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Environmental injustice: case studies from the South

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Abstract
We selected three case studies to illustrate environmental injustice issues in the South. These examples relate to migrant agricultural workers, the *maquiladora* industry and artisanal mining, while reviewing some of the major mechanisms involved, e.g. multinational corporations, the development of free trade zones, multilateral free trade agreements and the export of hazards.

A series of strategies are discussed in order to address environmental injustice and health disparities that exist on a global scale. Some of the recommendations involve policy initiatives; others, such as research and mentorship, fall within the traditional domain of public health practice. In this paper, special attention is given to concerned environmental and occupational health professionals using evidence-based data for *advocacy*. For lasting changes to be made, however, stronger institutions and legislation are required. Those who have the '*right to know*' about environmental injustice issues include communities of concern, workers' representatives and lawyers. Government officials and company officials may eventually work on the basis of conflict resolution, compensation and remediation, to quote some examples. Systematic approaches to protect both the environment and public health must be updated.

Keywords: environmental justice, health disparities, human rights, policy, Latin America

1. Introduction

Healthy ecosystems and safe workplaces are not equally distributed across populations. These disparities, in turn, are systematically linked to economic forces, weak institutions and different levels of underlying advantages or position in a social hierarchy (Braveman *et al* 2004, Lee 2005). In both wealthy and poor countries, particularly vulnerable populations live, play and work in patterns that distinguish them from the better-off groups. Indeed, there is increasing recognition that members of indigenous, ethnic and racial groups sustain disproportionate health risks from biological, chemical, physical and psychological exposures. Even in the wealthiest countries, some populations work in relatively more dangerous activities than others.

The concept of environmental justice—or distributive and procedural justice with respect to environmental goods—has a long history, rooted in the teachings of major religions and the practices of ancient societies (Clay 1999, Riechmann 2003, Lloyd and Bell 2003, Cairncross and Nicol 2005). Today, environmental injustice concerns have focused on indigenous peoples, migrant workers (euphemistically called 'minorities'), gender- and child-specific issues. Not seldom, entire communities composed of marginal and poorer populations constitute the favored destinations for waste or hazardous industries.

In many respects, environmental justice issues may be recognized as a subset of human rights. The UN Draft Principles on Human Rights and the Environment began with these three statements:

(1) Human rights, an ecologically sound environment, sustainable development and peace are interdependent and indivisible.
(2) All persons have the right to a secure, healthy and ecologically sound environment. This right and other

human rights, including civil, cultural, economic, political and social rights, are universal, interdependent and indivisible.

(3) All persons shall be free from any form of discrimination in regard to actions and decisions that affect the environment (DDHRE, UN 1994).

One or more of several mechanisms may contribute to the increased risk that underlies environmental justice concerns: inadequate implementation of environmental health policies, excessive exposures, inadequate technical resources, poverty, and decreased social support. Most significantly, developing countries have weaker legal and technical resources, so hazardous exposures tend to be less controlled and therefore more intense (Loewenson 1999, Ngai 2005, Banerjee 1995, Fassa *et al* 2000, Scanlon *et al* 2002, Gharaibeh and Hoeman 2003, Loewenson 1998, Kahn 1976, Wilk 1986). Affected populations may suffer poor baseline health due to nutritional deficiencies, infectious diseases, limited access to immunization and other health care services, and other factors, as reflected in high infant mortality rates, low life expectancy, and other health indicators (WHO 2005, Marmot and Wilkinson 1999, Leon and Walt 2001). These mechanisms may operate inside the so-called built environment, i.e. dwellings, the neighborhood, and the workplace, frequently in combination.

Economic liberalization with rapid expansion of the manufacturing and service sectors (in at least some countries), and depletion of key resources, all play a role in defining the environmental injustice and conditions that affect health (Spiegel *et al* 2004).

Increasingly, these mechanisms are taking place within wider processes: the growth of multinational companies (MNCs), the development of free trade zones (FTZ), and the promulgation of multilateral free trade agreements (FTA). Examples of these processes will be briefly described.

Multinational companies (MNCs) have increased in size, wealth, and international reach over recent decades. Half of the 100 largest economies around the globe are not countries, but rather MNCs. The 500 largest MNCs now account for 70% of world trade, 30% of all manufacturing exports, and 80% of technical and management services (Brown 2005). Many MNCs may have the resources and expertise to implement environmental and occupational safety and health practices in their facilities worldwide (Harrison 2004). MNCs, however, have taken advantage of lax regulations in less developed nations to avoid standards of practice that usually prevail in rich countries. There is typically a set of domestic subcontracted firms associated with MNCs, supplying components and packaging, and these firms may not implement optimal environmental and workplace practices. Examples include assembly plants in northern Mexico and mining operations in Ecuador (San Sebastián and Hurtig 2004, Moure-Eraso *et al* 1997).

The *North American Free Trade Agreement* (NAFTA) was ratified by the United States, Mexico, and Canada in 1992, and entered into force in 1994, for implementation over the next decade. NAFTA was designed to abolish most trade restrictions among these countries, formally addressing labor rights and environmental protection through its 'side agreements' (NAFTA 1994). Accordingly, these 'side agreements' focus on dispute resolution, some information exchange, and promoting each country's compliance with its own labor and environmental laws, rather than on joint research, training, standard-setting, technology development, and related initiatives. In actual terms, however, there was limited interest in incorporating social and environmental issues into the process. Labor unions and their allies vigorously opposed NAFTA and campaigned more to block the treaty altogether than for specific labor-friendly provisions. Some environmental groups, in contrast, participated in negotiations, perhaps accounting for the relatively greater emphasis on environmental practices. Moreover, all three governments were reluctant to relinquish any sovereignty over their respective labor and environmental laws.

Neither the main trade agreement nor the 'side agreements' express a shared commitment to upgrading or harmonizing environmental and occupational health laws or practices.

Given these limitations, these marginal agreements simply left a large list of environmental and occupational health in North America practically neglected (García and Simpson 2004, Hufbauer and Esty 2000, CEC 2000, 2002, 2003, Mayrand and Paquin 2003, Vaughan 2004). Assessing the impact of NAFTA is complex, since environmental and occupational health reflects many other forces—economic, technological, and political—in addition to NAFTA itself (Commission for Labor Cooperation 2003). In some sectors, there is evidence of deepening environmental injustice issues. For example, along the US–Mexico border, the volume of freight transport has increased air pollution, while migration and rapid growth has aggravated water pollution and bi-national conflicts regarding water. In other sectors, such as fisheries, evidence suggests little impact of NAFTA. There is little evidence that economic growth following the adoption of NAFTA has led to major investments in environmental services or infrastructure, or major improvements in environmental indicators.

On the labor side, the effect of NAFTA on workplace safety and health is highly dependent on economic driving forces and concerned institutions. Few data are available that would permit tracking workplace conditions and health outcomes, and associating any observed trends with NAFTA is always a complex task. Several cases have been brought under the NAFTA grievance procedure, alleging serious health and safety hazards in Mexican facilities and the failure of asymmetrical governments to enforce applicable laws. Even when these cases are found in favor of the complainants, advocates maintain that the solutions are ineffective, amounting only to calls for consultation (Brown 2004).

Free trade zones and maquiladoras. A growing list of governments have established special zones to promote global economic activity, typically located near seaports, airports, and/or national borders (Burns 1995). From their origin in the early 1970s to the 1990s, about 200 free trade zones (FTZ) had been established with an employment of approximately 4

million people. FTZ may offer any or all of several benefits to MNCs' manufacturing and trading firms, including tax relief, low or absent customs duties, reduced export controls, as well as easy access to land, water, energy, and infrastructure subsidies, a plentiful and tightly controlled labor force supply, with low wages and weak institutions characterized by limited enforcement of labor and environmental laws (Brown 2005, Smith and Mehta 2003). The economic activity in FTZ is typically labor-intensive, centering on manufacturing, although service work is also increasingly common. The workforces are often predominantly female. Workers may face physical hazards such as repetitive motions, awkward work positions, and noise, with risks of musculoskeletal disorders and hearing loss, chemical exposures, and stresses such as highly regimented work routines and dangerously high production quotas.

Maquiladoras are assembly plants south of the northern Mexican border, and in China, India, and Brazil, which typically import components from the US and other countries, complete assembly and other value-added processes, and re-export the products. The maquiladoras produce a wide variety of products, including electrical and electronic equipment, automobile parts, toys, clothing, and others (see case studies below). Health and environmental studies in maquiladoras are scarce, but do suggest a high burden of musculoskeletal disorders, stress, and other health burdens.

1.1. The export of hazards and the race to the bottom

In the 1980s, considerable attention was devoted to the 'export of hazard' (e.g. Ives 1985, International Labor Rights Education and Research Fund 1988, Jeyaratnam 1990, Hecker and Hallock 1991). Concern grew out of observations of double standards (Brown 2004, Burns 1995); critics anticipated that industries from developed nations would relocate plants in developing nations due to lower labor costs, lax regulatory environments, and in some cases proximity to raw materials and/or markets (Van Liemt 1992). In doing so, they would fail to follow the same workplace and environmental safeguards that were required in their countries of origin, and expose people in developing nations to relatively greater risks. Increasingly, international trade represents global hazards. And firms in developed nations, facing growing international competitors and seeking the lowest possible costs, would play one location against another. Standards of practice would descend in developed nations toward those of developing nations, exactly as predicted by the factor price equalization theorem that is central to the economics of free trade. This 'race to the bottom' would threaten environmental and occupational health in developing nations from the South.

2. Case studies from the South

Three case studies were drawn from a limited number of reports, related to agriculture, the *maquiladora* industry, and artisanal mining. The first case study focuses on migrant agricultural workers in the Valle de San Quintín, in the Mexican state of Baja California. Workers are housed in crowded conditions in substandard structures, often without access to potable water, sewage, and other environmental and health services. The second case study refers to workers in the maquiladora industry along Mexico's northern border. As described in the text, environmental challenges in this region, on both sides of the Mexico–US border, are barely documented. Within the maquiladora plants, workers face numerous hazards as well. The third case study describes small-scale mining in Ecuador. Artisanal mining is an activity steeped in poverty prevailing in geographically isolated communities, with little or no governmental regulation. Mine shafts often originate inside or next to workers' homes. Entire families may be involved in artisanal mining; children who do not work with their families may be hired directly by mine owners. Children may start by doing *jancheo* work (gathering mineral rocks from stockpiles and dumps), either on their own or together with their mothers, as a way of contributing to the family income. Together these case studies illustrate the diversity of affected populations and economic sectors, common features such as the social disadvantages and resulting vulnerability these populations suffer, and the diversity of responses they and their advocates have encountered.

3. San Quintín farmworkers, Mexico

The Valley of San Quintín, located south of the municipality of Ensenada (Baja California Norte), is known for its production of cash crops (fruits and vegetables), for export. This production depends on the labor of migrant workers, many of whom arrive as part of a seasonal cycle that brings workers from Mexico's west coast, especially from the Mixtec area of the Valley of Oaxaca (Montaño 2001, Nolasco 1997). Every year, from March to July, thousands of workers arrive at farms that belong to fewer than 40 families. Workers are paid the equivalent of only five to seven dollars a day, and do not receive even the minimal benefits required under the law. Most workers are unaware of legal rights such as social security and disability, and even if they do learn about them, they often cannot or do not access them.

The migrant workers' assignments differ according to gender and age. Mature men perform the heaviest field activities, including fumigating, irrigating, and working as *camperos* and drivers. Women and children pick the fruits and vegetables. Mestizo women from the state of Sinaloa are generally hired for the packing process (Cornejo 2000).

Additional vulnerability results from relative geographic isolation, the lack of planning policies, an annual population growth rate of 11.9%, the growing use of modern technology in agricultural activities, the introduction of other economic activities (for the most part aquaculture and tourism in the lakeside district), problems of land ownership, and the depletion of aquifers. These have resulted in rapid, unplanned growth of human settlements and deficient infrastructure for basic services such as drinking water and sewage treatment systems.

Living conditions and services are extremely poor. Of the field workers, 66.7% of workers live in camp barracks and 33.3% live in informal communities known as *colonias*. Over

80% of housing is constructed from improvised, nondurable materials, there are few piped water sources for many homes, almost no sewage service, and only limited electrical service. Available piped water often fails to meet standards of human consumption, and is contaminated with fecal bacteria and agricultural chemicals such as ammonia and phosphorus (Nolasco 1997).

Further environmental pressures arise from production practices. Pesticide use is common, leading to ecosystem contamination. Water with high concentrations of salt is used to irrigate crops, causing deterioration of the land, while treated and untreated waste water often mix and recirculate in the fields. Plastic sheeting is used to protect the growing fruit and vegetables, but it fragments and is often improperly disposed of. The plastic waste interferes with the movement of moisture and nutrients in surface soil and with the recharge of the aquifers. Other contributing factors are the domestic combustion of gas and biomass with resulting emissions of particles, carbon monoxide (CO), and volatile organic compounds, the emissions of dioxins, furans, mercury, and other pollutants from the burning of refuse, lack of waste disposal services and appropriate sites for the disposal of garbage.

Prevalent health problems among the farmworkers include acute respiratory infections, acute and chronic diarrhea, and tuberculosis. The incidence of pesticide toxicity is unknown, and possible long-term sequelae such as cancer have not been well characterized in this population.

Several actions have resulted from these problems. Members of the migrant population, led by women and with the support of organizations of residents from the colonies, have sought improved services including water, electricity, transportation, medical care, and education (Velasco 2002). In the 1990s, day nurseries, primary schools and chapels were set up in some of the camps. Local non-governmental organizations also successfully requested establishment of a rural Clinic-Hospital by Mexico's Instituto Mexicano del Seguro Social (IMSS), located in Delegación Vicente Guerrero. More recently, local groups, the Mexican federal government, and the home states of the migrants collaborated in a 'Vete Sano Regresa Sano' (Leave Healthy, Return Healthy) public health initiative, in order to provide health protection for the migrants (www.bajacalifornia.gob.mx/informe/1er_informe/part_social.htm).

4. Maquiladora workers on Mexico's northern border

With the end of the temporary worker program initiative, in 1964, large numbers of Mexican workers were deported from the United States. The population along Mexico's northern border swelled, and social problems such as unemployment rose (Comas 2002). Partially in response to this problem, the Mexican government established its Border Industrialization Program in 1965, to encourage foreign (usually US) companies to site assembly plants south of the border. Key to the program is a provision that allows firms to import components and raw materials without paying customs duties and to export finished products paying customs only on the value added—the labor—in Mexico.

The assembly plants, known as *maquiladoras*, grew slowly at first. In the 1980s, Mexico joined GATT and liberalized its trade restrictions, and the peso was repeatedly devalued, lowering the cost of Mexican labor. By 2000, when maquiladora employment peaked, over 3000 maquiladora employed approximately 1.3 million workers, accounting for nearly 10% of Mexico's formal sector employment and 40% of Mexico's exports (INEGI 2005).

Maquiladora employment declined during 2001–2003 due to a downturn in the US economy and competition from other low-wage countries (particularly China and India), but some rebound occurred starting in 2003. The concentration of economic activity along the border has made this region a magnet for Mexicans seeking employment. While three out of four maquiladoras are located in Mexico's border states (Tamaulipas, Coahuila, Chihuahua, Sonora, Baja California and Nuevo León), one in four is now located farther south, in such booming cities as Monterrey (INEGI 2005, Comité Fronterizo de Obreros 2005). In the years after 2000, at least 170 maquiladoras closed their operations in Mexico to move to Asian countries. This migration, representing a loss of over 200 000 jobs, was widely noted in Mexico, as the maquiladoras had emerged as a major factor in the national economy (Kourous 1998).

The maquiladoras produce a wide variety of products, including electrical and electronic equipment, automobile parts, toys, clothing, and others (Frumkin *et al* 1995). Labor-intensive assembly processes pose physical hazards such as repetitive motion, awkward work positions, and noise, with risks of musculoskeletal disorders and hearing loss. Chemicals such as solvents, acids, and metals are used in cleaning metal parts, fabricating electronic components, and such operations as painting and gluing, affecting not only workers but the ambient environment as well. While epidemiologic surveillance data are unavailable, surveys of *maquiladora* facilities and communities have suggested that a wide range of occupational hazards are common (USGAO 1993, Takaro *et al* 1999). Health problems reported include injuries, non-specific symptoms such as headache, insomnia, and dizziness, neurological symptoms, adverse reproductive outcomes, and urinary tract disorders (Harlow *et al* 1999, Kourous 1998, Guendelman and Jasis 1993, Jasis and Guendelman 1993, Guendelman *et al* 1998, 1999, Meservy *et al* 1997, Moure-Eraso *et al* 1997, Comité Fronterizo de Obreros 2005). Work practices such as inadequate breaks increase potential hazards, and with the workforce consisting predominantly of women, the presence of reproductive hazards is a special concern.

Other features of the US–Mexico border aggravate the effects of these exposures. Many of the workers are migrants from elsewhere in Mexico, who arrive without financial resources, education, job skills, or experience. Housing and health services are inadequate, general environmental health risks such as water contamination are prevalent (Warner 1991, Derechos Humanos en Mexico 2000), and there is little job security due to the constant influx of new arrivals in search of work. Hence, while stress levels are high

among *maquiladora* employees, they are also high among other workers in the same locations (Guendelman and Jasis 1993), suggesting that general features of the economic and social environment affect people both in and out of the foreign facilities. Environmental enforcement has never been rigorous in the region, and given the impulse to retain plants in the face of global competition, emissions control, waste management, and other environmental practices are often suboptimal. This combination of forces has made progress in environmental and occupational health extremely difficult to achieve.

Gender issues in the maquiladora industry deserve special mention. Much of the workforce consists of young women. While this represents new-found economic opportunity and independence for many women, it also offers opportunities for exploitation. There is evidence of wage discrimination, assignment to the most tedious tasks, and poorer labor protection and social security, especially in situations where women need flexibility in work hours because of responsibilities at home (United Nations 2000). There is also evidence of gender disparities in access to the most desirable jobs. While men hold 74% of technical positions and 64% of administrative positions, women account for fewer than 50% of production line jobs (Comité Fronterizo de Obreros 2005).

5. Children artisanal miners in Nambija, Ecuador

As many as 13 million people are estimated to work at artisanal mining worldwide, accounting for the bulk of production of minerals such as emeralds and tungsten, and for as much as a quarter of world gold production (ILO 1999, IIED 2002).

Nambija, meaning 'the place no-one can find', is a remote gold-mining settlement of about 2000 people in the mountains of southern Ecuador, near the Peruvian border. The population is predominantly of indigenous Saraguro and mestizo background, many of whom migrated to Nambija in order to work as gold miners. The settlement consists of hundreds of dilapidated wooden dwellings, high on a mountain that has been extensively damaged by years of mining operations (Counter *et al* 2005).

Mining is embedded in the social fabric of Nambija. Entire families, including the children, work at gold mining. Homes are often built directly over the openings of small mine tunnels. This landscape is common in Latin America and elsewhere in poorest areas of the world (IIED 2002). While artisanal mines may operate productively with techniques that protect health and the environment, more typically they are characterized by low technology, low productivity, unstable employment, high workforce turnover, low pay, and poor sanitation and occupational health protection for workers. Mining families often have no legal claim to the land they work. For the rural poor, artisanal mining is an alternative to unemployment and misery. It can be a force for local economic development. However, the health, environmental, and social costs of artisanal mining are high, as exemplified in Nambija. Workers extract gold from ore using liquid mercury, which forms an amalgam with gold that can be separated from ground ore. The mercury is then boiled off, leaving a residue of gold. Mercury toxicity has been well documented in the adults and children of Nambija (Counter *et al* 2005, 2002, 1998).

Children become miners in different ways. Some may be hired directly by mine owners and some may begin informally with *jancheo* (the act of gathering mineralized rocks from stockpiles and dumps), either on their own or together with their mothers as a way of contributing to family income. As children grow older, they become fully integrated into the mining workforce, graduating from *jancheo* to the entire spectrum of dangerous activities.

Hazards other than mercury threaten the health and safety of artisanal miners in Nambija. In addition, toxic chemicals such as cyanide and acids are used. Injuries are common as a result of misuse of explosives, and the use of grinding machinery and hand tools. Inhalation of silica dust poses a risk of a wide range of respiratory diseases. Explosions and noisy machinery can damage hearing, and tasks such as hauling large loads and repetitive motions can cause musculoskeletal injuries. Women and children are especially susceptible to the effects of some chemicals, and may also be subject to abuse such as threats and physical and psychological assault from adult miners. Social problems such as alcoholism, violence, and prostitution are persistent in this setting (IIED 2002, Mosquera *et al* 2005, Bonfim 2004).

Environmental impacts are also extensive (McMahon 1999, Tarras-Wahlberg *et al* 2000, Veiga 1997, Douglas and Forster 1993, Mol and Ouboter 2004, Peterson and Heemskerk 2001). In streams and rivers downstream of the mining area, mercury is converted to organic forms and bioaccumulates in fish. Land degradation, deforestation, and siltation of waterways are common as the result of unsustainable excavation practices. On the local scale, while most homes have an electrical service, well under half receive piped drinking water, and of these, many receive unprocessed water directly from the source. Fewer than one in five homes have sanitary services (Harari *et al* 1997, Centro Desarollo y Autogestión 2002, Hinton *et al* 2003).

6. Discussion

Environmental injustice is a widespread issue in the South, revealing extremely poor workplace conditions, and raising profound questions of social justice and human rights. In every example concerning migrant agricultural workers, the maquiladora industry sector, and artisanal mining, weak implementation of health protection, legal and insufficient technical resources, and decreased social supports are all among the contributing mechanisms resulting in excess risk, underlying environmental justice concerns. As illustrated in this paper, these mechanisms are increasingly reflecting the growth of MNCs, the development of FTZ, and the promulgation of multilateral FTA.

There are a limited number of published papers contributing to create the necessary links between environmental health professionals, justice specialists and potential research users (e.g. affected communities and institutions). Although similar issues have been described in Africa, Asia (Banerjee 1995, Cairncross and Nicol 2005), and Eastern Europe (UNEP 1972),

our work is expected to build upon the experience informing local struggles for environmental justice at a global level.

Indeed, there is a growing recognition of the ethical and practical dimensions of environmental injustice, and even more important, of the need to address these issues (e.g. Lloyd-Smith and Bell 2003, Mamo *et al* 2005). Scientists and citizens are expanding the scope of human rights into global environmental justice principles. A growing consensus underlines that health protection measures should apply equally to all communities and individuals, regardless of their race, ethnicity, gender, or geographical location. In recent years this focus has become a central core of recommendations and strategies in environmental and occupational health—a trend that has the potential to transform the environmental justice movement, as outlined below (Shabecoff 1993).

Environmental and occupational health professionals, as well as lawyers from developing nations from the South, need to engage in *advocacy*. These activities include training, technical assistance, and collaborative research, integrating evidence-based data into action (i.e. governance and policy-making processes). Environmental and occupational health professionals can contribute as advisors and advocates; there is plenty of room for professionals concerned with migrant workers, artisanal mining, and export of hazardous waste issues, to quote some few. Other activities (e.g. surveillance) often fall within the traditional domain of public health practice. Data my well be used as evidence and taken to court.

Policy initiatives include those that are official and legally binding, such as regulatory standards promulgated by governments, and those that are voluntary. Such standards, however, are only as effective as their enforcement mechanisms, and enforcement often lags well behind promulgation. Again, environmental and occupational health professionals can contribute as advisors and advocate, to make cases of neglect or corporate corruption—for instance, compliance with relevant international norms, such as the Conventions of the International Labor Office (ILO 2000), or the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (UNEP 1989). Motivated students are often an ignored but valuable resource when cases of neglect or corporate responsibility are brought into the court. Sometimes, non-governmental organizations (NGOs) may issue standards that include environmental performance and safe working conditions, and have organized consumer campaigns to promote compliance with these standards through market pressure.

6.1. Initiatives by public health professionals

Training is an essential activity for occupational health professionals, given the shortages of expertise in industrial hygiene, environmental and safety engineering, occupational and environmental medicine and nursing, and related fields. Approaches to training include formal academic studies in institutions from Brazil (University of Fio Cruz) and Mexico (National Institute of Public Health), short courses, and distance learning through newsletters and electronic means. Once more, there is plenty of room for professionals concerned with migrant workers, artisanal mining and export of hazardous waste issues. Training may include environmental data and public health policy research, and foster a stronger cadre of professionals handling legal cases taken to the court. Students must be taught to perform some of these functions.

Technical assistance is another important area of effort for public health professionals. Joint investigations and international collaboration, consultancies on environmental and occupational health problems, and direct technology transfer can all advance the protection of workers in developing countries. Technical assistance may occur through professional associations, through non-governmental organizations, through multilateral organizations such as the International Labor Organization, and/or through government efforts. One example is the work of the Maquiladora Health and Safety Network (www.mhssn.org), which assists labor organizations and employers in the Mexico–US border and in Asia to recognize and remediate workplace hazards. Despite these challenges, there remain important research needs in developing nations (Partanen *et al* 1999, Loewenson 2004, Rantanen *et al* 2004, Nuwayhid 2004, Rosenstock *et al* 2005). Just as important, however, is the traditional public health research function of *documentation*. Many workplace and environmental hazards are well understood, and their effects easily predicted. However, it may require in-country data demonstrating that a hazard is taking a toll on local workers and communities to stimulate governments to take action to control the hazard.

In summary, we recommend: first, to conduct more applied research on critical environmental injustice and health risk issues in the South, and to translate and integrate new knowledge into tools for advocacy and conflict resolution. Second, to develop and test novel problem-based learning methods, and implement mentorship programs addressing environmental and occupational health protection policies, and third, to strengthen existing/emerging networks (regional, national and global) to address ethical principles, health equity, and environmental justice issues. For lasting changes to be made, however, practical experience, data, and moral conviction must be laid before 'those who have the right to know', including worker representatives, government officials, and company officials. Systematic approaches to protecting public health must be implemented.

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