distinct industrial arrangement wherein maquiladoras (foreign-owned industries using imported raw materials) exist south of the border; the sole function of these facilities is to import raw materials mostly from the United States and return the finished products for sale in foreign markets. By law, all hazardous materials either imported or generated as by-products by these companies are to be returned to the United States for disposal. Regulations regarding the import and export of hazardous waste create an incentive for illegal disposal.

NAFTA

Although problems of environmental quality in general and toxicity in particular are not new in the U.S.–Mexico border region, preventive and remediative measures have been inadequate and uneven. However, the
negotiations leading to NAFTA and its passage in 1993 have heightened public awareness of the border and of the potential effects of large-scale economic development. One result of this attention and dialogue has been the adoption of a new cooperative, binational approach to alleviating environmental and public health problems.

This approach, formalized in the 1993 NAFTA environmental side accords, seeks to improve environmental infrastructure on the one hand and to assure environmental sustainability and community support on the other. The strategy relies on new investment to improve the region’s capacity to manage resources and improve the general quality of life, but it also provides for public input to the process and establishes environmental criteria for new projects.

This post-NAFTA process is still in the early developmental stages: its first tentative steps were taken during the summer of 1994. The binational framework within which this process will operate is innovative but experimental. The longest-standing modes of cooperation between the United States and Mexico have been water-related, principally governing the shared surface waters of the Rio Grande/Rio Bravo. In this regard, the century-old International Boundary and Water Commission (IBWC) is the region’s oldest and most durable binational institution. Its purview has included the entire 3000-km length of the border, and its primary concerns have been issues of water quality and sewage treatment.

Partly as a result of the mutual distrust between the two neighboring countries and partly as a reflection of societal indifference to environmental concerns, issues other than those governing surface water remained virtually unaddressed until the early 1980s. In 1983 the two nations’ presidents signed the La Paz Agreement, or Reagan-de la Madrid Accord, which for the first time addressed such matters as transboundary air and water pollution and hazardous materials. These issues, considered by joint national ad-hoc working groups, were discussed, and at least two major concerns (San Diego-Tijuana sewage and Arizona-Sonora “Gray Triangle” air pollution) were addressed during the late 1980s.

The post-NAFTA configuration relies on several new concepts and a number of new transnational institutions to implement these ideas. First, recognizing that sizable infusions of new capital are needed by communities on both sides of the border, the side accord to the free-trade agreement establishes a new regional lending institution, the North American Development Bank (NADBank). This bank, fueled by private investment capital, is to “finance public and private investment in environmental infrastructure projects” (5). NADBank’s decision-making, however, is tied to another new institution, the Border Environment Cooperation Commission (BECC), also created by the NAFTA side accord. According to its charter, BECC is to certify projects for NADBank funding. Additionally, the BECC is intended to provide a new voice to previously underrepresented and disadvantaged border communities by assisting them in developing and implementing environmental infrastructure projects (5). To accomplish this, BECC’s board includes two members (one from Mexico and one from the United States) representing the community at large.

Complementing NADBank and BECC at the trinational level, a third institution has been established: the trilateral (United States, Canada, Mexico) North American Commission on Environmental Cooperation (CEC). It too solicits public input and seeks to ensure that grassroots community concerns form a meaningful part of economic development resulting from NAFTA.

These organizations are nascent, and their agenda is just beginning to be implemented, so it is too early to gauge their effectiveness. Nevertheless, it has become clear to residents and public agency officials of the border region that the area’s environmental and health concerns need to gain greater attention and, not withstanding U.S. congressional politics, a larger share of resources. Insofar as free trade implies increased industrialization and therefore larger volumes of hazardous chemicals, and given that the new focus will lead to better data gathering and enhanced monitoring, it is safe to predict that problems of toxic pollutants are likely to become increasingly prominent.

Organizations Involved with Border Environmental Problems

The new approach to addressing environmental concerns in the border region has been adopted by the two countries precisely because they agree that existing mechanisms, organization, and financing arrangements have proven insufficient. Still, it would be incorrect to assume that NADBank, BECC, and CEC will operate in a social and institutional vacuum. They will, of course, function in a complex setting that includes numerous ministries, agencies, state and local governments, and nongovernmental organizations. In fact, by design, the NADBank and the commissions comprise these very elements within their memberships.

The existing organizations that retain jurisdiction over various aspects of environmental and health problems can be considered to function at three levels: international, national, and state.

International groups. In addition to the three new institutions discussed above, the IBWC, the Interagency Coordinating Committee for U.S.–Mexico Border Environmental Health, the Pan American Health Organization (PAHO), and the La Paz Agreement Technical Working Groups are the most important groups that function transnationally in the U.S.–Mexico border region. Recently, the United States passed a bill to establish the U.S.–Mexico Border Health Commission to address health concerns along the border.

PAHO maintains a regional office in El Paso, Texas, which has dealt with health issues of concern at the border. PAHO’s concerns have largely been communicable diseases and not environmental health issues, although environmental issues were addressed in their Project Consenso study. Thus, PAHO has added environmental health concerns to its agenda and should be a source of data in the future.

Environmental health issues stimulated the formation in 1992 of an Interagency Coordinating Committee for U.S.–Mexico Border Environmental Health. The lead agencies for the United States are CDC and EPA; involved agencies include NIEHS, the National Institute for Occupational Safety and Health (NIOSH), the Agency for Toxic Substances and Disease Registry (ATSDR), and the Food and Drug Administration (FDA). Federal agencies from Mexico include the Ministry of Health and the Ministry of National Resources, Environment, and Fisheries. The four border states on the U.S. side (Arizona, California, New Mexico, and Texas) are also represented along with the PAHO Border Office. This committee is developing a Border Action Program to address the most immediate environmental problems, and its activities involve data inventories, monitoring, technology transfer, training, and infrastructure. The disposition and public access mechanism to data accumulated is still being discussed.

A new organization called the United States–Mexico Border Health Commission was authorized in October 1994 by the U.S. Congress and now awaits a funding appropriation and an agreement with Mexico before it will be established. Its duties include: 1) conducting a comprehensive needs assessment in the border region to identify, evaluate, prevent, and resolve health problems; 2) implementing the actions recommended by the needs
assessment through assisting in the coordination and implementation of the efforts of public and private entities to prevent and resolve health problems and to educate such populations concerning health problems; and 3) formulating recommendations to the governments of the United States and Mexico concerning a fair method by which the government of one country could reimburse a public or private entity in the other country for the cost of health care service provided.

The law does not clarify how this commission will interact with the other international agencies described above or how any of the recommendations of the committee will be funded. If the two governments can work together in the development of this commission, it could serve as a beneficial group that could combine the efforts of several other groups.

**National agencies.** Environmental issues at the border reflect the spectrum of concerns including human health, ecology and biological diversity, and environmental quality and industrial activity. In the United States, several parent agencies are directly involved in research, regulation, and community action of environmental health concerns: CDC, NIOSH, ATSDR, and NIEHS. The U.S. EPA has responsibilities in environmental health, environmental quality, and ecology. Other federal agencies have specialized interests in this area, particularly with regard to potential data generation, are the Department of Interior and the U.S. Geological Survey, Bureau of Land Management (BLM), National Park Service, Bureau of Reclamation, U.S. Forest Service, and U.S. Department of Agriculture (USDA). In Mexico, the main ministry was SEDESOL up until December 1994. The new agency is Secretaría de Recursos Naturales, Medio Ambiente y Pesca (Ministry of Natural Resources, Environment, and Fisheries) and others involved are the Ministry of Health and the Ministry of Labor. The Ministry of Natural Resources, Environment, and Fisheries has representatives in each state of Mexico, but authority appears to be centralized in Mexico City.

**State agencies.** Each of the 10 states on the two sides of the border has separate offices of Health and Environmental Quality (generally called Ecology in Mexico). In the states on the U.S. side, there are offices specifically for border-related problems. In addition, these states generally have good communications with their cross-border counterparts. For example, Arizona and Sonora have an Arizona–Sonora Commission as a part of the governor's office that includes environmental concerns in its responsibilities, although its primary concern is economic development.

In addition, the Border Governors Association comprises all the border states in both countries. The governors meet regularly, and the association has appointees to a committee specifically responsible for environmental concerns.

Some border counties and cities have offices responsible for public health and environmental quality. These offices are often the first to become aware of environmental concerns. Generally, the cross-border cities have a long history of cooperative action in the identification and solution of common problems.

Finally, most of the region's universities in the U.S. and Mexico have outreach, education, and research programs concerning the environment. For example, The Udall Center for Studies in Public Policy at The University of Arizona has been particularly active in studying environmental problems along the U.S.–Mexico border.

**Environmental Health and Environmental Quality Data**

Reliable, thorough, and accurate information bases are essential to health researchers. Yet the border region does not have a central repository or even an inventory for data concerning environmental health or environmental quality. Of greater concern is the fact that virtually none of the existing studies has been published in peer-reviewed publications. The Interagency Coordinating Committee for U.S.–Mexico Border Environmental Health is compiling information on data sources for its evaluation of the border environmental problems and plans to make this information available in a user-friendly mode; but nevertheless, nothing currently exists.

The status of environmental health data is of particular concern. There have been reports of abnormally high incidences of neural tube defects including anencephaly in the lower Rio Grande Valley, of cancer (particularly multiple myeloma) and lupus in a neighborhood in Nogales, Arizona, and adverse pregnancy outcomes among workers in maquiladoras (4). However, these reports are not the result of rigorous epidemiological studies and have not been published except as reports or by the news media. Studies have been funded to examine the populations in the lower Rio Grande and in Nogales, Arizona, but the complete results from those studies will not be available for some time. These investigations may find it particularly difficult to link illness with hazardous chemicals because of a lack of baseline data and the presence of other factors such as lack of adequate nutrition, initial access to health care, and existence of infectious diseases. A major problem exists with regard to disease registries and health data in Mexico because their health statistics do not distinguish the border states from the rest of Mexico (6).

The status of environmental quality data is better; there is monitoring of air quality on both sides of the border and monitoring of water quality in the United States. Many of these efforts have been established recently or are in the process of being established, and results should be available in the timeframe of months to a few years. Air quality data are being collected on air toxics as well as criteria pollutants in El Paso/Ciudad Juárez and Brownsville, and they are available from the National Aerometric Information Retrieval System by contacting the Texas Natural Resources Conservation Commission (TNRCC) or EPA Region 6. A pilot environmental monitoring study of air quality in the Rio Grande Valley has recently been completed and is available. The TNRCC, the U.S. Geological Survey, the IBWC, and some local health departments routinely survey water quality in the Rio Grande. For example, TNRCC monitors at 39 main-stem sites and 14 major tributaries for toxic chemicals in water, sediment, and fish tissues. Data are available from TNRCC or EPA Region 6 databases. U.S. Geological Survey monitors at 6 main-stem sites and 5 tributaries and the data are available from STORET or USGS WATSTORE. The Rio Grande Toxic Substances Study conducted by agencies in the U.S. and Mexico to screen the Rio Grande for the prevalence, magnitude, and impacts of toxic chemical contamination was completed recently, and the data are available from TNRCC and the national EPA database. This represents a considerable amount of data from Texas and New Mexico alone, and the data reside in a variety of locations. The Consortium for International Earth Science Information Network (CIESN) is developing an inventory of the environmental databases that exist along the border, but nothing exists at this time to coordinate these data.

Findings to this point show nonattainment for PM10 (particulate matter <10 μm), carbon monoxide, and ozone in the El Paso/Ciudad Juárez area, but not much water contamination has been found. Based on the region's economy, one would expect environmental concerns to be primarily from pesticides and heavy metals.

The impact of emissions and disposal practices for hazardous materials from the
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maquiladoras has not been addressed in a systematic way by the Mexican government. Neither government appears to have data on hazardous waste disposal sites or on soil contamination by hazardous chemicals. In a border region that spans almost 3000 kilometers, there is ample opportunity for illegal dumping activity with small chance of detection.

Environmental Problems

Significant barriers must be overcome to address the environmental health and quality problems. The major concerns expressed at the workshop were with the amount, format, and availability of information, particularly health data. There is a need for baseline information that is identified by a geographical coding system so that smaller areas can be studied according to their exposure levels. Mexico needs to include the border region in its health statistics database and to gather that health data in a standardized format to build on existing vital statistics (birth and death). The location and accessibility of health data is of concern; there is a pressing need to disseminate information about where to get information, and this must be done on a binational basis.

Specific Data Gaps

There are specific data gaps in the environmental quality information that are not being addressed. Current environmental quality monitoring focuses on air quality and surface water quality near the largest urban centers, but hazardous waste in other parts of the environment is not being addressed. Specifically, environmental levels of pesticides and potential human exposure routes are not being targeted despite the likelihood that pesticides are a significant problem. Also, the area has a large number of colonias (unplanned communities without zoning regulations that do not have municipal water and sewer delivery). Their source of water is from private wells and their water levels of hazardous wastes should be examined. Most of the monitoring activity is in Texas and New Mexico, and monitoring of surface water in the western United States and Mexico border states should be as extensive as that done for the Rio Grande environmental assessment studies.

Data gaps in environmental health information are a greater problem because baseline health information that is necessary to identify chemically induced disease does not exist (6). Basic health data should be expanded to include additional data that would better control for confounding factors and improve the geographic coding of data so that smaller areas can be studied according to their exposure levels.

Community Participation

The NADBank, the vehicle for funding environmental infrastructure projects, has been designed to include two checks on its ability to finance: first, it will need to assure that its sponsored efforts protect the border region's fragile, semi-arid environment. Second, the NADBank will have to demonstrate that its decision-making is responsive to community input. While both of these features are innovative ways to approach international lending, the second characteristic, promoting democratic policy making, is especially unique to the North American continent. This heretofore untried mode of resource allocation is certain to challenge traditional thinking, especially traditional fiscal thinking. As NADBank begins to try to finance BECC-certified projects, it will be interesting to see how community preferences and concerns will be assessed and implemented.

Border communities, long ignored by distant policy makers and administrators, have become accustomed to what they perceive as environmental neglect and associated health problems. The largely Latino populations in these areas increasingly have begun to view their situation as a manifestation of environmental racism, a term that describes the effects of benign or deliberate neglect of communities and the consequences for public health (7). This perception commonly adds to fears that unexplained disease clusters result from degradation of the environment that residents have linked to industrialization. Among the most important promises of the post-NAFTA order is that government agencies in the United States and Mexico will become more sensitized to such community apprehensions and accordingly more willing to include the citizenry in project design and implementation.

Research Needs

By identifying the data gaps in the study of hazardous wastes along the border, certain research needs became apparent. First, reliable biological markers from chemically induced effects must be selected and specified because of the lack of reliable baseline epidemiological data, particularly in Mexico. To identify environmental health problems in the border region, the baseline incidence of disease must be determined. Health registries have been recently established in the U.S. border states, but there are no plans to establish such registries in Mexican border states. The development of biological monitors for chemical exposure and for chemically induced disease would be particularly useful in identifying hazardous waste problems in the border region. Furthermore, monitors of exposure to pesticides and to metal ions would also be beneficial at this time, although the use of all industrial solvents is expected to increase as the area develops.

Second, the influence of nutrition and underlying disease on chemical toxicity should be investigated. In the United States, the border region is populated by a substantially lower socioeconomic class than in the rest of the country, a characteristic that is often linked to higher incidence of nutritional deficiencies and more frequent exposure to infectious diseases. This population is at particular risk from exposure to hazardous waste. This combination of risk factors has not been adequately addressed in research studies.

Third, the incidence of lupus needs further investigation and, in particular, the role of chemicals in the development of that disease state. An excessive incidence of lupus has been identified in a border environmental health study, but its etiology remains unclear. Research to develop models of this disease as well as epidemiology studies would be valuable.

Finally, research in environmental data analysis is needed to obtain maximal benefit from the data being generated at the border. Several state and federal agencies have established programs to analyze chemicals in air, water, and soil. Such data have begun to come online, but there has been no comprehensive plan to analyze that data for trends, source of hazardous waste, profiles of chemical waste, etc. This dilemma may partially reflect the multiple sources of these data but also may be due to a lack of techniques to analyze these data effectively.

In summary, it is apparent that more well-targeted research is needed that evaluates the health impact of various wastes and waste treatment processes, improving the database and extrapolation methodologies upon which risk assessments are founded. The ultimate goal of such health investigations is to generate accurate and effective information that helps determine what type of intervention or prevention actions are necessary, if any.

Conclusions

The major problem to be addressed in a binational setting is determining the extent and origin of hazardous chemicals that cross or threaten to cross the U.S.–Mexico border. There is a general concern that the border region is seriously contaminated with hazardous waste chemicals and that there will be a substantial cost to clean it
up. An estimated cost of $1 billion dollars was mentioned in an article by Vandermeer (8). Further, there is concern that there is a general lack of data from the region. Several agencies currently are addressing the lack of environmental quality data, but the collection of environmental health data will be substantially slower. It is likely that there will be a large amount of data available soon that may defy analysis because it will be spread over so many sources. The problem may be evaluating all the data sources for completeness and reliability and assessing the true data gaps because of the sheer volume of information.

This conference has made recommendations, but it is unclear to whom they should be presented because of the uniqueness of the national border area. It is clear that there is heightened awareness of the problems at the border and that resources will be made available to address them. The procedures used and the people who will be involved in the decisions will be most important in defining how this binational relationship will actually work and in what will actually be accomplished. In a sense, this effort will serve as a laboratory for binational relationships that involve science, health, and policy.

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