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Efforts of the North American Development Bank to Address Air Quality

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ABSTRACT

When originally established in 1995, the North American Development Bank (NADB) and its sister institution the Border Environment Cooperation Commission (BECC) had a mandate that focused on addressing infrastructure needs in water, wastewater, and municipal solid waste. In response to a proposal made by the Mexican government in 1998, the NADB Board of Directors initiated a formal discussion in early 2000 about the desirability of expanding the number of environment-related sectors in which the bank worked, and encouraged public input.

In November 2000 the board decided to add eight categories of infrastructure to its portfolio, while at the same time maintaining a majority of its focus on the original three. The new categories were industrial and hazardous waste, water conservation, water and wastewater hookups for housing, recycling and waste reduction, air quality, public transportation, clean and efficient energy, and municipal planning. The categories of public transportation and clean and efficient energy were understood to be closely related to air quality.

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The board and bank staff explored several types of infrastructure projects that would accomplish air quality improvements and decided that its initial lending efforts would be in the area of street paving. Traffic on unpaved streets has been a significant contributor to levels of particular matter in the border region.

Between 2002 and 2005, BECC certified, and NADB gave loans to four street-paving projects. The first was in Agua Prieta, Sonora, in which 17 miles of streets were to be paved at a cost of \$21 million, about 20% of which was supported by a NADB loan (the balance of the financing came from other sources). The second project, in Ciudad Juárez, Chihuahua, was estimated to cost \$14.7 million and the bank contributed a loan of \$5.5 million. The third project was for five communities in Baja California, costing \$65.2 million, with \$27.6 million from NADB, and the fourth was in Nogales, Sonora, costing \$9.7 million, with \$4.8 million from NADB.

BECC and NADB have been reviewing additional street-paving proposals from the municipios of San Luis Rio Colorado, Sonora; Sonoyta, Sonora; Puerto Peñasco, Sonora; Matamoros, Tamaulipas; and Reynosa, Tamaulipas.

NADB intends to obtain and analyze data on PM_{10} concentrations in *municipios* where paving projects have been implemented to develop evidence that the projects have had the desired effect.

Esfuerzos del Banco de Desarrollo de América del Norte para atender la Calidad del Aire

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RESUMEN

Cuando el Banco de Desarrollo de América del Norte (BDAN) y su institución hermana la Comisión de Cooperación Ecológica Fronteriza (COCEF) se establecieron en 1995, tenían un mandato cuyo enfoque era atender las necesidades de infraestructura del agua, aguas residuales y residuos sólidos municipales. En respuesta a una propuesta planteada por el gobierno mexicano en 1998, la junta directiva del BDAN inició una discusión formal a principios del año 2000 en torno al deseo de expandir el número de sectores relacionados con el medio ambiente en los cuales el banco trabajaba y promovía la participación pública.

En noviembre de 2000 la junta directiva decidió agregar ocho categorías de infraestructura a su cartera, y a la vez manteniendo la mayoría de su enfoque en las tres categorías originales. Las nuevas categorías eran residuos industriales y peligrosos, conservación del agua, conexiones domiciliarias a las redes de agua y aguas residuales, reciclaje y reducción de residuos, calidad del aire, transporte público, energía limpia y eficiente y planificación municipal. Se entendía que las categorías de transporte público y energía eficiente estaban estrechamente relacionadas con la calidad del aire.

La junta directiva y el personal del banco exploraron diversas clases de proyectos de infraestructura que lograran mejoras en la calidad del aire y decidieron que sus esfuerzos iniciales de préstamos serían en el área de pavimentación de calles. El tráfico en las calles sin pavimentación ha sido un contribuyente significativo a los niveles de materia particulada en la región fronteriza.

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Entre 2002 y 2005, la COCEF certificó y el BDAN concedió préstamos a cuatro proyectos de pavimentación de calles. El primero fue en Agua Prieta, Sonora, en el cual 17 millas de calles fueron pavimentadas a un costo de \$21 millones, de los cuales un 20% fue auspiciado por un préstamo del NADB (el saldo del financiamiento provino de otras fuentes). El costo del segundo proyecto, llevado a cabo en Ciudad Juárez, Chihuahua, se estimó en \$14.7 millones y el banco contribuyó un préstamo de \$5.5 millones. El tercer proyecto fue para cinco comunidades en Baja California, costando \$65.2 millones, con \$27.6 millones del BDAN, y el cuarto fue en Nogales, Sonora, costando \$9.7 millones, con \$4.8 millones del BDAN.

La COCEF y el BDAN han estado revisando propuestas adicionales de pavimentación de calles de los municipios de San Luis Río Colorado, Sonora; Sonoyta, Sonora; Puerto Peñasco, Sonora; Matamoros, Tamaulipas; y Reynosa, Tamaulipas.

El BDAN pretende obtener y analizar información de concentraciones de PM_{10} en los municipios en donde los cuales los proyectos de pavimentación han sido implementados para desarrollar evidencia de que los proyectos han obtenido el efecto deseado.

In 1995, the governments of the United States and Mexico jointly established the North American Development Bank (NADB) to finance environmental infrastructure projects certified by its sister institution, the Border Environment Cooperation Commission (BECC). Under the original mandate, both institutions were restricted to addressing the water, wastewater, and municipal solid waste needs of the U.S.-Mexican border region. This chapter describes how that mandate was subsequently expanded to include infrastructure related to air quality and the strategy adopted to address this new category.

The original focus was based on what were considered the major environmental infrastructure challenges resulting from the demographic pressure on the border region. The unmet needs of the water, wastewater, and solid waste sectors posed then were, and

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remain today, the greatest threat to the border region's human health and environment. They present a critical challenge to improving the quality of life of border communities.

In early 1998 the NADB Board of Directors initiated an informal discussion of an expansion of its original mandate in response to a proposal from Mexico's Secretaría de Desarrollo Social (SEDESOL). The NADB board determined however, it would not proceed with the discussion until a reasonable pool of projects, certified by BECC and financed by NADB, could be adequately evaluated and analyzed to determine the bank's success vis-à-vis use of its capital and lending capacity.

By the year 2000, after its first five years of operation, NADB determined that the region would in fact require billions of additional investment dollars to meet water and sanitation needs, reinforcing the convenience of having a bank such as NADB to partially cover such needs. Additionally, new financing facilities and the expansion of NADB's activities would be necessary if it were to expand into additional environmental sectors considered worthy of attention but not included in its original mandate.

Responding to increasing requests by border communities that NADB do more to address a wide variety of infrastructure needs, in 2000 NADB encouraged a public dialogue on how to maximize the use of its capital and lending capacity. The NADB Board of Directors asked management to prepare a detailed report identifying additional sectors that would promote environmentally sustainable development, exploring mechanisms for future financing activities, and assessing the possible expansion of NADB's geographic scope. The NADB board directive was to be implemented using the following criteria:

- Maintain the highest priority for water, wastewater, and solid waste sectors
- Ensure sustainable development criteria are prevalent throughout the expanded scope
- Increase the use of the bank's lending capacity and preserve it to service current and future border needs
- Develop new programs and financing mechanisms to the extent necessary to cover the infrastructure development needs more adequately and expand the geographic scope of the bank

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- Explore ways to provide loans for new types of projects geared toward improving the quality of life of the region's residents
- Expand technical assistance to the communities and the region, particularly in the development of human capital and institutional strengthening, and reinforce the bank's role as financial advisor for the development and completion of projects

After the submission of this report, in November 2000 the NADB Board of Directors authorized NADB to engage in work within additional sectors that would improve environmental conditions in the U.S.-Mexican border region. The sectors were the following:

- Industrial and hazardous waste
- Water conservation
- Water and wastewater connections for housing
- Recycling and waste reduction
- Air quality
- Public transportation
- Clean and efficient energy
- Municipal planning, development, and water

In August 2004, through exchange of diplomatic notes between the governments of the United States and Mexico, an additional change in the original mandate was made with respect to NADB's geographic zone of influence. Originally set consistent with the La Paz Agreement, which defined the border region as the territory within 100 kilometers (km) (about 60 miles) of either side of the international border, the zone was expanded by the new agreement to 300 km on the south side of the border to make BECC and NADB assistance available to some additional Mexican municipalities. North of the border, the boundary of the zone remained at 100 km.

In addition to the explicit inclusion of air quality in this expanded mandate, the bank was aware that two of the other additions—public transportation and clean and efficient energy—were also directly related to a desire to reduce air contaminants. NADB recognized that air quality was a serious problem in several portions of the border region and that there were ways it could help ameliorate this problem through investment in infrastructure. Many of the activities that defined urbanization, and particularly economic

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development, had simultaneously generated emissions, and it was important to reduce these emissions while still encouraging economic growth.

To meet the challenge of improving air quality, NADB established explicit objectives:

- Expedite the improvement of the living standards of the border population in terms of environmental quality, specifically air quality
- Establish mechanisms for sustainable development in terms of air quality
- Facilitate the dialogue, cooperation, and coordination between neighboring communities in addressing their transboundary air quality problems
- Actively partner with the private sector in the implementation of projects aimed at improving the air quality

With this directive from the NADB board, management began to explore ways to address the border's air quality issues. First, some of the activities that led to significant generation of air emissions were identified: inadequate design of roadways that inhibited the free flow and movement of traffic; a large percentage of unpaved streets; a high concentration of old and badly maintained vehicles; long queues of idling traffic at the international bridges; power plants based on fossil fuels, especially coal; open air burning (of brick kilns, dumps, and home fireplaces); paint and body shops; and various industrial, commercial, and residential activities that were not optimized for energy use.

NADB encouraged citizens and local officials to suggest the types of projects that might provide benefits. Examples of solutions included street paving, dedicated commuter lanes in border crossings, proper disposal and recycling of used tires, conversion of brick ovens to natural gas, the San Diego and Arizona Eastern Highway, urban public transport in Ciudad Juárez, urban public transport in Tijuana, and the Arizona Interstate 19 bypass.

NADB reviewed the financial viability of these various project ideas and concluded that the only category clearly feasible for near-term consideration was street paving, because street paving is usually an item in the investment budget of municipalities that can be

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used as a repayment source for the bank's loan. Other types of projects, while also important, would require the identification of such a repayment source. A 1999 report prepared by the Arizona Department of Environmental Quality (ADEQ) had cited airborne dust created by vehicles driving on unpaved roads as an important contributor to ambient concentrations of particulate matter (PM) and the resulting respiratory health effects. With this and other supporting documentation, NADB set out its criteria for success with respect to street-paving projects:

- Reduce the possibilities for non-point sources of air pollution
- Increase the financing options for sustainable development, particularly for small communities in the border region
- Reduce the construction and maintenance costs and increase the environmental and financial sustainability of paving activities
- Promote the use of recycled materials, such as used asphalt and tires, in street paving projects

Border communities responded with great interest to this new window for financing at the bank. As of summer 2005, BECC had certified four street-paving projects in Agua Prieta, Sonora; Ciudad Juárez, Chihuahua (Sistema de Urbanización Municipal Adicional); Baja California (Programa Integral de Pavimentación de Calidad del Aire); and Nogales, Sonora.

The Agua Prieta project, certified by BECC in December 2002, encompasses 17 miles of previously unpaved streets. In addition, the project includes the expansion of a four-mile section of Federal Highway 2, which runs through the city, and the construction of three bridges at low-water crossings. Prior to initiation of the project, ADEQ conducted a key study at the request of the project sponsor. The study determined that the selected streets were generating 125 tons per year of PM_{10} (particulate matter with an aerodynamic diameter of 10 microns or less), and that this could be reduced by as much as 54% (to 57 tons per year) during the first year of the project and to 29 tons per year after the second year (Envair 2002). The total project cost was estimated to be \$21 million. NADB financed

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20% of this amount, or \$4 million. The balance of the project was financed with Mexican federal and state grant resources. Implementation of the project began in August 2004.

A Ciudad Juárez street-paving project, also certified by BECC in December 2002, was designed as a multi-phase effort. The first phase is the paving of 560,000 square meters (m²) of residential streets. According to the BECC certification document, the justification for this project was the direct correlation found in Ciudad Juárez between unpaved streets and a high incidence of respiratory illnesses, combined with a study concluding that in Ciudad Juárez there is a 65% higher incidence of PM₁₀ from unpaved streets than from paved streets (General Directorate of Ecology and Civil Protection of Ciudad Juárez 2002). The total project cost was estimated at \$14.7 million. The proposed NADB financing was \$5.5 million, with additional sources of financing coming from Banco Nacional de Obras y Servicios Públicos (BANOBRAS) (\$5.5 million) and Ciudad Juárez beneficiaries (\$3.7 million). Unfortunately, this project has not begun yet, as the new municipal authorities in Ciudad Juárez have not yet reached a decision about whether they will carry on the project or not.

In April 2003 BECC certified a street-paving project for five communities in the border region of Baja California. The full project would pave 14.9 million m² of residential streets in Ensenada, Mexicali, Playas de Rosarito, Tecate, and Tijuana and the cost is estimated at \$400 million. The cost of the first phase is estimated at \$65.2 million. Thus far, the sponsor is involved in the completion of a first phase, for which NADB has approved a loan. The NADB loan is for \$27.6 million and the balance of the first-phase cost, \$37.6 million, has been provided by Mexican federal and state resources. Implementation of the project began in November 2003. It is expected that the sponsor will continue with subsequent phases over a period of several years.

The most recent BECC certification of a street-paving proposal, in July 2004, was for a project in Nogales. According to the BECC certification document, this project was the result of two studies—first a general study of air quality in the area and then a focused study of unpaved roads—and a workgroup.

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ADEQ, in conjunction with Mexico's Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), worked with the consulting firm ENSR to conduct a binational air quality study in Nogales, Arizona, and Nogales, Sonora (jointly known as Ambos Nogales) from 1994 to 1999 (Heisler, et al. 1999). This EPA-funded study revealed unpaved roads to be one of the main sources of air pollution in Nogales, Sonora. This study led to the formation of a binational workgroup consisting of state and local government officials focusing on identifying and implementing control measures to alleviate the Ambos Nogales air quality problem. This workgroup, which operates under the auspices of the Border Liaison Mechanism (BLM), considers the unpaved road problem a top priority toward improving air quality in the region. Recognizing that resources were likely unavailable to pave all dirt roads in Nogales, Sonora, ADEQ funded a six-week traffic-count study to help identify the roads with the greatest traffic volumes. In general, these were found to be located in the southwest area of the city.

Subsequent to these studies, Nogales, Sonora, pursued funding from different sources for a multi-phase paving project that would pave in total 2 million m² of streets. Following up on the BECC certification, NADB is presently considering financing the first phase. The total cost of this phase, which would pave 300,000 m² of residential streets, is estimated at \$9.7 million and the proposal is for the NADB to provide a loan of \$4.8 million. Additional sources of financing would be BANOBRAS (\$2.24 million) and the State of Sonora (\$2.63 million). NADB staff is in negotiations with the municipio of Nogales regarding the loan's terms and conditions.

BECC and NADB are considering street-paving projects in additional cities for certification and financing, including:

- San Luis Rio Colorado, Sonora
- Sonoyta, Sonora
- Puerto Peñasco, Sonora
- Matamoros, Tamaulipas
- Reynosa, Tamaulipas

The municipio of San Luis Rio Colorado estimates that 76% of its streets are unpaved and is proposing a project to pave approximately 1.6 million m² at a rate of 266,000 m² each year over a

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period of six years. The municipio is seeking NADB assistance (approximately \$6.7 million) through a market rate loan for up to 50% of the total project cost. The municipio anticipates using financial resources from its share of the Puente del Rio Colorado fideicomiso to finance a portion of the total project cost (the fideicomiso is a trust that manages the revenues from the toll-bridge over the Colorado River and distributes those revenues among the municipios of San Luis Rio Colorado, Sonoyta, and Puerto Peñasco).

The Municipio of Sonoyta estimates that 90% of its streets are unpaved. The municipio is seeking a NADB loan in the amount of \$1.9 million to use toward meeting the costs of a street-paving project. The city anticipates using financial resources from its share of the Puente del Rio Colorado fideicomiso to finance the balance.

Similar to Sonoyta, the municipio of Puerto Peñasco estimates 90% of its streets are unpaved. The city has proposed a comprehensive project that would pave up to 96,000 m² at a total cost of approximately \$1.8 million. The city anticipates using financial resources from its share of the Puente del Rio Colorado fideicomiso, which is approximately \$960,000, and is seeking a NADB loan in the same amount to complete the project.

The municipio of Matamoros, with 53% of its streets unpaved, is undertaking a three-phase paving project estimated to cost \$100 million. The entire project would pave 14.3 million m². The first phase will cover 2.8 million m². The municipio anticipates the first phase will cost \$20 million, 50% of which it would seek in an NADB loan. Other sources of funding have yet to be determined for the first phase, but the city anticipates seeking both federal and state funding to complete the financial package.

The municipio of Reynosa is developing a 300 km street-paving project over a three-year period. The municipio is seeking an NADB loan in the amount of \$2.4 million, with additional financing from federal and state resources. The total project cost is currently estimated at \$4.8 million.

Although there is anecdotal evidence that less dust is now in the air in the proximity to completed street-paving projects, NADB intends to obtain and analyze data on PM₁₀ concentrations in municipios where paving projects have been implemented.

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Measurable reductions in those concentrations would provide further justification to BECC and NADB for their investments, based on established correlations between such concentrations and respiratory effects among the public, especially in infants, children, the elderly, and those suffering from asthma.

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