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Environmental Regulation and the Border

TRANSBORDER COOPERATION IN THE SONORAN DESERT

Ambos Nogales consists of the twin cities of Nogales, Ariz., and Nogales, Sonora. Located in the heart of the Sonoran Desert, the cities are surrounded by stark desert terrain with mountain ranges floating like islands in the distance. The border is omnipresent in Nogales, Ariz., and plays an important part in the economy. Nogales is a high-volume port-of-entry—it is the most important entry point for Mexican produce into the United States. Indeed, one cannot help but be impressed when driving into Mexico by the sometimes several miles-long lines of 18-wheelers traveling the opposite direction, waiting to pass through U.S. Customs.

Residents of the region share many cultural and business links, but they also share air pollution. Nogales, Ariz., has been deemed a nonattainment area for coarse particulate matter less than 10 microns in diameter (PM_{10}) by the U.S. Environmental Protection Agency (EPA). While Mexico does not have the equivalent of U.S.-enforced nonattainment areas, examination of records show that ambient air quality in Nogales, Sonora, does not meet Mexican total PM standards.¹ The existence of a common airshed means that neither U.S. nor Mexican officials can easily solve air quality problems unilaterally. A reduction in transborder pollution in Ambos Nogales can be achieved if regulators coordinate their efforts. To this end,

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the Ambos Nogales Binational Air Quality Study was undertaken. The project represented an unprecedented level of cooperation between local, state, and federal officials (ADEQ 1999) and involved the comprehensive gathering of information on air quality in an 8-mile by 12-mile rectangle divided approximately in half between the United States and Mexico. Data were gathered on air quality, metrological monitoring was undertaken, and an environmental inventory was compiled.

The Ambos Nogales study found that air quality is essentially identical on both sides of the border, so the health risk faced by both U.S. and Mexican border residents is similar. Using data generated from the project as inputs, simulations were conducted showing that an average person would face a PM₁₀ exposure of 30 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) in Nogales, Ariz., and 31 $\mu\text{g}/\text{m}^3$ in Nogales, Sonora. The excess exposure to PM will, on average and on both sides of the border, cause 2% more hospitalizations, 8% more asthma episodes, 8% more lower-respiratory illnesses, 3% more coughs, and 47 more premature deaths from cardiovascular or respiratory diseases. The project identified unpaved roads as the major source of PM in the region. Auto and truck emissions associated with the border crossing area and industrial sources were also deemed significant. The data support the conclusion that Ambos Nogales is a single airshed and that improving air quality for residents requires binational action.

These particular twin cities provide an example of how cooperation can significantly improve air quality. Attempts to improve air quality on one side of the border without emission controls on the other side are likely to fail by nature of the interconnectedness of the environment. Cooperation can take many forms and a variety of approaches could be used—just three possibilities include road paving projects, improved management of traffic at the port-of-entry (Figure 1), and direct subsidies of enforcement efforts. Could emissions reduction trading be used to coordinate a PM control program? The answer is yes, at least when dealing with industrial sources. Indeed, a functioning PM market operates in Santiago, Chile. In the case of Nogales, PM sources could be allowed to purchase offsets without regard to the side of the border on which the offsets are generated.

Figure 1. A Small Sample of Traffic Headed Northward from Tijuana Toward the United States



Source: SCERP

As Ambos Nogales illustrates, cooperation is often a key ingredient in the formula for improving border air quality. Congruent U.S. and Mexican institutions and shared goals are important prerequisites for cooperation, so understanding these institutions and goals is important in promoting cooperation. This chapter compares the legal and regulatory environmental institutions of the United States and Mexico. The chapter demonstrates that the air quality standards of the two countries, while not identical, are similar. This is important because cooperation is easier when goals are shared. This chapter also discusses the U.S. and Mexican border institutions within which cooperation will likely take place. Finally, the chapter addresses the environmental status of the border and details the most significant problems faced by policymakers. The basic conclusion, not surprising to anyone familiar with the issues of border air quality, is that the border is characterized by poor air quality, thus the scope for transborder cooperation is considerable.

U.S. AIR QUALITY REGULATION

U.S. institutions involved in regulating air quality are well developed. This facilitates the maintenance of air quality within the continental United States. The main law governing air quality in the United States is the Clean Air Act and Amendments (CAAA), origi-

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nally passed in 1970 and amended in 1977 and 1990. CAAA is among the most complex and ambitious laws ever passed by the federal government (Michaels 2002). The purpose here is not to describe CAAA in detail² but rather to focus on those aspects of the law most relevant to permit trading.

The primary goal of CAAA is to protect the public from the negative health effects from all pollution, including air pollution.³ To this end, EPA established National Ambient Air Quality Standards (NAAQS), which set the maximum atmospheric concentrations for a pollutant consistent with human health. Six criteria air pollutants are subject to NAAQS: ozone (O₃), nitrogen dioxide (NO₂), carbon monoxide (CO), particulate matter (PM₁₀ and PM_{2.5}), sulfur dioxide (SO₂), and lead (Pb). In addition to the six criteria pollutants, EPA tracks the two precursors for ozone, volatile organic compounds (VOC) and nitrogen oxides (NO_x). EPA also has established standards for dozens of other less-widely spread pollutants. These minor pollutants are collectively referred to as hazardous air pollutants (HAPs).

NAAQSs typically take the form of maximum atmospheric concentration averaged over a period of time. The standards for the six criteria pollutants are displayed in Table 1. For example, the standard for SO₂ is 0.145 parts per million (ppm). This is averaged over eight hours. If the eight-hour average exceeds 0.145 ppm, then the location is in violation of EPA standards. The second exceedence for the SO₂ standard in a year results in an area being deemed in non-compliance with NAAQS. Each of the criteria pollutants has a similar standard, as do VOCs, NO_x, and HAPs. Counties or parts of counties that consistently fail to meet NAAQS for specific criteria pollutants can be designated a nonattainment area for those pollutants. Nonattainment areas are subject to increased monitoring and enforcement, and a state must specify a strategy for achieving attainment for any nonattainment area within its borders.

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Table 1. Comparison of U.S. Federal and U.S. Border States' Air Quality Standards

Pollutant	Symbol	Units	Averaging Time	U.S. Federal Standards		Standards in U.S. Border States Where Different from Federal Standards	
				Primary Standards**	Secondary Standards**	California	New Mexico ²
						General Standards	General Standards
Carbon Monoxide	(CO)	ppm*	1 hr (a)	35.5	35.5	20	13.1
			8 hr (a)	9.5	9.5	9	8.7
Nitrogen Dioxide	(NO ₂)	ppm*	1 hr (a)	0.25			
			24 hr (b)				0.1
			Annual Mean	0.054	0.054		0.05
Particulate Matter	(PM _{2.5})	µg/m ³	24 hr (c)	66	66		
			3 yr Annual Average	15.1	15.1		
Particulate Matter	(PM ₁₀)	µg/m ³	24 hr (c)	150	150	50	
			Annual Mean (d)	50	50	30	
Ozone	(O ₃)	ppm*	1 hr (a)	0.125	0.125	0.09	
			8 hr (e)	0.085	0.085		
Sulfur Dioxide	(SO ₂)	ppm*	3 hr (a)		0.55		
			24 hr (a)	0.145		0.04	0.01
			Annual Mean	0.035			0.02
Lead	(Pb)	µg/m ³	Calendar Quarter (b)	1.55	1.55		
			30 Days Average (b)			1.5	
Total Suspended Particles	(TSP)	µg/m ³	24 hr (a)				150

a) Not to be at or above the standard more than once per calendar year

b) Not to be at or above the standard

c) The three-year average of the annual 99th percentile for each monitor within an area

d) The three-year average of the annual arithmetic mean concentrations at each monitor within an area

e) The average of the annual four highest daily eight-hour maximums over a three-year period is not to be at or above the standard

* ppm = parts per million

** Primary standards are adopted to protect public health; secondary standards are to protect public welfare

1. Arizona and Texas have adopted standards identical to U.S. federal standards

2. California also includes air quality standards for visibility-reducing particles, sulfates, and hydrogen sulfide, which have no corresponding U.S. or Mexican federal standards

Sources: EPA; New Mexico State Air Quality Bureau; California Air Resources Board; Arizona Department of Environmental Quality; Texas Commission on Environmental Quality

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An important aspect of CAAA is that air pollution regulation is highly decentralized and administration of NAAQS is the responsibility of the states. In particular, states are individually responsible for the development of a State Implementation Plan (SIP). SIPs are a collection of regulations that ensure NAAQS (or stricter state standards, where applicable) are met and maintained. SIPs are adopted after public comment and are subject to approval by EPA. While CAAA calls for EPA to set standards for criteria pollutants, each state is allowed to set stricter local standards, if desired. Two border states—California and New Mexico—have done so. Two other border states—Texas and Arizona—have chosen not to do so.

Table 1 displays NAAQS for each of the criteria pollutants as well as the standards set by U.S. border states when they differ from national standards. California (one-hour average) and New Mexico (one-hour and eight-hour averages) have stricter standards than NAAQS for CO. New Mexico sets stricter standards for CO, NO_x, and SO₂. New Mexico also includes a standard for total suspended particulates. California sets stricter standards for CO, PM, O₃, and SO₂.

The 1990 amendment to CAAA empowered EPA to implement a permitting system. Emission sources are now required to obtain, in effect, a license to emit a pollutant prior to the start of operations. Permits include information on which pollutants are being released, how much may be released, and steps to be taken by the facilities' operators to reduce emissions. Permits also include a plan on how emissions are to be monitored. Monitoring is critical because if an environmental regulation is to have teeth, regulators need to know if and when the environmental standards are violated. The issuing of permits is a tool that can be used by regulators to improve air quality in nonattainment areas. New permits for sources emitting the nonattainment pollutant can be restricted. Often, new emitters must obtain an offset—which takes the form of a reduction from another source of the pollutant in question—before a permit is issued. Usually the offset must be more than 100%. While required by federal law and overseen by EPA, the actual administration of the permitting system is the responsibility of the states; state authorities issue permits.

The EPA permit requirement opens the door to the establishment of an emissions reduction trading program. Federal law allows the transfer of permits between operators. Emissions reduction trading as a practical matter, then, is the transfer of a permit to emit a quantity of a pollutant for a fee. (In the U.S. Acid Rain Program, for example, each allowance is a permit to emit one ton of SO₂; see box, page 12).

Not only does federal law allow the transfer of permits, thereby establishing a mechanism for emissions trading, but the law goes further, actually promoting emissions trading. In particular, CAAA includes provisions to promote the use of markets and market incentives, of which permit trading is a prominent example. The stated reason behind the inclusion of these provisions is to allow emission sources flexibility in choosing how to meet a standard, thereby reducing the cost of achieving any given standard. For example, if a major source operating in a nonattainment area wants to expand production or otherwise increase the amount of a criteria pollutant it is emitting, an offset must be obtained. Under CAAA, the offset must be greater than the planned increase in emissions so that the net release into the environment is reduced. The offset, which in all cases must come from within the nonattainment area, can be obtained from another stack within the same plant, from another plant owned by the firm, or it can be obtained from another company. In the latter case, money often changes hands.

MEXICAN ENVIRONMENTAL REGULATIONS

The main environmental law in Mexico is the Ley General de Equilibrio Ecológico y la Protección al Ambiente (LGEEPA), passed in 1988 and amended in 1997 and 2001. Environmental regulation is the responsibility of the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). Within SEMARNAT, power is distributed among three institutions. Instituto Nacional de Ecología (INE) is responsible for setting and enforcing most environmental standards, including those for air quality. Comisión Nacional del Agua (CNA) is responsible for setting and enforcing standards for water quality.

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The Procuraduría Federal de Protección al Medio Ambiente (PROFEPA) is charged with factory inspections and enforcement of all pollution regulation.

The relationship between federal and state authorities is in flux in Mexico, with power slowly devolving more and more to the states. This general trend in Mexican law is evident in environmental regulation. Until recently, enforcement of environmental regulation has been highly centralized and individual states had almost no responsibility. Moreover, enforcement was limited primarily to large cities. The trend has been toward greater responsibility for enforcement devolving to state and local officials, but that process has been slow as well. For example, although all Mexican states have established state-level environmental agencies, until recently they have had little enforcement power because of the limited local budgets and a lack of local technical expertise (Lybecker and Mumme 2002).

The 1997 and 2001 amendments to LGEEPA more carefully delineated the responsibilities of the federal, state, and local governments. For example, Mexican states will take the lead in developing emissions inventories (see box, page 53). The process of decentralization involves states negotiating judicial frameworks with the federal government, under which states will have more power to determine and enforce environmental regulations. Each state is negotiating a separate agreement with the central authorities, with different states potentially undertaking different tasks depending on the resources of the state. In many cases, the responsibility for local enforcement will continue to rest with the SEMARNAT state delegation. In other cases, local responsibility will rest with state and local officials. While the balance of power still favors the Mexican federal government, the authority of local governments in matters having to do with the environment is increasing.

Mexican law authorizes the establishment of atmospheric concentration standards, referred to in Spanish as *norms*. These have been developed for the same six criteria pollutants covered by NAAQS, ozone precursors (VOCs and NO_x), and for various HAPs. The guiding principle in setting these standards, as with NAAQS in the United States, is the protection of human health. Often Mexican officials refer to U.S. studies in determining what concentration of a pollutant is consistent with protecting health, so it is not surpris-

U.S. and Mexican Cooperation: Air Monitoring and Emissions Inventory on the Border

The monitoring of ambient air quality had been hit-and-miss in Mexico until recently. Even now it remains true that coverage is limited—concentrated on the border and in a few large cities. One objective of the Border 2012 Program is to solve this problem. Current efforts involve the establishment of an integrated national monitoring system for ambient air quality in conjunction with the U.S. Environmental Protection Agency's (EPA) Aerometric Information Retrieval System (AIRS), which allows public access to data via the Internet. In the initial phase of this effort, a monitoring system has been installed on the border.

The data are being maintained by the Information Center on Air Pollution for the U.S.-Mexico Border, known by its Spanish acronym CICA. According to its web site, "CICA provides bilingual (English/Spanish) technical support and assistance in evaluating air pollution problems along the U.S.-México border and to other areas and countries according to the resources available" (EPA 2002e). As of 2002, data are available for Ciudad Juárez, Nogales, Mexicali, and Tijuana.

A second effort underway in Mexico is the development of an emissions inventory, spearheaded by the Western Governors Association in cooperation with EPA, the Mexican Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), and local officials. Air pollution results from a complex mix of literally thousands of sources ranging from industrial smoke stacks and motor vehicles to the individual use of grooming products, household cleaners, and paints (Radian Corporation 1996). A full understanding of the emissions sources allows the development of detailed regional and local plans for control of air pollution. Emissions inventories have routinely been undertaken in the United States, but no complete systematic inventory exists for Mexico, although such inventories for industrial sources are

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required by Mexican law.¹ An inventory will be developed first for the six Mexican border states and then for Mexico as a whole.

¹ Article 17 of the Mexican environmental law states that point sources must provide information to authorities about their emissions. Article 112f requires states and *municipios* to create and continuously update the emissions inventory (Radian Corporation 1996).

ing that U.S. and Mexican standards are similar (Table 2). Moreover, where the standards do differ, it is not necessarily true that U.S. standards are stricter than Mexican standards. For example, the United States imposes a one-hour standard on carbon monoxide; Mexico does not, but it does impose a stricter eight-hour standard (9 ppm v. 11 ppm). For NO_x, the Mexican standard is stricter (0.21 ppm v. 0.25 ppm), but Mexico has no standard for the annual arithmetic average, while the United States does impose an annual standard. The United States and Mexico have the same standard for PM₁₀. Mexico has a stricter one-hour ozone standard (0.125 ppm v. 0.11 ppm) but has no eight-hour standard. For SO₂, Mexico has a stricter 24-hour standard (.014 ppm v. 0.13 ppm) but has the same annual standard as the United States. The United States and Mexico have the same standard for lead (1.5 µg/m³). Mexico has no standard for PM_{2.5}, while the United States has no standard for total suspended particulates.

The similarity of air quality standards between the United States and Mexico greatly facilitates coordination of environmental policy on the border. If there were great disparities between the two regimes, officials of the country with the more liberal policy might resist projects aimed at achieving the tighter standard. As noted above, while the standards of the United States and Mexico are similar, they are not identical, and where they differ there is potential for conflict. The difference between the two countries in regulating PM is troubling since PM is of special concern in the arid desert border region and several regions are in noncompliance. These differences may complicate transborder cooperation. For example, Mexico has no standard for PM_{2.5}. Programs to reduce PM_{2.5}

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Table 2. Comparison of U.S. and Mexican Federal Standards

Pollutant	Symbol	Units	Averaging Time	U.S. Federal Standards		Mexican Federal Standards
				Primary Standards**	Secondary Standards**	General Standards
Carbon Monoxide	(CO)	ppm*	1 hr (a)	35.5	35.5	
			8 hr (a)	9.5	9.5	11
Nitrogen Dioxide	(NO ₂)	ppm*	1 hr (a)	0.25		0.21
			Annual Mean	0.054	0.054	
Particulate Matter	(PM _{2.5})	µg/m ³	24 hr (c)	66	66	
			3 yr Annual Average	15.1	15.1	
Particulate Matter	(PM ₁₀)	µg/m ³	24 hr (c)	150	150	150
			Annual Mean (d)	50	50	50
Ozone	(O ₃)	ppm*	1 hr (a)	0.125	0.125	0.11
			8 hr (e)	0.085	0.085	
Sulfur Dioxide	(SO ₂)	ppm*	3 hr (a)		0.55	
			24 hr (a)	0.145		0.13
			Annual Mean	0.035		0.03
Lead	(Pb)	µg/m ³	Calendar Quarter (b)	1.55	1.55	1.5
Total Suspended Particles	(TSP)	µg/m ³	24 hr (a)			260

a) Not to be at or above the standard more than once per calendar year

b) Not to be at or above the standard

c) The three-year average of the annual 99th percentile for each monitor within an area

d) The three-year average of the annual arithmetic mean concentrations at each monitor within an area

e) The average of the annual four highest daily eight-hour maximums over a three-year period is not to be at or above the standard

* ppm = parts per million

** Primary standards are adopted to protect public health and secondary standards to protect public welfare

Sources: EPA; SEMARNAT

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sources, for example, in Ciudad Juárez to aid El Paso in meeting U.S. PM_{2.5} standards might be politically unpalatable to Mexican officials. Nevertheless, the broad consistency between U.S. and Mexican standards presents many opportunities for cooperation.

Despite the similarity in air quality standards, enforcement efforts on the two sides of the border differ substantially. The United States has among the most strictly enforced environmental laws in the world. Under the 1990 amendments to CAAA, EPA need not even go to court when enforcing air quality standards because the law gives the agency the power to fine violators directly, much like a police officer giving traffic tickets. Penalties for violation were also increased under the 1990 amendments (EPA 2002c). The record on enforcement in Mexico is not stellar. For example, action against Mexico for failure to enforce LGEEPA in issuing a permit to Molymex, S.A., for expansion of its site in Cumpas, Sonora, continues before the Commission for Environmental Cooperation (CEC) (CEC 2003a). Molymex processes residual generated from copper smelting, an activity that potentially could have severe adverse effects on the local environment.

Of course, Mexico's failure to strictly enforce environmental laws is not surprising. As argued in the previous chapter (see box, page 28), low-income countries have limited resources. Often, pressing social needs such as education, potable water, and sewage will exhaust these resources, leaving little budget for enforcement of air quality standards. The consequence is that enforcement actions such as plant inspections often go undone. Unfortunately, this scenario appears to apply to Mexico.

NAFTA AND THE BORDER ENVIRONMENT

In the late 1980s, Canada, Mexico, and the United States began negotiations to form a free trade area that ultimately resulted in ratification of the North American Free Trade Agreement (NAFTA) in 1994. The negotiation brought environmental issues to the fore. Environmentalists opposed to free trade argued that the economic development arising from free trade would result in environmental degradation on the border. They argued that free trade would attract population to the border that could not be sustained by the sensitive

desert ecosystem. They also expressed concerns about the border becoming a pollution haven in that pollution-intensive operations would relocate to the border to avoid strict U.S. environmental laws (Wheeler 2001). This, coupled with increased industrial output, would cause an environmental disaster.

Transborder Pollution

The 1990 amendment to the Clean Air Act includes a provision, Section 179B, which provides an exception from National Ambient Air Quality Standards (NAAQS) when the U.S. Environmental Protection Agency (EPA) determines that pollution is from an international source. Under the law, if the EPA administrator is satisfied that the area is in attainment except for emissions emanating from outside the United States, then the area is considered in attainment.

To date, two areas have been considered exempt from provisions of the act under Section 179B—El Paso and Imperial Valley. In both cases, the pollutant in question is PM_{10} .¹ For El Paso, the state of Texas found that El Paso would be in compliance except for sources emanating from Ciudad Juárez (TNRCC 2000). As of July 2002, EPA had not taken action on El Paso's 179B status. In the case of the Imperial Valley, the finding was that the area was in nonattainment from domestic sources, a status the area has had since 1994, but that the area was not in serious noncompliance (EPA 2001). Had a 179B exemption not been granted, reclassification to serious status was likely, which would trigger more stringent environmental actions (Earth Justice 2000). The Imperial Valley's 179B status, coupled with the Sempra and InterGen power plant controversies (see box, page 37), have roiled environmentalists.

Those critical of the 179B provision complain that regardless of the source of a pollutant, areas that do not meet NAAQS expose residents to unacceptable health risks. Thus, the source of a pollutant is irrelevant.

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Clearly, when the source of a pollutant is transborder, coordination of environmental policy becomes paramount if a healthy environment is to be achieved. To this end, emission reduction credit trading can be a solution.

¹ Another nonattainment area where studies have documented the transborder nature of PM₁₀ is Nogales-Nogales (ADEQ 1999), which is in noncompliance for PM₁₀. The area has not received an exemption under Section 179B.

Free trade advocates argued that these environmentalists' concerns were overblown. Proponents of free trade argued that the maquiladora program, which applied only to the border, artificially diverted development to the border. The passage of a free trade agreement, which abolished the special status of the border under the maquiladora program, would eliminate the border's advantage in attracting foreign capital, thereby slowing border economic growth. Moreover, much employment on the border, especially on the U.S. side, arises from border-related activities such as drayage and warehousing. To the extent that NAFTA eliminated these activities, for example, by allowing continent-wide trucking, development on the border would be slowed. Finally, the proponents of free trade argued that indigenous Mexican environmentalists would most likely take action to mitigate damage to the border ecosystem, thereby eliminating the potential of the border as a pollution haven. Some proponents of free trade went further, arguing that economic development might actually promote environmental sustainability. According to this argument, attempts to cure the border's environmental woes were doomed as long as Mexico remained an underdeveloped country. By promoting economic growth, more resources would be available for environmental programs. The kick to economic growth would, in effect, move Mexico forward on the Environmental Kuznets Curve to the benefit of environmental causes (Erickson 1992).

Regardless of the relative merits of the two sides' arguments, the environmentalists' opposition to free trade began to gain traction with the public and in the U.S. Congress, thus threatening to derail NAFTA. The administrations of U.S. presidents George H. W. Bush

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and Bill Clinton sought to garner votes by blunting environmentalists' concerns though negotiated environmental side agreements. The first of these side agreements—the North American Agreement on Environmental Cooperation (NAAEC)—involved all three NAFTA partners and established the CEC, which is primarily responsible for the enforcement of the provisions of NAAEC. CEC was established with the goal of fostering environmental protection, promoting sustainable development, increasing cooperation among the three countries, supporting the environmental goals of NAFTA, enhancing enforcement of environmental laws, promoting transparency and public participation in environmental policymaking, and promoting pollution prevention policies and practices (CEC 2003b). It also has a quasi-judicial role in reviewing submissions from the public on enforcement matters. CEC serves as an arbitration panel to resolve disputes among the NAFTA parties on specific trade-related issues associated with the failure to enforce environmental laws and regulations effectively. In particular, Articles IV and V of NAAEC require each party to enforce its environmental laws. An action can be instigated by either a signature government or private parties. Failure to enforce environmental laws can result in an adverse finding by CEC, but there is no explicit mechanism for imposing sanctions. This lack of an enforcement mechanism greatly weakens CEC as an institution that can help achieve environmental goals.

The second NAFTA environmental side-agreement involved the United States and Mexico and established two border environmental institutions—the Border Environment Cooperation Commission (BECC) and the North American Development Bank (NADBank). BECC's primary objective is to provide technical assistance to border communities. This assistance is designed to ensure sound and feasible projects, master plans, project design, environmental assessment, and local institutional capacity building. A second major function of BECC is to certify infrastructure projects. Certified projects are eligible for financing consideration by NADBank and other sources (BECC-NADBank 1999). Certified proposals must meet criteria for technical and financial feasibility. The projects must be environmentally sound, self-sustaining, and supported by the public (GAO 2000). BECC also assists states and localities in

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the preparation, development, implementation, and oversight of environmental infrastructure projects in the border region. BECC has mainly restricted its concerns to water, wastewater, and municipal solid waste disposal, but BECC could play a role in improving air quality by certifying projects as contributing to improved air quality and perhaps by serving as a third-party auditor. Recently, BECC has certified road-paving projects aimed at improving air quality.

NADBank's primary purpose is to facilitate financing for the development, execution, and operation of environmental infrastructure projects on the border. Only projects certified by BECC qualify for construction financial assistance from NADBank. The bank provides direct financing in the form of loans or guarantees for BECC-certified environmental projects. NADBank is funded by equal contributions from the United States and Mexico. The agreement governing NADBank calls for a total lending capacity of \$3 billion, with \$450 million as paid-in capital and an additional \$2.55 billion as callable capital. Callable capital is composed of funds that the governments are to provide to the bank, if required, to meet outstanding debt obligations or guaranties issued by the bank (GAO 2000). The bank's paid-in capital is available to support borrowing for its international programs. From a practical viewpoint, the total lending capacity of NADBank is limited to the total of its paid-in and callable capital.

The bank's lending program has faced difficulties. Under its charter, the bank is required to make loans at a rate sufficient to compensate for the cost of funds. These rate restrictions often result in NADBank being priced out of the market. Larger communities on the U.S. side generally have access to lower-cost loans. Smaller communities, many of which are located in Mexico, can't afford NADBank's interest rate. Recognizing these problems, EPA has established a program called the Border Environmental Infrastructure Fund (BEIF). BEIF grants are administered by NADBank and can be used to reduce the total cost of funds to low income communities (Erickson and Eaton 2002).

NADBank is not currently making loans to finance air quality projects, but may decide to become active in the future. One possible role for NADBank would be to finance projects that result in emission reductions, and then sell these emission reductions credits to defray lending costs, thus allowing NADBank to lend at more favorable terms. Such a program would be particularly attractive in dealing with small and medium businesses. NADBank would be able to package several small emission reductions into larger, more marketable securities.

BORDER ENVIRONMENTAL PLANS

The history of cooperation between the United States and Mexico on border environmental issues is mixed. The La Paz Agreement,⁴ signed in 1983, serves as the legal basis for cooperation. It gives responsibility for coordinating border environmental policy to the Mexican and U.S. environment agencies, SEMARNAT and EPA. Each country is required to designate a specific official as the contact person for border issues—currently those are the administrator of EPA for the United States and the secretary of SEMARNAT for Mexico. The La Paz Agreement allows SEMARNAT and EPA to negotiate directly on border issues, develop comprehensive plans, and form working groups.

A number of official programs have been adopted under the authority of the La Paz Agreement, with mixed results. The Integrated Border Environmental Plan (IBEP, also commonly referred to as the Border Plan) was the first of these. IBEP established six workgroups, each dedicated to an aspect of the border environment, including those for water and air. The working groups sought to develop border-wide responses, but many criticized this approach, pointing out that the border is a diverse area that requires local responses to local problems. The lack of local focus was not the only criticism of IBEP—it was also criticized for lack of public involvement because it was initiated with few public hearings and had limited mechanisms for public input. Many observers cite the lack of public involvement as the most important limitation of IBEP (CDC 2000).

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In response to the criticism of IBEP, a new program for border cooperation called Border XXI was announced in 1996. Border XXI emphasized three strategies for achieving sustainable development on the border:

- Ensuring public involvement in development and implementation of the Border XXI Program
- Building capacity and decentralized environmental management to encourage state and local institutions in the implementation of Border XXI goals
- Ensuring interagency cooperation to maximize resources and minimize duplication of efforts (EPA 1996)

The Border XXI air workgroup identified five major goals for the five-year period of the program:

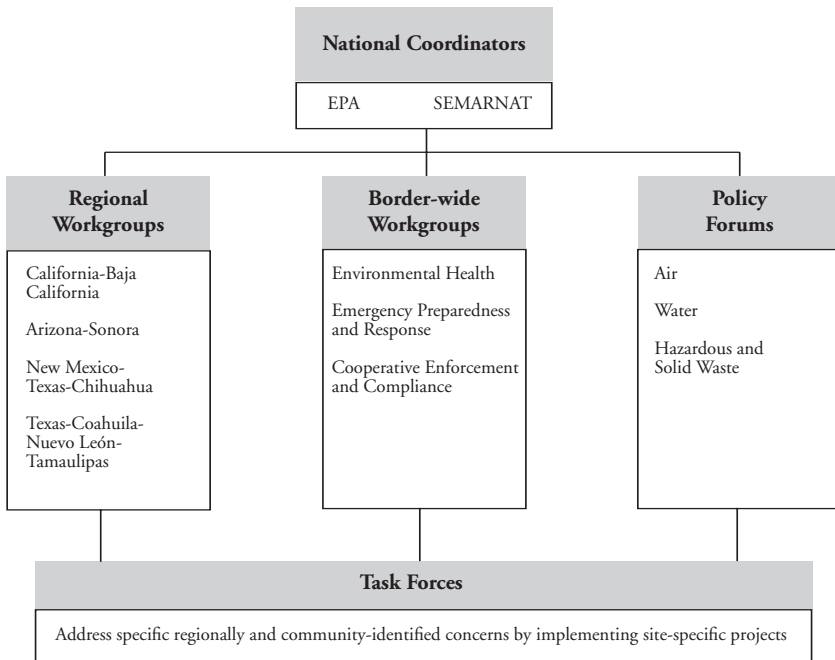
- Develop air quality assessment and improvement programs such as monitoring, inventorying, and modeling
- Build institutional infrastructure and technical expertise in the border area
- Encourage ongoing public involvement
- Promote air pollution abatement
- Study potential economic incentive programs for reducing air pollution (EPA 1996)

While Border XXI paid considerable lip service to public involvement, especially after the criticisms leveled against IBEP, in practice Border XXI had many of the same flaws of its predecessor. The decision to continue to rely on border-wide working groups tended to minimize state, tribal, and local input, thereby minimizing public involvement. State, tribal, and local officials complained bitterly of not being adequately consulted. In 1999, for example, New Mexico refused to participate in the Border XXI process as a protest against what was viewed by local officials as heavy-handed federal regulation (Faulker 1999). In public hearings during the final year of the Border XXI program, a continuing theme was the need for additional opportunities for public input (see, for example, NEJAC 2003). Like IBEP that preceded it, Border XXI was of limited success in large part due to the lack of opportunity for public participation.

Environmental Regulation and the Border

Stung by the criticism of their previous efforts, EPA and SEMARNAT sought to increase public participation in the development of their next border plan, Border 2012 (Figure 2). Indeed, Border 2012 includes 10 goals, six of which deal with promoting local participation either directly or indirectly (see Appendix).⁵ Overall coordination of Border 2012, consistent with the La Paz Agreement, rests with EPA and SEMARNAT. The program is organized into 10 sub-organizations. Three of these are policy forums—air, water, and hazardous solid waste; three are border-wide working groups—environmental health, emergency preparedness, and cooperative enforcement and compliance; the final four, in an innovation aimed at increasing local participation, are regional working groups—California-Baja California, Arizona-Sonora, New Mexico-Texas-Chihuahua, and Texas-Coahuila-Nuevo León-Tamaulipas. Any of these 10 sub-organizations can form task forces to address specific issues that may arise.

Figure 2. Organization of the Border 2012 Program



Source: EPA 2002f

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Border 2012 deals with several issues relevant to air quality. Goal #2 aims to reduce air emissions “as much as possible toward attainment of respective national ambient air quality standards, and reduce exposure in the border region.” This is a rather vaguely worded goal. A major problem with such a vague goal is that quantifying success in achieving this goal will be difficult.⁶ Recognizing this, Border 2012 contains two interim objectives dealing with air quality: the development of baseline and alternative scenarios for emission reductions by 2003 and the defining of specific emission reduction strategies and air quality and exposure objectives to be obtained by 2012. Achievement of these objectives will require, through a currently ongoing process, the installation of monitoring stations along the border and the integration of data into the Aerometric Information Retrieval System (AIRS), which allows public access to data via the Internet. Border 2012 sets a rather modest health objective for air: The evaluation of various studies concerning respiratory health in children to determine the policies most likely to improve health on the border.

The program also deals with compliance and enforcement issues relevant in achieving air quality goals. Goal #6 is the improvement of environmental performance through increased compliance, enforcement, pollution prevention, and the promotion of environmental stewardship. The plan sets three enforcement objectives: an increase in voluntary compliance and self-audits of 50% compared to the baseline by 2006, the determination of high-risk pollution sources in the border area and the setting of priorities in dealing with these sources, and increased enforcement in accordance with the priorities set in the second objective.

The Border 2012 Program is an improvement over its predecessors, especially in the promotion of public participation. With regard to emissions trading, monitoring of ambient air quality, development of an emissions inventory, and on-site monitoring are prerequisites for a cap-and-trade system. All are included in Border 2012. However, the plan sets only modest goals, envisioning, for example, only a 50% increase in point-source monitoring. It appears, then, that the prerequisite for a cap-and-trade system on the border is years away. This is unfortunate because cap-and-trade has been effective in achieving air quality goals set by the U.S. Acid

Rain Program. The practical alternative, though, is baseline-and-trade. A baseline-and-trade approach has already been successfully executed in the case of the El Paso Electric Brick Kiln Project. The conditions under which baseline-and-trade can contribute to meeting air quality goals will be addressed in Chapter V.

ATTAINMENT STATUS ON THE BORDER

Air quality is poor in many locales, as is reflected in the nonattainment status of U.S. border communities (Table 3). EPA has designated 154 areas as noncompliant (EPA 2002b) and 10 of these nonattainment areas are on the border. Of the 154 areas designated as noncompliant, 27 are nonattainment for two criteria, and two of these are on the border. Of the 154 noncompliant areas, eight are noncompliant for three criteria. One of these, El Paso, is on the border. Of the 25 U.S. counties that border Mexico, all or part of eight are in noncompliance.⁷ Some 895,000 of the 6.3 million U.S. residents of the border, or 14%, are living in nonattainment areas.⁸ Environmental data for the Mexican side of the border are more fragmentary. While EPA and SEMARNAT are developing a more systematic monitoring method, current monitoring stations are fewer and the variety of data gathered is less. For example, as of June 30, 2002, EPA has maintained no data on SO₂ on the Mexican side of the border even though a 1997 study found that Ciudad Juárez and Agua Prieta were in noncompliance for this pollutant. Table 4 reports the air quality status of Mexican *municipios*. Current data are available for Ciudad Juárez, Nogales, Mexicali, and Tijuana. Presently, Ciudad Juárez, Mexicali, and Tijuana are nonattainment for ozone, carbon monoxide, and particulate matter; Nogales is nonattainment for particulate matter (EPA 2002e).

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Table 3. Nonattainment Status on the Border:
United States as of June 30, 2002

Criteria Pollutant	Nonattainment Area	
	Area	County, State
Ozone	El Paso (Serious)	El Paso, TX
	Sunland Park (Marginal)	Dona Aña, NM
Carbon Monoxide	El Paso (Moderate)	El Paso, TX
Nitrogen Dioxide	None	None
Sulfur Dioxide	Ajo (Primary)	Pima, AZ
	Douglas (Primary)	Cochise, AZ
Particulate Matter	El Paso (Moderate)	El Paso, TX
	Anthony (Moderate)	Dona Aña, NM
	Ajo (Moderate)	Pima, AZ
	Rillito (Moderate)	Pima, AZ
	Paul Spur (Moderate)	Cochise, AZ
	Nogales (Moderate)	Santa Cruz, AZ
	Yuma (Moderate)	Yuma, AZ
	Imperial Valley (Moderate)	Imperial, CA
Lead	None	None

Source: EPA 2004

Table 4. Nonattainment Status on the Border:
Mexico as of June 30, 2002

Criteria Pollutant	Nonattainment Area	
	<i>Municipio</i>	State
Ozone	Ciudad Juárez	Chihuahua
	Mexicali	Baja California
	Tijuana	Baja California
Carbon Monoxide	Ciudad Juárez	Chihuahua
	Mexicali	Baja California
	Tijuana	Baja California
Particulate Matter ^a	Ciudad Juárez	Chihuahua
	Nogales	Sonora
	Mexicali	Baja California
	Tijuana	Baja California

a) Ozone and carbon monoxide are not monitored in Nogales

Source: Authors' calculations using data obtained from the U.S.-Mexico Border Information Center on Air Pollution

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A common problem in the arid border region is PM_{10} . All Mexican *municipios* monitored are in violation of PM_{10} standards. All or parts of seven U.S. border counties are nonattainment for this pollutant, including Imperial Valley, all Arizona border counties, Dona Aña County, and El Paso County. The reasons for the border's problem with PM_{10} vary from area to area, but it seems certain that one contributing factor is the desert environment. Certainly deserts are characterized by dry conditions, blowing dust, and unpaved roads. All of these contribute to high PM_{10} levels. While data are fragmentary, what is available indicates that Mexican PM sources contribute to PM_{10} problems in U.S. border communities, and vice versa. For example, the aforementioned Ambos Nogales study found high concentrations of PM_{10} on both sides of the border and identified several sources of PM_{10} in Nogales, Sonora, that contributed to PM_{10} levels in Arizona (ADEQ 1999). Similarly, Ciudad Juárez is a major source of PM in El Paso (TNRCC 2000).

El Paso-Ciudad Juárez, a typically unhealthy border area, is nonattainment for three criteria pollutants—ozone, carbon monoxide, and PM_{10} .⁹ Transborder pollution is a major cause of the pollution in El Paso. As discussed in Chapter I, Texas has determined that El Paso is in attainment based on domestic sources of pollution, but the continuing status of El Paso as a nonattainment area results from pollution emanating from Ciudad Juárez (TNRCC 2000). This illustrates once again the theme of the impact of economic development on environmental quality. The fact is that Ciudad Juárez is a large, industrialized city located in a relatively poor country. As is typical of such cities, many residents of Ciudad Juárez live in substandard housing where heating is often provided by burning wood or even solid waste. As is also typical, many small and medium enterprises operate outside the formal sector. Not only are these businesses not regulated, they are not even officially recognized as existing businesses. Ciudad Juárez does not have the resources necessary to monitor or enforce all air quality standards. Public funds are allocated to higher priorities, such as providing sanitation services, education, and basic health needs, which are more pressing. The same argument applies to other regions along the border.

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ENDNOTES

¹ The status of Nogales, Sonora, was determined by the authors using data obtained at the U.S.-Mexico Border Information Center on Air Pollution (<http://www.epa.gov/ttn/catc/cica>).

² Several detailed summaries of the U.S. CAAA are available (see, for example, EPA 1993).

³ EPA is also required to consider the effect of air pollution on the public welfare by limiting the effect of air pollution on visibility and by limiting damage to agriculture and private property.

⁴ The La Paz Agreement is formally referred to as the Agreement Between the United States of America and the United States of Mexico on Cooperation for the Protection and Improvement of the Environment in the Border Area.

⁵ A full discussion of Border 2012 is beyond the scope of this monograph. Excerpts from the Border 2012 Program are included in the appendix to this chapter. Included are the mission statement, guiding principles, and a summary of the goals and objectives. The full Border 2012 document is available at <http://www.epa.gov/usmexicoborder/>.

⁶ The vague wording of the goal is made more obvious when compared to the other objectives of Border 2012. Take, for example, the objectives for water quality, which set specific numeric objectives (see Appendix, Goal #1).

⁷ Nonattainment areas are determined by the extent of the pollution being considered and do not correspond to county borders. Thus, a nonattainment area may be an entire state (i.e., Connecticut for ozone and PM_{10}), several counties located in different states (i.e., New York City-North New Jersey-Long Island for ozone, carbon monoxide, and PM_{10}), or several nonattainment areas could be

located in one county. On the border, there are three counties that contain two nonattainment areas each: Pima and Cochise Counties in Arizona and Doña Ana County in New Mexico.

⁸ Authors' calculation using affected population estimates taken from EPA 2002b.

⁹ The two nonattainment areas in the New Mexico borderlands—Sunland Park and Anthony—are adjacent to El Paso. Sunland Park is also adjacent to Ciudad Juárez, being located at the juncture of Texas, New Mexico, and Chihuahua. A significant portion of the pollution in these two locales originates in El Paso and/or Ciudad Juárez.

Appendix A

Excerpts from the Border 2012 Program

Mission Statement

As a result of the partnership among federal, state, and local governments in the United States and Mexico, and with U.S. border tribes, the mission of the Border 2012 program is to protect the environment and public health in the U.S.-Mexican border region, consistent with the principles of sustainable development. In this program, sustainable development is defined as “conservation-oriented social and economic development that emphasizes the protection and sustainable use of resources, while addressing both current and future needs and present and future impacts of human actions.”

Border 2012 Guiding Principles

The following principles are designed to support the mission statement, ensure consistency among all aspects of Border 2012, and continue successful elements of previous border programs:

- Reduce the highest public health risks, and preserve and restore the natural environment
- Adopt a bottom-up approach for setting priorities and making decisions through partnerships with state, local, and U.S. tribal governments
- Address disproportionate environmental impacts in border communities
- Improve stakeholder participation and ensure broad-based representation from the environmental, public health, and other relevant sectors

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- Foster transparency, public participation, and open dialogue through the provision of accessible, accurate, and timely information
- Strengthen the capacity of local community residents and other stakeholders to manage environmental and environment-related public health issues
- Achieve concrete, measurable results while maintaining a long-term vision
- Measure program progress through development of environmental and public health-based indicators
- The United States recognizes that U.S. tribes are separate sovereign governments, and that equity issues impacting tribal governments must be addressed in the United States on a government-to-government basis
- Mexico recognizes the historical debt it has with its indigenous peoples; therefore, appropriate measures will be considered to address their specific concerns, as well as to protect and preserve their cultural integrity within the broader environmental purposes of this program

Goals and Objectives

Goal #1: Reduce Water Contamination

- Objective 1 by 2012, promote a 25% increase in the number of homes connected to potable water supply and wastewater collection and treatment systems
- Objective 2 by 2012, assess significant shared and transboundary surface waters and achieve a majority of water quality standards currently being exceeded in those waters
- Objective 3 by 2006, implement a monitoring system for evaluating coastal water quality at the international border beaches; by the end of 2006, establish a 2012 objective toward meeting coastal water quality standards of both countries
- Objective 4 by 2005, promote the assessment of water system conditions in 10% of the existing water systems in the border cities to identify opportunities for improvement in overall water system efficiencies

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Goal #2: Reduce Air Pollution

- Objective 1 by 2012 or sooner, reduce air emissions as much as possible toward attainment of respective national ambient air quality standards, and reduce exposure in the border region, as supported by two interim objectives
- Interim Objective 1 by 2003, define baseline and alternative scenarios for emission reductions along the border and their impacts on air quality and human exposure
- Interim Objective 2 by 2004, based on results from Interim Objective 1, define specific emission reduction strategies and air quality and exposure objectives to be achieved by 2012

Goal #3: Reduce Land Contamination

- Objective 1 by 2004, identify needs and develop an action plan to improve institutional and infrastructure capacity for waste management and pollution prevention as they pertain to hazardous and solid waste and toxic substances along the U.S.-Mexican border
- Objective 2 by 2004, evaluate the hazardous waste tracking systems in the United States and Mexico; during the year 2006, develop and consolidate the link between both tracking systems
- Objective 3 by 2010, clean up three of the largest sites that contain abandoned waste tires in the U.S.-Mexican border region, based on policies and programs developed in partnership with local governments
- Objective 4 by 2004, develop a binational policy of clean-up and restoration resulting in the productive use of abandoned sites along the length of the border contaminated with hazardous waste or materials, in accordance with the laws of each country

Goal #4: Improve Environmental Health

- Objective 1 (Air) by 2006, evaluate various measures of respiratory health in children that might be tracked to assess changes that may result from actions to improve air quality in border communities

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- Objective 2 (Water) by 2006, evaluate various measures of gastrointestinal illness that might be tracked to assess changes that may result from actions to improve water quality in border communities
- Objective 3 (Pesticides) by 2006, an assessment and pilot program will be completed that explores the feasibility of harmonizing a binational system for reporting acute pesticide poisonings; by 2007, reduce pesticide exposure by training 36,000 farm workers on pesticide risks and safe handling, including ways to minimize exposure for families and children
- Objective 4 (Capacity Building) by 2006, establish a “distance-learning,” post-graduate degree program to support advanced training on environmental health in conjunction with Pan American Health Organization regional offices and academic institutions; by 2004, extend current efforts in binational environmental health training for 100 health care providers for pesticides and water

Goal #5: Reduce Exposure to Chemicals as a Result of Accidental Chemical Releases and/or Acts of Terrorism

- Objective 1 by 2004, a chemical emergency advisory/notification mechanism between Mexico and the United States will be clearly established, as well as identification of existing chemical risks on both sides of the border
- Objective 2 by 2008, joint contingency plans for all 14 pairs of sister cities will be in place and operating (including exercises), with the establishment of binational committees for chemical emergency prevention (or similar border forums)
- Objective 3 by 2012, 50% of sister city joint contingency plans will be supplemented with preparedness- and prevention-related efforts, such as risk and consequence analysis, risk reduction, and counter-terrorism

Environmental Regulation and the Border

Goal #6: Improve Environmental Performance through Compliance, Enforcement, Pollution Prevention, and Promotion of Environmental Stewardship

- Objective 1 by 2006, increase by 50% the number of industries along the U.S.-Mexican border implementing voluntary compliance and/or self-audits (such as the development of an Environmental Management System or participation in voluntary assessment programs), using 2003 as a baseline year
- Objective 2 by 2006, determine the pollution sources in the border area subject to regulation that present high risks to human health and the environment and set priorities for actions to lower the risk
- Objective 3 by 2012, increase compliance in the priority areas determined in Objective 2 by assessing and responding to citizen complaints, compliance assistance, compliance incentives, compliance monitoring, and enforcement to reduce the risks from non-compliant facilities and encourage voluntary pollution prevention

