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## Border Finances: Paying for Environmental Infrastructure

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### EXECUTIVE SUMMARY

Growing environmental deterioration has prompted concern about promoting sustainable economic development. This concern is especially relevant in the fragile arid areas that characterize much of the U.S.-Mexican border region. Given the level of poverty in the border region, environmental protection measures must consider economic realities to be successful. Both Mexican and U.S. government agencies have recognized this and, consequently, have adopted policies that emphasize sustainable development that is both financially and environmentally sound (Thoms and Betters 1998).

The most severe environmental problem facing the border is the challenge of supplying the region with a safe and reliable water supply. Water is very scarce along the border and resources to finance needed infrastructure are in even shorter supply. In Mexico, all water belongs to the federal government. In the United States, water rights are controlled by a variety of states. The Comisión Nacional del Agua (CNA), or National Water Commission, is charged with administering water rights in Mexico. Mexico is currently undergoing a decentralization of the management and operation of water resources, although the process remains incomplete. The International Boundary and Water Commission's (IBWC) jurisdictions and responsibilities under the

Water Treaty of 1944 include responsibility for managing issues involving the waters of the Rio Grande and the Colorado River.

There are numerous impediments to meeting the environmental infrastructure needs of border communities. These impediments vary, but key among them is the lack of human capital to plan, implement, and maintain environmental infrastructure and the limited ability of communities to obtain affordable financing for the construction of needed projects. Given existing infrastructure needs and the expected population growth, environmental infrastructure improvements on the border are likely to be limited unless the key impediments are addressed.

The U.S.–Mexican border region faces a unique set of circumstances that arises from the juxtaposition of two economies at very different levels of development. The situation is complicated by the relative positions of the border communities within their respective countries. The northern frontier of Mexico is characterized by low income typical of developing countries, yet it is the wealthiest region in Mexico. The Mexican federal government, faced with constrained financial resources, has reasonably chosen to allocate limited infrastructure funds elsewhere. Consequently, the northern frontier will need to become less dependent on funds from the federal government and develop independent sources of funding.

By contrast, U.S. border communities are eligible for numerous federal and state programs aimed at mitigating the effects of income disparities on infrastructure. In addition, U.S. communities routinely access municipal bond markets to finance environmental infrastructure. This is not to say that there are no problems in the U.S. border region. Low incomes, rapid population growth, and more stringent national standards have all put strains on the financing capacity of U.S. border communities.

There are five major alternatives for financing environmental infrastructure:

- *Tax Financing.* Current tax revenues are often inadequate to finance environmental infrastructure, which requires large initial outlays while the receipt of user fees are delayed (Standard & Poor's 2000). Nevertheless, border municipalities without access to financial markets may be forced to utilize current tax revenues. The consequence can be inadequately maintained facilities and environmental degradation.

- *General Obligation Bonds.* General obligation bonds are secured by tax revenues and backed by the full faith and credit of the municipality.
- *Revenue Bonds.* A very common method of financing environmental infrastructure is with revenue bonds. Revenue bonds differ from general obligation bonds in that they are secured by a dedicated revenue stream generated from a particular municipal enterprise, such as a sewage treatment plant or a landfill.
- *Contracting with the Private Sector.* Contracting with the private sector to provide environmental infrastructure can be beneficial in two ways. First, to the extent that the private sector can provide services at a lower cost, the financial needs of the community can be reduced. Second, by privatizing services, the community can access the financial resources of the businesses providing the services.
- *Philanthropy.* Philanthropy is an appealing source of financing since it represents an actual increase in the funds available for the community for environmental infrastructure investment.

There are three institutions primarily concerned with border infrastructure:

- *International Boundary and Water Commission (IBWC).* The IBWC is responsible for maintaining the boundary between the United States and Mexico and managing issues involving the waters of the Rio Grande and the Colorado River. Its responsibilities include resolving water quality problems and designing, constructing, operating, and maintaining wastewater treatment facilities along the border. The IBWC also administers the EPA's Facilities Management Planning Grant Program, which provides technical assistance to communities attempting to develop water or wastewater projects for the Border Environment Cooperation Commission (BECC) certification.
- *Border Environment Cooperation Commission (BECC).* The primary roles of the BECC are to provide technical assistance to border communities and to certify environmental infrastructure projects in the border region for financing consideration by the North American Development Bank (NADB) and other sources.
- *North American Development Bank (NADB).* The NADB's primary purpose is to facilitate financing for the development,

execution, and operation of environmental infrastructure projects. Only projects certified by the BECC qualify for construction financial assistance from the NADB. The NADB provides direct financing in the form of loans or guarantees for BECC–certified environmental projects. The NADB administers grant funds provided by other donors through the Border Environment Infrastructure Fund (BEIF). This fund was originally financed with a \$170 million contribution from the EPA. In addition to financing, the NADB also provides technical assistance to communities to help them develop the financial and administrative capacities of utility managers and their staffs.

Under the NADB’s charter, it is required to make loans at a rate sufficient to compensate for the cost of funds and risk associated with lending on border infrastructure. These restrictions on the rate the NADB can charge often results in the NADB being priced out of the market. Larger communities on the U.S. side generally have lower cost alternatives to finance projects. Smaller communities cannot afford the NADB’s interest rate. The U.S. Government Accounting Office (GAO) has recommended to the U.S. Congress that the NADB’s charter be amended to allow the NADB to charge below market rates, which, in effect, would mean that it would be subsidizing loans to border communities.

Two important reforms that will likely continue to proceed in Mexico are increasing reliance on private contracting and the development of municipal bond markets. Mexico’s wide-ranging privatization initiatives have resulted in the modernization and increased efficiency in numerous industries. Among the most promising areas for private investment are water and wastewater treatment projects. The government has demonstrated its commitment through the development of transparent bidding procedures and by learning from past mistakes. Mexico has taken these important steps to attract much needed investment to infrastructure projects that are key to ensuring the country’s continued competitiveness. To create a viable financing package, the risks associated with water projects in Mexico must be carefully allocated among project participants. In general, the commercial risks associated with the completion and operation of the project should be allocated to the private sector participants while the political risks are increasingly being assigned to the federal, state, or municipal govern-

ments or to participating multilateral agencies.

There are several reasons to believe that the time is right for the development of a Mexican municipal bond market:

- Municipal bond markets have been established in a number of developing countries over the last few years. During a recent two-year span, Standard & Poor's (1999), for example, rated 13 municipal bond issues in emerging markets, mainly in Latin America and Eastern Europe. These municipalities were located in "middle income" countries with similar macroeconomic circumstances to Mexico.
- The overall credit position of Mexico has improved dramatically since the 1994 peso crisis. This positive trend has been reinforced by the sharp rise in oil prices.
- The favorable economic conditions that characterize the overall Mexican economy apply even more so to the northern frontier region. This region has seen the greatest economic growth over the last two decades. This economic growth has created the economic depth conducive to the establishment of financial markets.

While circumstances are favorable for movement toward the establishment of a municipal bond market, there are still considerable hurdles. An insufficient local tax base is a major problem. Under the Mexican Constitution, most taxes are deposited with the federal government. Local governments then depend on revenue sharing financed by federal and state governments. Another problem for Mexican border communities is the lack of adequate management institutions beset by administrative deficiencies, inadequate financial control, and a lack of legal authority to collect user fees and taxes. Underlying these management problems is the more fundamental problem of inadequate human capital needed to plan, implement, and maintain environmental infrastructure.

While many obstacles remain for the establishment of a fully functional bond market, the first steps toward the formation of such have already occurred. For example, in December 1997, the state of Guanajuato issued 10-year GTO bonds secured by revenue generated from Guanajuato–Silao toll road (Nacional Financiera 1997). The cities of Medina and Monterrey, and the states of Nuevo León and Durango, have all received positive reviews from Standard & Poor's.

## INTRODUCTION

The U.S.–Mexican border is the world's longest and most frequently crossed border between a developing and a developed country. On both sides, world-class manufacturing coexists alongside third-world poverty. While rapid population growth, sprawling maquiladora plants, deficient urban planning, egregious poverty, drought, illegal immigration, drug trafficking, and environmental problems all characterize the region, it is also a place of dynamic change and growth. It is the contact point between two very different countries that share a past of conflict, but more importantly, that also share a future of trade and cooperation. Indeed, the development of broad-based/cross-border civil entrepreneurship is leading to greater cooperation between all sectors of the border community. These efforts should be encouraged and the resulting positive energy must be channeled into constructive solutions for sustainable development along the border.

Growing environmental deterioration along the border has prompted concern about promoting sustainable economic development. An important element in sustainable development is the provision of environmental infrastructure such as a safe water supply, wastewater treatment, and solid waste management (U.S. EPA and SEDUE 1992; U.S. EPA 1996). Indeed, the most severe environmental problem is the challenge of supplying clean, reliable sources of water, which is especially relevant in the fragile, arid areas that characterize much of the U.S.–Mexican border region. Given the poverty of the area, environmental protection measures must consider economic realities to be successful. Water is scarce along the border, but funds to finance much-needed infrastructure are even scarcer. Both Mexican and U.S. government agencies have recognized this and, consequently, have adopted policies that emphasize sustainable development that is both financially and environmentally sound (Thoms and Betters 1998).

This paper will examine the future of the U.S.–Mexican border region from the narrow perspective of the financing of environmental infrastructure. The authors worked under the assumption that current financing mechanisms for water infrastructure in Mexico will not be adequate to meet future demand. Most of this paper is devoted to examining two mechanisms that could be used to channel greater investment into water infrastructure along the border: private sector participation in Mexican water utilities through the granting of

Design, Build, and Operate (DBO) concessions and the development of a municipal bond market. The advantages of each approach, as well as the barriers to the successful implementation of these reforms, are highlighted.

## A SNAPSHOT OF THE BORDER

The border region is experiencing explosive population growth, which is taxing existing social infrastructure such as schools, hospitals, and public transportation. The demands of a growing population are creating severe environmental problems. Specifically, governments are straining their resources to provide residents with potable water and to treat the growing quantities of wastewater. More than 10 million people live in the border region. If the 1990–1995 migration patterns continue, the border population will grow by more than 12 million people in the next 20 years. Two-thirds of this growth is projected to occur on the Mexican side of the border. For example, in 1978, Tijuana had only 400,000 inhabitants; today, it has almost 1.6 million. Growth rates for Matamoros, Reynosa, Nuevo Laredo, Piedras Negras, Ciudad Juárez, and other Mexican border cities are equally shocking.

Much of the population growth along the border can be attributed to the explosion of maquiladora plants in the border region. Maquiladoras are assembly plants that import parts primarily from the United States and then export assembled goods back to the originating country. As of 1998, approximately 2,500 foreign companies have established operations in the border region to take advantage of Mexico's competitive labor force, the geographic proximity to the United States, and the benefits of temporary importation programs. To date, the maquiladora industry has generated over 1.2 million direct jobs and many more indirect jobs in Mexico. Over 72% of all maquiladora jobs have been created along the border. Border officials have been quick to take credit for the rapid growth of the maquiladora industry, correctly pointing to the success of maquiladora attraction programs. Unfortunately, little urban planning has accompanied these very successful programs. The consequence has been increasing environmental degradation. In the press, maquiladoras have been blamed for many of the environmental problems facing the border region. While much of this criticism is justified, it should be noted that the managers of many maquiladoras have been willing to contribute to the development of

their region, but have not been presented with a general framework in which to do so. New efforts must be launched to incorporate maquiladoras into a sustainable growth model for the border.

While great efforts were undertaken to attract foreign-owned manufacturers to the region, little attention has been paid to constructing the social infrastructure necessary to meet the needs of maquiladora workers or to protect the environment. The border suffers from an acute lack of almost all basic infrastructure, including schools, hospitals, day-care centers, housing, potable water, electricity, paved roads, solid waste landfills, and so on. One of the most desperate problems is the lack of housing. The housing deficit in the border region is estimated at 500,000 units. Faced with the lack of options for housing, workers who arrive at the border from the interior of Mexico begin to form irregular housing developments, which eventually lead to social and environmental problems, including serious problems related to potable water and sewage treatment. These migrant neighborhoods lack almost all basic services. As a result, health problems and environmental damage are commonplace. The current urban development model in the border region is unsustainable.

Much of the U.S. infrastructure shortfall can be found in small, unincorporated communities located primarily in Texas and New Mexico called colonias, which often lack even the most basic services. While several federal and state programs are directed at providing colonia residents with basic water and sanitation services, colonias are generally located outside of established water districts. Colonias lack both the tax base and the administrative resources to qualify for bond financing or bank loans (GAO 2000). There are federal and state programs to assist colonias in obtaining basic services; however, program requirements often restrict the use of these funds. For example, federal funds cannot be used to improve property that is subject to ongoing litigation, which is often the case with colonias; many programs cannot be used to improve property located in flood plains, as many colonias are; and Texas does not allow funds to be used to establish septic systems if current plans call for connection to a sewer system, even if the plans are not expected to be executed in the near future. According to the GAO (2000), between 1989 and 1999, \$579 million was allocated to improve colonia environmental infrastructure in Texas, but only \$337 million was spent due to constraints on funds. The

NADB's Small Communities Initiative would dedicate \$1 million in matching funds to small communities in each of the four border states, but no funds have yet been released from this program.

Population growth, industrial activity, and severe drought are rapidly degrading the border environment. Environmental problems include lack of municipal solid waste landfills, clandestine hazardous waste dumps, poor air quality, destruction of natural habitat, contaminated drinking water, and insufficient wastewater treatment capacity. Border environmental infrastructure needs (including water, wastewater, and solid waste) identified in early 1999 by the BECC and the NADB total approximately \$1.7 billion. This figure could more than double in the next 10 years. Within the wide range of environmental problems, the most severe in the border region are the quantity and quality of available water. Since one of the most pressing issues is how to finance the millions of dollars needed along the border for water and wastewater infrastructure, this paper will look closely at the financing of water infrastructure on the Mexican side of the border. From this analysis, lessons can be learned for the financing of other types of environmental infrastructure.

## THE NEED FOR ENVIRONMENTAL INFRASTRUCTURE

Most U.S. border communities already have access to clean drinking water. However, existing facilities require rehabilitation and expansion, and some communities need entire new systems due to neglect or lack of funds (BECC 1998). Many infrastructure needs faced by border communities arise from regulatory changes. For instance, satisfying the rules imposed by recent amendments to the Safe Drinking Water Act (SDWA) requires further treatment of potable water. Additionally, more stringent regulation under the Clean Water Act (CWA) has imposed greater controls on effluent quality, sludge disposal, and storm water overflows. The full cost of compliance with these standards is currently uncertain (Standard & Poor's 2000). With regard to waste management, residents of colonias and rural areas generally lack comprehensive solid waste collection. A major challenge for municipalities is complying with evolving state and federal regulations, which in some cases now require multiple liners, leachate collection and treatment, and methane gas collection (Standard & Poor's 2000).

On the Mexican side of the border, the problem is more fundamental, being one of basic access to services. Mexico's Comisión Nacional del Agua (CNA), or National Water Commission, estimates that only 88% of the population has access to safe drinking water, 75% have access to sewage collection, and 34% have access to wastewater treatment (BECC 1998). These estimates are probably overly optimistic, especially given the migration of population from the interior to the border in recent years. Collection, management, and disposal of solid waste are often done by institutions with administrative inadequacies and without adequate legal authority. Only 86% of households have waste collection and only 53% of that is deposited in sanitary landfills (BECC 1998).

The need for additional environmental infrastructure along the border is well recognized, yet finding funds to finance such investment is a challenge. Between 1994 and 1999, through various initiatives, the United States and Mexico have provided approximately \$3.1 billion to address border environmental infrastructure needs (GAO 2000). Of these funds, approximately 80% has been provided by the United States, mostly by the EPA. While billions of dollars have already been spent, billions more need to be spent. The Southwest Center for Environmental Research and Policy (SCERP) estimated in 1999 that an additional \$3.2 billion is required to meet existing infrastructure requirements on both sides of the border for safe water, wastewater treatment, and solid waste disposal. About 77% of this amount is needed for wastewater treatment.

The timely building of environmental infrastructure is a crucial element of sustainable development. Households have a high demand for safe and convenient water supply as well as for sewage disposal. Should the community not provide these services, individuals will often take action to secure them privately. However, the technology available to individuals is often not as cost effective nor as efficient as the technology available at the community level. Indeed, private actions can even compromise the public provision of services. For example, faced with a lack of a reliable public water supply, households will resort to private wells as supplements. If these wells are pressurized, as is often the case, it is possible that well water will be pumped into the community's water supply, thereby compromising the public water system.

## THE BENEFITS OFFERED BY A FINANCIAL SYSTEM

A financial system provides three key benefits: risk sharing, liquidity, and information services. The financial system allows risk sharing by making it easier for savers to hold a diversified portfolio of assets. Diversification reduces the risk faced by savers since a low return on one asset tends to be offset by a high return on another asset, allowing for a more steady return. Savers value liquidity because they may need to spend assets, and financial markets and intermediaries provide mechanisms that increase asset liquidity. Finally, a financial system can provide information services, which include both information gathering and information communication. These benefits make savers more willing to hold financial assets, increasing the municipalities' ability to raise funds at low cost.

Information services are particularly important in the development of a municipal bond market for financing border infrastructure. Financial markets quickly absorb information, incorporating it into the price of financial assets, thereby communicating the status of such assets to other market participants. The easiest way to understand this is through the following example: suppose that new information becomes public about employment generated from a new manufacturing plant located in ABC Township. Market participants will evaluate the effect of the employment on tax revenue available to service ABC's outstanding bonds. If the bonds are now more secure, the price will be bid up. Of course, the bonds might have been overvalued (perhaps the new employment generated was disappointingly small), in which case the bond's price will be bid down. In either case, information about the township's new situation is quickly incorporated into the bond's price. In general, municipal bond prices, like the price of other types of financial assets, will fluctuate to reflect risk, liquidity, and information costs. By so fluctuating, market prices convey information to market participants about the municipality backing the bonds.

Border communities will likely need help in overcoming information problems. Investment banking is an institution that helps to overcome information costs. These institutions specialize in advising on how to raise funds. Investment bankers may recommend that a municipality finance infrastructure through a bank loan, through private placement

of debt, or through a public bond issue depending on the credit characteristics of the municipality. While each situation is unique, generally municipalities with limited credit will have to use bank financing or private placement. Municipalities with better credit will be able to use bond financing. If the decision is to issue bonds, the investment banker advises on the term of the bond issue. An important function performed by the investment banker is to underwrite the public offering.<sup>1</sup> In underwriting the issue, the investment banker promises to purchase the unsold portion of the new issue, thereby guaranteeing the success of the issue. The fact that the investment banker is willing to underwrite conveys to the market information about the quality of the issue.

Given the specialized needs of the border, the development of an investment banker dedicated to border development may be appropriate. In recent years, the NADB has begun to develop into just such a specialized investment banker for the border, having shifted somewhat away from acting as a direct lender. For example, the NADB served as the investment banker, securing funding from other sources, as well as lender in the financing of the Agua Prieta Landfill project. Similarly, NADB served as financial “advisor” as well as lead lender on the Brawley, California, Wastewater Treatment Plant. By serving as an investment banker, the NADB is reducing the information cost of border financing and increasing available funds.

Another group of institutions that have developed to help overcome information problems are bond-rating services. Bond-rating services assign a rating to a bond issue that indicates the default risk associated with that bond. Highly rated bonds face little or no default risk while lower rated bonds face greater default risk. While bond-rating systems vary slightly, the rating systems are rather similar; for example, Moody’s system ranges from least risky to most risky (Aaa, Aa, A, Baa, Ba, B, C, and D). Bonds rated Baa or better are considered investment grade and have little default risk. Bonds rated less than Baa are considered speculative and are sometimes referred to derisively as “junk bonds.” Bonds rated D either are in default or thought likely to soon enter default. While bonds may also be unrated, many investors require that they be rated before they will purchase them.

Both investment bankers and bond-rating services will require municipalities to meet certain standards before they will certify credit worthiness. An example of this is the Institutional Development Cooperation Program (IDP) sponsored by the NADB. The program

provides technical assistance to local utilities aimed at enhancing the administrative and financial strength of the utility. The kinds of studies financed under the IDP include water rate studies, user registry update, and implementation of a management information system.<sup>2</sup> While programs like the IDP are helpful, the need for administrative reform among border municipalities remains.

Bond-rating agencies also offer technical assistance to improve the credit worthiness of a municipality seeking a rating. Below are listed in more detail the types of actions investment bankers and bond-rating agencies will likely require of municipalities if a bond market is to be established. The point here is that the requirements placed on municipalities by investment bankers and bond-rating agencies are the types of reforms consistent with good government and sound municipal finances. Regardless of the desirability of environmental infrastructure financing, reforms consistent with the establishment of a bond market are exactly the types of reforms that promote efficient and democratic local government.

## BORDER ENVIRONMENTAL INFRASTRUCTURE INSTITUTIONS

There are three institutions primarily concerned with border infrastructure. These are the IBWC, the BECC, and the NADB. The IBWC has been in operation for more than a century while the BECC and the NADB were established in conjunction with the North American Free Trade Agreement (NAFTA). The remainder of this section describes each of these institutions.

### *International Boundary and Water Commission (IBWC)*

The IBWC was established by international treaty between Mexico and the United States in March 1889. Its jurisdictions and responsibilities were expanded under the Water Treaty of 1944 to include the U.S.–Mexican border and inland into the two countries where both countries have constructed international projects (IBWC 1998). It is responsible for maintaining the boundary between the United States and Mexico and managing issues involving the waters of the Rio Grande and the Colorado River. The IBWC's responsibilities include

resolving water quality problems and designing, constructing, operating, and maintaining wastewater treatment facilities along the border. The IBWC also administers the EPA's Facilities Management Planning Grant Program, which provides technical assistance to communities attempting to develop water or wastewater projects for IBWC certification.

The IBWC has developed a reputation of supporting the building of so called "cement edifices," that is, traditional, large-scale wastewater treatment facilities. The IBWC constructed and maintains wastewater treatment facilities in the South Bay area of San Diego, California, and in Nogales, Arizona. These two projects involved a total U.S. federal government investment of \$321.9 million. The IBWC was also involved in the construction and maintenance of the international waste treatment plant in Nuevo Laredo, Tamaulipas. Many observers have criticized the IBWC's reluctance to consider alternative technologies that some view as more appropriate solutions to border infrastructure shortfalls. Others criticize the critics as inappropriately applying a politically correct criteria.

Under the 1944 Treaty, the IBWC was allowed to conclude international agreements, with the approval of the two national governments, in the form of IBWC Minutes. Between 1994 and 1998, the IBWC has concluded nine such agreements. Six of these concerned environmental infrastructure (IWBC 1998). Of these six agreements, four concerned IBWC's relationship with BECC. The creation of the BECC and the NADB have led to a reduction in the role played by the IWBC in transboundary environmental infrastructure (GOA 2000). Generally, the IBWC has taken on a supporting role in the post-NAFTA era.

#### *The Border Environment Cooperation Commission (BECC)*

The primary responsibilities of the BECC are to provide technical assistance to border communities and to certify environmental infrastructure projects in the border region for financing consideration by the NADB and other sources (BECC/NADB 1999). The BECC's assistance helps ensure technically sound and feasible projects, master plans, project design, environmental assessment, and local institutional capacity building. Approximately \$15.5 million have been allocated by the BECC's Technical Assistance Program to aid in the develop-

ment of 107 environmental infrastructure projects and/or concepts related to water, sewage, and municipal waste in more than 78 communities on both sides of the U.S.–Mexican border.

Certified proposals must meet certain criteria for technical and financial feasibility. The projects must be environmentally sound, self-sustaining, and supported by the public (GAO 2000). The BECC also assists states and localities in the preparation, development, implementation, and oversight of environmental infrastructure projects in the border region. The BECC restricts its concern to water, wastewater, and solid waste disposal. It emphasizes the importance of project sustainability in its certification process since past projects have been built in poor communities with grants and other assistance that could not be properly maintained due to the communities' limited administrative capacity and financial resources. The BECC also provides technical assistance to border communities with project development activities, including devising plans, creating project designs, and performing environmental assessments. As of September 1999, the Border Commission had certified 31 projects—12 in Mexico and 19 in the United States. Twenty-eight projects were for water and wastewater treatment systems, and three were for solid waste disposal facilities. The total estimated construction cost of these projects is \$680.2 million, and when completed they are expected to benefit more than six million people. The United States and Mexico provide annual appropriations to the BECC to cover operational expenses. The initial agreement creating the BECC required that the national governments provide full funding for five years. Despite continued need for environmental infrastructure, funding by the national governments has been reduced as of the fiscal year 2000. In addition, most of the EPA's technical assistance funding to U.S. and Mexican communities for water or wastewater treatment projects is channeled through the BECC.

#### *North American Development Bank (NADB)*

The NADB's primary purpose is to facilitate financing for the development, execution, and operation of environmental infrastructure projects. Only projects certified by the BECC qualify for construction financial assistance from the NADB. The Bank provides direct financing in the form of loans or guarantees for BECC-certified environ-

mental projects. To date, the NADB has made seven loans totaling more than \$11 million. Three loans have gone to Brawley, California; Mercedes, Texas; and Ciudad Juárez, Chihuahua.; the other four loans were channeled through the Corporación Financiera de Desarrollo de América del Norte (COFIDAN), which was developed to finance projects sponsored by public entities in Mexico. These loans were made to Tijuana, Baja California; Agua Prieta, Naco; and Puerto Pensasco, Sonora.

The United States and Mexico agreed to contribute equally to the capitalization of the NADB. The agreement called for a total lending capacity of \$3 billion with \$450 million as paid-in capital and an additional \$2.55 billion as callable capital. To date, each country has contributed \$174.4 million (78%) of the paid-in capital, with the remainder to be paid by September 2004. The NADB's paid-in capital is available to support borrowing for its international programs. Callable capital is composed of funds that the governments are to provide—if required—to meet outstanding debt obligations or guaranties issued by the NADB (GAO 2000).

The NADB administers grant funds provided by other donors through the Border Environment Infrastructure Fund (BEIF). This fund was originally financed with a \$170 million contribution from the EPA. The BEIF provides grants to communities to reduce the total cost of needed projects. These BEIF funds may be applied to water and wastewater projects on the U.S. side of the border; however, they are only available to finance water and wastewater projects on the Mexican side of the border if the infrastructure deficiency affects communities in both countries. If grant funds are used on the Mexican side of the border, Mexico must provide an equal border investment. As of September 1999, nearly 93% of BEIF funds had been committed. Without continued funding for BEIF grants, environmental infrastructure development along the border will be jeopardized. Through September 1999, BEIF grants accounted for 96% of NADB funds provided to U.S. projects and 88% of NADB funds provided to Mexican projects.

In addition to financing, the NADB also provides technical assistance to communities to help them develop the financial and administrative capacities of utility managers and their staffs. The IDP is designed to assist public utilities in the areas of institutional strengthening and financial development to ensure long-term viability of infra-

structure projects. So far, 75 projects in 58 communities have been funded. The NADB has recently initiated a program called the Utility Management Institute (UMI). UMI is designed to provide water utility personnel with the specialized knowledge needed to organize, administer, and finance water utilities.

## REFORMING THE NADB

While the NADB has initiated a number of programs, it has had a limited impact on border infrastructure. In particular, it has made very few direct loans. As of September 1999, the NADB had obligated a total of \$154.5 million in loans and grants to fund construction for 20 BECC-certified projects. However, direct loans represent only 3.2% of the NADB's current paid-in capital. The biggest source of the NADB's assistance has been through BEIF grants. All but four of the 20 NADB-financed projects had such grant funding. Since the creation of the BEIF, 93% has already been obligated.

Why has the NADB made so few direct loans? Under its charter, it is required to make loans at a rate sufficient to compensate for the cost of funds and risk associated with lending on border infrastructure. These restrictions on the rate it can charge often results in the NADB being priced out of the market. Larger communities on the U.S. side of the border generally have lower-cost alternatives to finance projects. Smaller communities cannot afford the NADB's interest rate.

The GAO (2000) has recommended to the U.S. Congress that the NADB's charter be amended to allow it to charge below market rates, which, in effect, would mean that the NADB would be subsidizing loans to border communities. Both the U.S. State Department and the EPA concur with this proposal, but the U.S. Treasury Department is opposed (GAO 2000). The Treasury Department argues that the problem is not that interest rates are too high, but that border communities are extremely poor. Moreover, border utilities do not have the technical capacity to manage financial resources and infrastructure projects. In addition, the Treasury Department stated that the NADB effectively has a mechanism that provides low-cost financing by combining loans with grants. While the Treasury Department is correct in its position that often a lack of expertise is as great (or even greater) an impediment to successful management of environmental infrastruc-

ture as is lack of financing, high interest rates also serve as a barrier to the border communities' ability to access NADB's capital.

Current financial theory emphasizes the fact that financial institutions provide information services, a role which was not mentioned by the GAO nor considered by the Treasury Department, and which cannot be duplicated by grant financing. Banks serve as information warehouses, gathering information about potential borrowers and using that information to determine which borrowers represent the best credit risks. Given the special information advantage enjoyed by banks, a bank loan conveys information about credit worthiness to other potential borrowers. By lending, a bank indicates that its information is such that it believes that the borrower is a good credit risk. Conversely, by declining to lend, a bank indicates that the borrower is not a good credit risk. Thus, other potential lenders, seeing that the bank is willing to lend to a borrower, will also lend to that borrower. This argument would indicate that the NADB can play a special role in border infrastructure finance; because the NADB is a specialist in lending to border environmental infrastructure projects, its decision to lend or not to lend provides a particularly important signal to other potential lenders.

Grants can also play a role in conveying information about the credit worthiness of an infrastructure project in that the NADB is unlikely to make grants for projects it sees as having no value. However, the information conveyed by grants is likely to be of lower quality than the information conveyed by loans. First, because grants are a one-time event, there is less incentive for the NADB to monitor the project on an ongoing basis. Thus, while a useful indicator of the current credit worthiness of a project, grants provide less information about future credit worthiness. Second, because grant recipients need not qualify for loans to receive a grant, the credit worthiness of the recipient, all else constant, should be less than for those receiving a loan.

There is one final reason for amending the NADB's charter to allow concessionary lending. Such a change in the law, if nothing else, increases the options available to the organization's management. The NADB will be better able to design financing packages that meet the needs of border communities if concessionary lending is allowed.

## SOURCES OF FUNDING FOR ENVIRONMENTAL INFRASTRUCTURE

There are a wide variety of methods by which environmental infrastructure can be financed. Here the focus is on some of the more important alternatives. These include tax financing and user fees, central government grants, general obligation bonds, revenue bonds, contracting to the private sector, and philanthropy. The exact combination of funding sources that are accessed by a particular community varies depending on circumstances. Not surprisingly, the set of options available to U.S. communities is greater than those available to Mexican communities. U.S. communities have access to the most developed financial system in the world while Mexican communities are embedded in an economy that has experienced periodic financial crises. Because municipal ratings are restricted to no higher than the national government (Moody's 2000), a lack of confidence in the financial stability of the Mexican federal government adversely affects the cost of funds to local municipalities. U.S. communities also have a larger tax base than their Mexican counterparts and have independent tax authority. In Mexico, the tax distribution is tilted toward the federal government and municipalities are dependent primarily on property taxes.

The following is an elaboration of each of the major alternatives in financing environmental infrastructure.

### *Tax Financing and User Fee*

Current tax revenues, including user fees, are often inadequate to finance environmental infrastructure, which requires large initial outlays while the receipt from taxes and user fees are delayed (Standard & Poor's 2000). These problems are compounded by difficulties in collecting user fees in many border communities, which are characterized by extreme poverty. Nevertheless, border municipalities without access to financial markets may be forced to utilize current tax revenues. The consequence can be inadequately maintained facilities and environmental degradation.

### *Direct Grants*

Both the Mexican and U.S. federal governments have provided direct grants to local governments. However, these programs have been reduced on both sides of the border. In Mexico, the funding mechanisms for water supply and wastewater infrastructure are currently in a state of flux. Traditionally, almost all monies came from direct federal appropriations to the CNA. As part of Mexico's larger process of decentralization, states and municipalities are now called upon to finance more public works projects. The federal government still plays a dominant role in the financing of water infrastructure, but it is moving away from direct grants and more toward loan programs. Most of these funds are still provided through the CNA, but non-CNA federal grants are also available under the so-called Ramo 33 program, which assigns resources directly to Mexican state and local governments for social programs, including environmental infrastructure. Unfortunately, Ramo 33 funds have been reduced as a result of the 1999 budget conflict.

There has also been a reduced emphasis placed on direct grants in the United States. EPA funds were once distributed directly to pay for the construction of wastewater treatment facilities. However, amendment to the Clean Water Act shifted funds from direct construction grants to state revolving funds (SRFs), which act as environmental infrastructure banks. Most states have used the SRFs to subsidize loans to local government.

### *Direct Loans*

As previously indicated, an important source fund for direct loans for U.S. communities has been the SRFs, which, in effect, act as infrastructure banks. These SRFs often secure pooled loans that are then sold in bond markets. Another important source of direct loans for border communities is the NADB, which was discussed earlier. The Banco de Obras Publicas (BANOBRAS) (Mexican Public Works Bank) provides loans to state and municipal governments for water infrastructure projects. BANOBRAS created a special program called the Fondo de Inversión en Infraestructura (FINFRA) (Infrastructure Investment Fund), which is designed to provide resources for key infrastructure projects in Mexico. FINFRA was originally funded in

the amount of approximately \$170 million through the privatization of state-owned enterprises such as the railroads. The fund provides risk capital and credit enhancement mechanisms for, among others, water and wastewater facilities.

### *General Obligation Bonds*

General obligation bonds are secured by tax revenue, and are backed by the full faith and credit of the municipality. This type of bond is popular with investors because of their reputation for safety. Such bonds can be used to finance environmental infrastructure but there are certain disadvantages to doing so. For instance, general obligation bonds encumber the overall financing capacity of the municipality (Standard & Poor's 2000). Municipalities may not want to use general obligation bonds, which affect overall credit worthiness, when it is possible to use revenue bonds secured by dedicated revenue stream from a municipal enterprise. Moreover, for municipalities with poor credit, investors may view revenue bonds as more secure. A further constraint on using general obligation bonds for Mexican municipalities is the constitutional prohibition against the issuing of foreign currency denominated debt. This restriction severely limits municipalities' direct access to U.S. financial markets. Also, because Mexican municipal revenues are restricted to property taxes, their narrow tax base further limits access to financial markets (Standard & Poor's 2000).

### *Revenue Bonds*

A very common method of financing environmental infrastructure is with revenue bonds. Revenue bonds differ from general obligation bonds in that they are secured by a dedicated stream of revenues generated from a particular municipal enterprise such as a sewage treatment plant or a landfill. Revenue bonds are a particularly promising way to pay for environmental infrastructure along the border since the revenue streams from infrastructure projects actually have better credit characteristics than do the overall communities.

The viability of revenue bonds is obviously dependent on the ability of facility managers to collect user fees. This can be difficult in communities that are characterized by extreme poverty, such as those

along the border. User-fee collection is further complicated by long-standing custom. For example, in Ojinaga, Chihuahua, approximately half of the population is connected to the sewer system. Of that one half, only half pay their hookup fee in any given month. When asked why this failure to pay user fees was tolerated, the system administrator responded that the Mexican Constitution prohibits the cutting off of basic services for nonpayment, yet municipal officials in other communities do not view the Mexican constitution as limiting their ability to withhold services for nonpayment. If revenue bonds are to become a significant source of financing for environmental infrastructure, constraints on user-fee collection—whether real or perceived—must be removed.

### *Contracting with the Private Sector*

Contracting with the private sector to provide environmental infrastructure can be beneficial in two ways. First, to the extent that the private sector can provide services at a lower cost, the financial needs of the community can be reduced. Second, by privatizing services, the community can access the financial resources of the businesses providing the services. While contracting with the private sector can be financially advantageous, using private providers adds the need for oversight. Specifically, the provision of water, sewage removal and treatment, and solid waste disposal are public goods in the sense that they are nonexclusive and nonrival. Ensuring the social welfare requires that the community actively monitor service providers to ensure that services are provided at an adequate level (Cointreau-Levine 1994). Thus, hiring private contractors requires an extra layer of management not required for direct public provision of these services. The decision to contract privately then comes down to a comparison of the costs of contracting services versus the direct provision of resources.

### *Philanthropy*

Philanthropy is an appealing source of financing since it represents an actual increase in the funds available for the community for environ-

mental infrastructure investment. The border presents several interesting issues from the point of view of philanthropic giving. First, by the standards of the third world, the U.S.–Mexican border is relatively prosperous. Thus, in the context of Mexico, philanthropic foundations may prefer to allocate resources to other areas of greater perceived need, such as the southern part of the country where poverty is more extreme than along the border. However, by standards of the industrialized countries, the border region is extremely poor. The colonias are among the U.S. communities most in need of outside support. Moreover, because of its proximity to the United States, any funds allocated to the Mexican border region will likely have relatively high visibility. High stock prices, which have inflated the endowments of many U.S. charities, coupled with U.S. tax laws that require charities to disperse a minimum percentage of their endowment each year, means that many U.S. foundations are looking for worthy projects. Thus, this may be a particularly opportune time to seek funding for border environmental infrastructure expenditures.

## WATER IN MEXICO

Mexico, taken as a whole, has a sufficient water supply, yet it is not equally distributed throughout the country. For example, central and northern Mexico receive only 9% of the country’s annual rainfall while supporting 75% of the country’s total population, 70% of its GNP, and 40% of its agricultural land (Table 1). Mexico’s per capita water con-

Table 1: Water Supply and Consumption and Productivity by Territory

Territory	Precipitation	Population	Industrial Activity	Agricultural Land
Central Plains, North and Northeast	9%	75%	70%	40%
South and Southeast	70%	20%	Incipient	20%

Source: CNA.

Table 2: Water Demand by Sector

Country	Agriculture	Industry	Domestic Use
China	87%	7%	6%
Egypt	88%	5%	7%
India	93%	3%	4%
Mexico	83%	3%	14%
France	12%	71%	17%
UK	1%	78%	21%

Source: World Business Council for Sustainable Development.

sumption is very similar to other OECD countries (Table 2). However, Mexico tends to waste much more water than its OECD colleagues.<sup>3</sup>

### *Water Rights*

Article 27 of the Mexican Constitution establishes that all water belongs to the federal government. The CNA, created in 1989, is charged with distributing water through the granting of concessions for both water usage and discharge. The CNA is a semi-autonomous agency of the Secretariat of the Environment, Natural Resources and Fisheries (SEMARNAP). Under authority granted by Article 20 of Mexico’s Water Law, the CNA has granted usage and discharge concessions to approximately 300,000 states, municipalities, farming operations, and industries.

The right to extract and use water depends on the type of usage and the availability of water in the user’s region of the country. “Regular” or qualified users are those who comply with the terms of the concessions granted to them by the CNA by paying extraction quotas and respecting discharge standards. Unfortunately, the list of “irregular” users is growing rapidly. Irregular users frequently do not pay for the water they use or do not comply with discharge standards. Furthermore, clandestine users, who do not have concessions to extract water from or discharge into the country’s hydraulic system, are also growing in number. Mexico must work aggressively to more thoroughly regulate the use of its water resources and to implement systems that can promote the principle that the end-users must pay for the water they consume and contaminate.

To a certain extent, industrial users in Mexico are the only users who are paying the true cost of water service. Industry currently subsidizes both agricultural and domestic users. Agricultural users do not pay for the right to use water and domestic usage is highly subsidized. For industrial users, a fee is determined for every cubic meter of water used, while domestic users pay the same fee but for every thousand cubic meters consumed. In other words, industrial users pay 10 times more than domestic users. The current system does not promote the efficient use of Mexico's water resources.

Mexico is currently undergoing an impressive decentralization of the management and operation of its water resources. With greater frequency, responsibilities are being relegated to state and municipal governments. As municipalities demonstrate their ability to take on more responsibility, the CNA and the state governments are affording them greater authority. This has occurred in many border cities. For example, the CNA has granted a concession to the municipal government of Reynosa to operate the city's potable water distribution and treatment system. The city carries out this task through its water utility department, the Comisión Municipal de Agua Potable, Alcantarillado y Saneamiento (COMAPAS) (Municipal Commission for Potable Water, Sewage, and Treatment). Likewise, several other cities such as Nuevo Laredo and Matamoros operate their own COMAPAS departments. The state government of Tamaulipas also plays an important administrative role as overseer of the COMAPAS. Tamaulipas is one of several states that has formed an entity called the Comisión Estatal de Agua Potable y Alcantarillado (CEAPA) (State Commission for Potable Water and Sewage). The CEAPA is charged with overseeing the COMAPAS and coordinating water usage for the entire state. The objectives are to reach higher levels of efficiency in water usage, reduce contamination, and avoid conflicts between the various municipalities. The development of administrative capacity is an important component in achieving CEAPA's goals. The CEAPA also serves as a water utility for communities with fewer than 50,000 inhabitants. Both the COMAPAS and the CEAPA's systems are an integral part of the CNA's decentralization program.

The decentralization of water administration places the provision of this vital public service in the hands of local authorities, who are more in tune with the demands of city residents. This is a significant deviation from Mexico's traditionally centralized governmental *modus*

*operandi*. However, many municipalities are not prepared to take on the complicated task of operating a water utility. Specifically, local governments lack the tax base necessary to construct much-needed infrastructure. They also often lack adequate administrative capacity. Exacerbating the problem is the fact that the federal government recently cut appropriations to states and municipalities.

### *Wastewater Discharges*

End-users must also pay to discharge wastewater into the national water system. Wastewater discharge charges are established primarily according to compliance or noncompliance with contaminant limits set by the CNA. While compliance problems are ubiquitous, poor billing practices mean that revenue generated from wastewater charges is almost nonexistent. The failure to enforce discharge charges creates incentives for continued pollution. Municipalities are required to treat their waste streams before releasing them back into national waterways, yet despite these requirements, the majority of municipalities do not treat their wastewater. This creates serious problems for downstream users. Untreated agricultural runoff is also troublesome given the large amounts of fertilizers and pesticides used by Mexican farmers. In the border region, these virtually untreated waste stream flows empty into common aquifers as well as surface waters, leading to serious cross-border environmental problems.

The Mexican agricultural sector uses an enormous amount of the border’s water and significantly contributes to water pollution. The country as a whole is grappling with how to rationalize agricultural policies dating back to the revolution that create incentives for inefficient water use and continued pollution. The agricultural sector consumes approximately 83% of Mexico’s water supply while contributing only 3% to the overall GNP. Complicating matters is the fact that

Table 3: Wastewater Generated by Sector

Urban /Residential	Industry	Agriculture
28%	10%	62%

Source: CNA.

agricultural users do not have to pay for the right to extract water. In addition, electricity used to pump water for irrigation is heavily subsidized. Finally, agricultural users generate the majority of the country's wastewater, yet they do not pay discharge quotas regardless of the level of pollution in their wastewater (Table 3). Free water and cheap energy for irrigation have led to the inefficient use of water by Mexican farmers. This is particularly important along the border where agriculture, industry, and human consumption compete for the region's scarce water resources.

## WATER ON THE BORDER

Water is becoming scarce along the border. The desert region is arid and problems related to water scarcity have been exacerbated by extreme drought conditions in recent years. Population growth, industrial activity, cattle ranching, and farming are increasing demand for water. At the same time, the lack of rainfall is leading to the depletion of existing reserves and has led to an overreliance on groundwater. The current depletion of groundwater reserves is unsustainable and the trend must be reversed. Infrastructure improvements must be made that will lead to more efficient water usage and conservation.

The scarcity of water in the region, intensified by the current drought, has highlighted the need for communities to make significant investments in water infrastructure for three principal reasons. First, investments must be made to reduce waste. Border communities traditionally lose up to 40% of their precious water reserves through leaks and poor management. Second, drainage system improvements are needed to capture runoff from torrential desert downpours. A significant percentage of the border's rainfall comes in the form of sudden and rapid thunderstorms. Current infrastructure does not allow for the capture of such rainwater and the opportunity to harness this vital supply is lost. Third, there is a need for more reservoirs to store water for times of drought. Many of the dams built along the border under the auspices of the IBWC were built precisely with this purpose in mind. However, more large scale and localized rainfall reservoirs are needed in most border communities.

There are four main competing users for the border's scarce hydraulic resources: human consumption, industry, agriculture, and habitat pro-

tection. Solutions to the border region's water problems, in order to be sustainable, must take into consideration all four of these uses. A balance must be struck that permits economic growth, protects the environment, and provides for safe drinking water for border residents.

## THE VICIOUS CYCLE OF MEXICAN WATER UTILITIES

Before private investors will seriously consider participating in Mexican water projects on a broad scale, the “vicious cycle” of water utilities must be broken. Mexican water utilities are taking important steps to restructure themselves and to attract private sector investment. Nevertheless, much remains to be done.

### *Physical Infrastructure*

Enormous investment in physical infrastructure is needed. Due to the dilapidated nature of existing infrastructure, much of the potable water provided to water utilities is lost. Both the U.S and Mexican governments must provide more grant monies to fund infrastructure improvements. Supplemental sources of funding, such as user fees, are the key to the long-term sustainability of water utilities. Nevertheless, as a result of the magnitude of the problem, grant monies are the only way to remedy the current infrastructure deficit. In some cases, sewer systems are in place, yet do not have the capacity to handle the demands of the border's rising population. Higher demand is stretching the limits of the current infrastructure, which, in turn, is accelerating the depreciation of infrastructure and leading to even higher capital needs.

### *Operation and Maintenance Costs*

Mexican utilities struggle to keep up with rising operation and maintenance costs. Often times, Mexican utilities do not have the capital reserves needed for preventative maintenance and unexpected repairs. As a result, the system is beginning to break down more frequently and water is wasted. More importantly, delays in repairing the physical

infrastructure eventually results in the need to spend more on upgrading the entire system. Future financing packages and infrastructure designs must take into consideration operation and maintenance costs. For example, efforts must be made to guarantee that user fee streams are sufficient to cover operation and maintenance costs. Occasionally, state-of-the-art systems put in place in Mexican water utilities require prohibitively high operation and maintenance costs. Policymakers must select systems that attack the fundamental problems related to water quality while taking into consideration that operation and maintenance costs must be covered by user fees. This pragmatic approach may necessitate selecting less than ideal technology, yet will contribute to the financial sustainability of water utilities.

### *Collections Procedures*

Mexican border utilities are working aggressively to improve their billing procedures. In fact, some of the nation's most efficient water utilities are found in the border region. For example, after years of hard work, Tijuana is one of the most successful utilities in billing and collecting for water service. Unfortunately, many border water utilities are not collecting from municipal end-users. Grant monies are necessary to put in place the proper collections infrastructure. Such grants would allow utilities to eventually become self-sufficient. For example, meters must be installed and computers and billing software must be upgraded. Most importantly, governments must demonstrate the political will to go out and collect from a populous that is not accustomed to paying the true cost of water service.

### *Human Resources and Institutional Memory*

Constant employee turnover in Mexican water utilities inhibits their long-term viability. On average, employees stay for 1.8 years in border utilities. Today, the proper functioning of a water utility requires a core of specialized civil servants. The proper operation and maintenance of plants and equipment demands highly trained personnel. In addition, the lack of institutional information on consumption patterns and costs reduces the utilities' ability to plan for the efficient use of water resources. Accurate information on consumption habits, industrial pollution, peak demand times, groundwater reserves, and the true cost of service does not exist in many water utilities. In the

short run, federally funded programs, such as those administered by the NADB, that train water utility personnel and work on institution building must be expanded.

### *Ability to Pay—End-Users and Municipalities*

Making the Mexican water sector more attractive to investors will most likely require an increase in water rates. To pay for the enormous capital investments needed, private investors or bondholders will most likely require raising rates for the end-users. Many of the border's poorest residents cannot afford higher water rates. Merit-based subsidies must be put in place that take into consideration the ability of the end-user to pay. Likewise, many politicians are hesitant to raise rates. As it stands now, municipalities struggle to collect from end-users and often times do not have the resources to pay the CNA for their water usage.

### *Willingness to Pay*

After years of bad service and subsidized rates, many of Mexico's end-users are not willing to pay more for water. After generations of paternalistic governmental policies, many residents see water service as a fundamental right that should be provided by the government at little or no cost. This culture of nonpayment is in direct conflict with the interests of private investors. Obviously, private sector operators will have to win over consumers through improved service.

### *Political Will*

Politicians must be willing to support moderate rate hikes in the face of public opposition. Water utilities in Mexico are faced with serious challenges when it comes to collecting from domestic users. Many politicians are reluctant to take the steps necessary to collect from delinquent customers. Faced with the electoral pressures of a young democracy, many political parties are unwilling to accept the consequences of rate hikes. Exacerbating the situation is the heated competition for limited public funds. Water utilities compete with other basic social needs such as schools, transportation, hospitals, and public safety. Often times, water infrastructure is not a hot button issue for voters and gets put on the bottom of the list of priorities.

### *Budgetary Restrictions*

Frankly, water utilities are overwhelmed by the enormity of current infrastructure needs. Federal, state, and municipal budgets have all been cut back in recent years and governments are struggling to expand their tax bases. Despite these noble efforts, most water utilities' budgets are still too small. As a result, until user fee streams increase and local governments can diversify their tax base, grant monies will be necessary. The Mexican government should consider using portions of the additional revenue generated by the increase in the international price of petroleum to fund much needed water infrastructure projects.

### *Budgetary Fluctuations*

In Mexico, the tax base available to municipal governments is very limited, which makes local governments overly dependent on federal subsidies for the development of water infrastructure. Much of the funding provided to municipalities for water projects are discretionary appropriations from the federal government and are based, to a large extent, on political considerations. Such funding schemes can vary with the political winds and make it difficult to plan. Likewise, most investors and lenders are hesitant to rely on these future revenue streams.

## MOVING TOWARD GREATER PRIVATE SECTOR PARTICIPATION

Two major reforms are recommended—the establishment of a municipal bond market and the use of private sector concessions. It is important to note that these reforms are not independent of each other. Many of the changes needed to establish a viable bond market are identical to those required to attract private capital funding of environmental infrastructure. Moreover, implementation of one reform will make the other reform more attainable. For example, bonds might be used to raise seed money for the establishment of a treatment plant that can then be administered by a private concession. By the same token, by allowing the private sector to take responsibility for the operation and maintenance of the plant, the municipality can improve its credit

worthiness. Current political and financial conditions are conducive to the implementation of these two reforms for a number of reasons:

- Municipal bond markets have been established in a number of developing countries over the last few years. During a recent two-year span, Standard & Poor's (1999), for example, rated 13 municipal bond issues in emerging markets, mainly in Latin America and Eastern Europe. These municipalities were located in middle-income countries with similar macroeconomic circumstances to Mexico.
- In addition to establishing bond markets, middle-income countries have also relied more on the private sector in providing services.
- The overall credit position of Mexico has improved dramatically since the 1994 peso crisis. This positive trend has been reinforced by the sharp rise in oil prices. As a consequence, Mexico's national credit rating has been upgraded to investment grade by the bond-rating agency Moody's, and Standard & Poor's is expected to follow suit (*Wall Street Journal* 2000). The bond rating of the national government is important because municipal bonds cannot receive a rating in excess of those of the national government (Moody's 1999). Mexico's improved financial condition, therefore, makes it easier to establish a viable municipal bond market.
- The favorable economic conditions that characterize the overall Mexican economy apply even more so to the northern frontier region. This region has seen the greatest economic growth over the last two decades; economic growth has created the economic depth conducive to the establishment of financial markets. Because the northern frontier is the most economically advanced region, it is likely that this region will be the area that first develops a municipal bond market, with the exception perhaps of Mexico City.

### *Municipal Bond Markets*

While circumstances are favorable for movement toward the establishment of a municipal bond market and increased reliance on private concessions, there are still considerable hurdles. For example, one problem is an insufficient local tax base. Under the Mexican Consti-

tution, most taxes are deposited with the federal government. Local governments then depend on revenue sharing financed by federal and state governments. The legal basis for state and local government finance is the Municipal Reform Law of 1983 and subsequent amendments of 1990 and 1995 (Fallon 1999). Under the Sistema Nacional de Coordinación Fiscal, 20% of income taxes, value-added tax, and special tax on production (which represents about 90% of all federal collections) are rebated to state governments. At least 20% of the states' shares are passed on to municipalities.

Another problem is that Mexican border communities often lack adequate management institutions and are beset by administrative deficiencies, inadequate financial control, and lack the legal authority to collect user fees and taxes. Underlying these issues is the more fundamental problem of inadequate human capital needed to plan, implement, and maintain environmental infrastructure (GAO 2000).

While many obstacles remain to the formation of a fully functional bond market, the first steps toward its formation have already occurred. For example, in December 1997, the state of Guanajuato issued 10-year bonds secured by revenue generated from the Guanajuato–Silao toll road (Nacional Financiera 1997). These bonds are not currently actively traded; nevertheless, the success of the issue indicates the potential for future bond issues. The cities of Medina and Monterrey, and the states of Nuevo León and Durango have all received positive reviews from Standard & Poor's. Figure 1 contains a case study for Nuevo León.

### *Private Concessions*

Mexico's wide-ranging privatization initiatives have resulted in the modernization and increased efficiency in numerous areas of the economy, from a revival of its mining and steel industries to a sweeping overhaul of the country's telecommunications and transportation infrastructure. One of the most promising areas for private investment is water supply and wastewater treatment projects. Broad-based privatization plans in recent years demonstrate the government's continued desire to open its economy and to enhance Mexico's attractiveness as a destination for investment. The country has taken several important steps to attract much needed investment to infrastructure projects. This approach is key to ensuring the country's continued competitiveness.

Figure 1: Nuevo León Case Study

Nuevo León is located in northern Mexico and shares a small border with the United States. The majority of economic activity is located in the capital of Monterrey, 140 miles south of Laredo, Texas. Monterrey is home to many of Mexico's largest industries, including Grupo Alfa, Grupo Finsa, and Grupo Vitro. The economic strength and diversity of Monterrey contributes to a relatively high standard of living and healthy labor market. However, the intergovernmental relationship with the federal government limits Nuevo León's share of tax receipts generated from its economy. Nevertheless, the financial operations of Nuevo León are generally stable. In recent years, annual budgets have been virtually balanced, with revenues and expenditures within 1% of each other.

As a result of limited revenue raising flexibility and the limited ability of the states to benefit from any growth in the local economy, close oversight of the balance between revenues and expenditures is critical. Nuevo León has developed a good track record in its fiscal trends, which are backed up by timely independent financial audits. However, much of Nuevo León's budget is considered to be nondiscretionary.

Management structure, systems, and controls are satisfactory and the recently institutionalized rules governing debt and financial reporting have contributed to a greater ability to oversee the state's fiscal picture. The mandate for a balanced budget also provides some long-term stability. The state oversees 53 public entities as well as a pension system. Operating subsidies are 657 million pesos or 5% of the budget.

Nuevo León was recently rated by Standard & Poor's on its CaVal scale as mxBBB. According to Standard & Poor's:

*The CaVal scale rating on the State of Nuevo Leon reflects:*

- *A very high level of dependence on the federal government for revenues,*
- *High levels of fixed costs including outstanding debt and pension obligations, and*
- *A perceived lack of flexibility to raise nonfederal revenues, which combined with modest financial reserves, leaves the state vulnerable to outside fiscal shocks.*
- *Countering these concerns to a degree is the sound industrial base in Monterrey that provides for economically driven growth in local revenues (Fraser and Fallon 2000, 1).*

Standard & Poor's rating does not apply to any particular debt issued by the Nuevo León government, although it expected that it would be used by the federal Hacienda to evaluate the credit risk exposure of the national development banks and commercial lending banks.

Source: Fraser and Fallon 2000, 1.

This section of the paper is based on the premise that, as a result of the 1994 economic crisis, the subsequent banking sector bailout, budget cutbacks in 1999, and most importantly, competing societal needs such as education, public safety, and health care, the Mexican federal government is no longer able or willing to fulfill its traditional role as the principal developer of water and wastewater infrastructure. In order to guarantee that the current water and wastewater infrastructure deficit does not exacerbate environmental and health problems along the border, the private sector must join in the development and financing of these important projects. Failure to lure private enterprise into the Mexican water sector will only widen the disparities between the United States and Mexico, possibly jeopardizing economic integration in the NAFTA region.

Private sector development of water and wastewater infrastructure in Mexico will be carried out through a series of international financing mechanisms such as Project Finance (which will be discussed in further detail later) and the development of municipal bond markets. Programs administered by the BECC/NADB, BANOBRAS/FINFRA, the IBWC, and by grant monies from national and international sources (such as the EPA) can substantially enhance Project Finance and bond market investment mechanisms. In fact, bilateral organizations, federal agencies, municipal leaders, and the private sector must all be engaged in a constructive dialogue designed to find creative solutions to infrastructure financing needs.

### *Three Steps to Financial Reform*

There are several reforms a Mexican border water utility should initiate in order to make their project more attractive to private investors:

1. Develop a more reliable billing registry of end-users; analyze rate setting criteria in the operation and maintenance of the utility's infrastructure; establish a transframework that clearly defines water rights, rate setting authority, and the rights to sue for nonpayment; determine enforcement authority between federal, state, and municipal governments; and begin an aggressive water conservation campaign.
2. Invest multilateral and federal grant monies in computer equipment, meters, and collection systems; increase customer satisfaction through improved service (monitor customer sat-

isfaction); continue to update billing information and train technical staff; complete a detailed audit of the condition of existing infrastructure; identify and prioritize pressing infrastructure needs; quantify operation and maintenance costs for the infrastructure to be concessioned; and explain the objectives of the concessionary program to key leaders in the community.

3. Work to reduce operation and maintenance costs; invest grant monies in infrastructure repairs designed to reduce system inefficiencies, such as leaks; launch a public education campaign on the benefits of private participation in the water sector; generate computerized maps of the existing system; establish a transparent procedure for the granting of the concessions, which includes dispute resolution procedures; and internationally publicize the concessionary program.

### *Project Finance*

There are several challenges faced by the private sector when trying to use mechanisms to obtain financing for Design, Build, and Operate (DBO) contracts with Mexican water utilities. The term *Project Finance* refers to a financing arrangement in which a lender or group of investors finance a specific infrastructure project rather than an entity such as a corporation. One important example of Project Finance is the use of revenue bonds issued by a municipality. Credit evaluation is based primarily on the adequacy of expected future cash flow from the project itself to service the debt and not on the overall credit rating of the corporation. Under this type of mechanism, the legal liability of the project sponsor is restricted and specifically contractually defined, which has given rise to the term “nonrecourse financing.” This type of financing limits the sponsor’s risk to the amount invested in the infrastructure project and to any other specifically defined guarantees. For this reason, the company is able to keep the project debt off of its financial balance sheet, which is why this type of structure is also referred to as “off-balance sheet” financing. These projects usually involve the development and operation of capital such that corporations would consider this level of debt to be an unacceptable capital structure. Thus, the ability to keep the debt off of

the corporate balance sheets is one of the primary advantages to the sponsor of this type of project.

Many infrastructure projects would provide an inadequate return if capitalized with a level of debt consistent with most corporate capital structures. In contrast, significantly increasing the financial leverage allows the owners to improve the rate of return on the capital invested in a project. Because of this ability to improve the return of large-scale capital investments and the ability to minimize risks, a company will often undertake an infrastructure project that would be considered too risky or to have an insufficient return given the debt burden if undertaken using traditional balance sheet financing schemes.

Project Finance allows a lender to monitor and exert certain contractually-defined control over the allocation and disbursement of funds needed for the construction of the given infrastructure projects. This allowed control is through relatively restrictive loan covenants and recourse against independent third party experts, such as property appraisers and construction advisors, who can be authorized to approve or reject actions of the project participants. Such enhanced degree of control is extremely important to lenders who assume the vast majority of the risks associated with the financing of an infrastructure project. In contrast, traditional financing mechanisms afford the lender much less control over management's selection of projects, methods of financing, and the use of funds. Also, because a Project Finance scheme generally carries a higher debt load as a percentage of total capitalization than most companies, the lender can place the funds at higher rates of interest than it could lending directly to a corporation. Thus, provided the lender can properly mitigate its liability exposure, it can realize high rates of return on a Project Finance scheme than it can on a traditional corporate lending transaction. Due to these higher margins and the increased oversight capability commensurate with this type of project, lenders have more incentives to provide funds to a capital-intensive infrastructure project in Mexico than it would for projects it considered a less-than-acceptable credit risk.

As a result of the benefits associated with Project Finance mechanisms, many water projects in Mexico could be undertaken that would otherwise not be completed if a corporation were forced to build on a balance sheet and with full recourse against the corporation. However, the high degree of leverage and the limited recourse present challenges

that must be overcome in order to create an acceptable credit risk. This is accomplished by carefully designing the project so that creditworthy project participants or other interested third parties assume the risks inherent in water and wastewater projects. An effective project is usually organized so that each of the risks is allocated to the party in the best position to mitigate that risk. The primary goal is to organize infrastructure developments in such a fashion that various parties can contribute their individual strengths supported by proportional guarantees while not exposing themselves to liability for the entire project. The combination of parties and their limited guarantees must be sufficient to create a creditworthy project in the eyes of international lenders. Logically, if a governmental agency, the NADB, or a creditworthy state government provides a full or partial guarantee, then this task becomes much easier.

### *Risks Associated with Private Sector Financing*

Private investors will not participate in the Mexican water sector if risk is excessive relative to return. Each project has its own unique characteristics and associated risks; however, certain types of risks are common to most water projects in Mexico. Risks can be categorized as follows:

#### *Participant Risk*

In DBO water projects, participants can include design firms, construction companies, municipal water utilities, equipment suppliers, lenders, etc. In many financing schemes the individual participants in a water project are only liable for their particular part of the puzzle and not for the entire project. Therefore, it is very important that the proper mix of participants be assembled to ensure the overall success of the project. The following are two major factors that determine the eligibility of a participant for a project:

- *History.* The key question here involves the participant's track record. Do they have the proven experience and expertise necessary to complete their assigned tasks within the time frame allotted while also managing the types of risk that are allocated to them?
- *Creditworthiness.* If a participant agrees to a contractually defined obligation, the sponsors and lenders must have confi-

dence that the entity is capable and willing to comply with these obligations. In Mexico, there is a shortage of credit information on most private companies. Likewise, most municipal water utilities do not have documented credit histories that comply with international lending standards. This makes it difficult to determine the creditworthiness of many of the participants in a given project.

### *Permit Risk*

Generally speaking, there are two types of permits: (1) preconstruction permits that lenders usually require before the project financing can be obtained, and (2) milestone permits or permits that, by their very nature, cannot be obtained until construction (and therefore funding) has commenced. Lenders typically require assurances from the project sponsor that each of the permits required will be obtained in time. A very important factor is the faith (or lack thereof) that the lenders and sponsors have in the transparency and objectivity of the permitting process. The subjective application of the permitting requirements oftentimes irreversibly damages the confidence of investors. In Mexico, the transparency and objectivity on the part of regulators who grant all necessary permits is vitally important to the success of a DBO project.

### *Design Risk*

If there is a flaw in the design, the project is not likely to proceed successfully. A paradigm shift is needed with respect to the design of infrastructure in the border. Traditionally, projects have been designed without taking into consideration the limited budgets of most water utilities. For example, engineers are customarily called in to design a project that will solve a specific water supply or sanitation problem. Once the project is designed, construction, operation, and maintenance costs are calculated. As a result of the scarce budgetary resources, engineers should design a facility that coincides with the funds available to the municipality.

Likewise, project design should incorporate realistic operation and maintenance costs given the limited revenue streams of most water utilities. One of the primary design considerations in Mexico is the choice of equipment. Using reliable and proven technology may reduce the

risk of unexpected problems down the road. Nevertheless, top-of-the-line international technologies are not always appropriate for Mexican water utilities. Most Mexican utilities have very small operating budgets. Often high-tech solutions for Mexico's water problems do not take into consideration these budgetary shortfalls. For example, given the low water rates and poor collection practices, water utilities do not generate sufficient resources to cover operation and maintenance costs. Likewise, sophisticated equipment requires a high level of operator expertise, which is often not available to many utilities. Frequently, equipment is not properly maintained and tends to break down. This, in turn, leads to the need to prematurely replace equipment and exacerbates competition for limited municipal resources. Increased training and lower employee turnover would lead to a more efficient use of the border region's scarce water and budgetary resources.

In Mexico, the lack of standardization and certification for water technologies has led to the sale of inferior products such as meters, valves, and pipes. As a result, several multinational companies have sold inferior or outdated equipment to Mexican water utilities, which has resulted in unnecessary problems. Options must be available for the purchase of parts and equipment that are specifically designed for Mexico's needs and which can be purchased in pesos from local suppliers.

### *Construction Risk*

Construction risk includes the possibility that the facility will not be completed according to design specifications, that construction is delayed and/or over budget, or that performance criteria are not met. In these cases, it may be necessary for sponsors to increase their investment or for lenders to increase the amount of or extend the terms of their loans. Construction risks come in many forms, including the following:

#### *Completion Delays*

The cash flow projections and agreements with the project lenders assume a specific date when the project will begin operating and producing revenues. A completion delay can increase capitalized interest, reduce the present value of future cash flows, and harm the project's ability to service its debt. A delay can also expose the project sponsor to contractually defined liabilities for failure to meet promised delivery dates to the water utility.

### *Cost Overruns*

Cost overruns may be caused by many factors including mistakes in design, increases in the costs of key construction materials, regulatory or legal changes, and contractor incompetence. In Mexico, cost overruns are often caused by the sudden or gradual devaluation of the peso. A weaker peso can lead to cost overruns when the project budget is established in pesos and large percentages of the building materials are imported from the United States. Further, governmental entities, for reasons of sovereignty, tend to carry out public bidding procedures in Mexican pesos. To counteract the destabilizing factor of currency fluctuation, most construction budgets are now established in dollars. Despite the fact that budgets are calculated in dollars, cost overruns caused by fluctuations in the exchange rate are frequent.

### *Condition of Mexico's Large Contractors*

In the construction of water infrastructure projects in Mexico, it is vital to retain a contractor who is experienced and financially sound. Several of Mexico's contractors are still reeling from the 1994 peso crisis, the ensuing recession, the disastrous toll road concessions of the early 1990s, and recent federal budget cutbacks for public works projects. Therefore, the choice of a Mexican contractor should be made with extreme care and a great deal of research. In addition, Mexican builders, especially the small- and medium-sized companies, are not accustomed to building under project finance schemes in which maintaining strict completion schedules is an integral part of the financial viability of the entire project. As a result, it is often difficult to maintain construction schedules on medium-sized projects.

### *Operating Risk*

An assessment of operating risks focuses on the project's output levels, costs, and longevity. These are necessary to service the project's debt and meet its contractual obligations. The water utility should require that a builder's contract include post-completion guarantees with provisions for liquidated damages in the event of construction-related operational problems. Operating risk may be reduced greatly if management is experienced and competent. Nevertheless, even the most

competent operator will not be able to control all of the factors that could affect the operation of the project.

A significant source of operating risk is inflation. Mexico's inflation rate has oscillated around 17% in the last few years. For this reason, many long-term operational agreements contain cost escalation provisions in line with increases in a published price level index.

### *Commercial Risk*

All projects need to ensure that their supply of raw materials and/or fuel is assured at a reasonable price and that the output generated by the project can be sold at prices sufficient to cover debt service. The primary commercial risks are the availability and price of raw materials, transportation, and the market risk associated with selling the finished product. The principal market risk in Mexico is the fact that end-users are not accustomed to paying the true cost of water service and politicians are hesitant to raise rates.

### *Exchange Risk*

International investors in most DBO concessions will want to convert collected user fees into their home currency. If the peso drops significantly in value, debt service payments and/or profits could be impacted. Therefore, it is extremely important that steps be taken to protect all project participants from sudden and drastic fluctuations of the pesos collected from end-users. This is especially true given that debt service payments are generally payable in U.S. dollars, while the principal source of repayment is generated from user fees based on the often volatile Mexican peso.

There are several mechanisms for reducing devaluation risk including forward contracts, hedging, forward swaps, and by matching receipts and payments by currency. Mexico's history of periodic devaluations causes investors and lenders alike to shy away from peso-based revenue streams. While some economists contend that severe devaluations are much less likely in Mexico today, effective hedging strategies will probably be necessary for several more years until the peso can demonstrate a stable track record. For this reason, the credit enhance-

ment mechanisms offered by the NADB should put more emphasis on devaluation coverage for private sector DBO concessions.

### *Regulatory Risk*

Regulations have a significant impact on the viability of private investment in environmental infrastructure projects. Regulatory changes can impose the need for expensive redesign or retrofitting. Arbitrary enforcement of existing regulation can also impose added expenses. Mexican environmental laws are progressive and compare favorably with U.S. laws. But in the near term, neither the resources nor the will exists to strictly enforce environmental laws. Long-term economic development and increased environmental awareness will likely result in stricter enforcement. How to establish a grandfather clause for projects built after environmental regulations were placed on the books, but before the laws were strictly enforced, is yet to be resolved.

Because of the changing political and regulatory environment in Mexico, there is the possibility that the government will make changes in laws or regulations that could render the project unprofitable. Such changes could include user-fee price controls, excessive taxation, the requirement to provide service to remote areas, and new environmental enforcement tactics. Recent democratic reforms in Mexico have given rise to a more equitable distribution of the development of legislation between the executive and legislative branches and between the federal, state, and local governments.

Despite the enormous benefits of Mexico's democratic reforms, the process of transformation can lead to regulatory uncertainty, confusing laws, and unpredictable jurisdictional lines. The current system for the establishment of regulatory guidelines for environmental infrastructure projects is in a state of flux. As a result, private participants in water projects are faced with a higher level of regulatory risk. This dramatically changing regulatory framework is offset by many of the provisions found in NAFTA, Chapter 11, which are designed to protect investors and create a more transparent investment environment.

### *Legal Risk*

The CNA is working aggressively to create a legal environment conducive to private investment in water projects. These reforms are creat-

ing more interest on the part of many international investors. Both DBOs and bond issues involve complex contractual relationships in which it is crucial that the relationship among investors, managers, and the municipality is clarified. It is imperative that the court system be adequate to resolve complex contractual issues in a consistent and predictable manner. In Mexico, the legal system is in the process of developing the resources to adequately resolve business and property rights disputes. Nevertheless, many investors are still hesitant to rely on Mexican courts in resolving disputes.

A well-developed body of commercial law that resolves disputes in a fair and timely manner is essential to promote greater investment. Mexico needs to promote the transparent and objective interpretation and implementation of its laws. Such efforts are important in order for lenders and project sponsors to effectively plan and identify the requirements and risks associated with projects in Mexico. Unclear laws and their subjective application expose all parties to additional risks. As a result, lenders will charge high interest rates and investors will seek higher returns to compensate for the additional risk. This ultimately raises the cost of environmental infrastructure to the end-user.

Contract rights of private parties participating in concession water projects in Mexico must be improved so as to provide greater legal certainty. The control, transfer, and mitigation of project risks associated with large water projects are often addressed through a complex series of contracts referred to as the “security package.” These contracts bind the parties by specifically delineating the responsibilities of each of the project participants. These contracts are used to facilitate the debt financing by holding the project consortium together and allowing each project participant to take on the risks that it is best suited to manage and control. To obtain project financing, it is crucial for all contracts to interlock and form a “watertight” credit structure, since the contracts are the only real source of security to the lenders. Lenders and project participants alike are weary of being subjected to the rigors of the Mexican court system, especially when their potential adversary is a Mexican governmental body who may have sovereign immunity. Thus, they seek to resolve disputes in a foreign country or through an international arbitration venue. As one can imagine, Mexican state and local governments are reluctant to agree to any dispute resolution mechanism other than national courts.

### *Political Risk*

In Mexico, changes in municipal governments present political risks for DBO concession holders. Subsequent governments from different political parties may seek to revoke the concession granted by the prior administration. In recent years, Mexico has taken significant steps to create a more open and democratic society. However, the country's fledgling democratic institutions cause potential investors to be concerned that legal protections offered to foreigners will be restricted.

To avoid political opposition, it is recommended that investors require broad-based local participation in a project. This can be accomplished through a variety of mechanisms such as local equity ownership, inclusion of local banks in financing, and the use of local suppliers and labor. One of the most frequently overlooked advantages of the BECC-certification process is the development of community-based public participation forums. The BECC has created a vehicle for public participation in investment decisions in Mexico where one did not exist. This contribution to democracy and civil entrepreneurship should not be underestimated.

### *Political Will*

While the need for private investment in environmental infrastructure in Mexico is obvious to most, there are still groups that strongly oppose privatization and liberalization efforts. Their influence can clearly be seen in the Zedillo administration's 1997 policy reversal concerning petrochemical privatization. If private investment is to provide the infrastructure that Mexico so desperately needs, then the government must demonstrate the political will to continue with promised privatizations even in the face of political opposition. Also, for certain types of projects, such as DBO contracts, it is important that users be charged the true cost of the service provided in order to create viable revenue streams. Water tariffs in Mexico have traditionally been subsidized and it is not certain if the country's leaders have the political will to raise the cost to the end-user. The reality is that rates must be raised to levels that would support international mechanisms for infrastructure finance.

Water subsidy policies should be redesigned so as to promote more efficient water use while protecting Mexico's urban poor. The outcome

of federal, state, and municipal elections in July 2000 will determine, to a large extent, the future of private participation in border water projects. Many parties, and citizens in general, are still very hesitant to relinquish governmental control over key public services such as water.

## NOTES

1. Meaning to underwrite the issue by itself but through a syndicate.
2. As of June 1999, 71 municipalities had participated in IDP.
3. For more information regarding the Organisation for Economic Cooperation and Development (OECD) and its member countries, including Mexico, see the OECD's Web site at <<http://www.oecd.org>>.

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