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Promoting Air Quality Improvements with Carbon Finance

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ABSTRACT

This paper examines the potential to promote air quality improvements in northern Mexico with carbon finance and identifies elements of an institutional framework for facilitating project development. The focus is on energy efficiency (EE) activities under the Clean Development Mechanism (CDM) of the Kyoto Protocol, because clear potential exists in this area. However, the general discussion can be extended to many other project types, including landfill gas-to-energy and other renewable energy projects, agricultural projects, fuel substitution and clean vehicle/fleet projects, and non-CDM carbon markets.

There is a huge opportunity for air quality improvements through EE measures in northern Mexico. Unfortunately, numerous barriers to EE projects exist, and many efficiency gains and air quality improvements go unrealized. Participation in CDM could be a catalyst to more successful EE project development. Energy savings generate carbon credits that could be sold under CDM. The revenues could be used to redress certain financial barriers to EE implemen-

tation. High-quality credit opportunities might also induce technical assistance (as they already have) and technology transfer from industrialized countries.

High transaction costs and a low carbon revenue stream are barriers to developing EE projects under CDM. The notional solution is to advance a portfolio of projects and bundle the credits through an intermediary. Transaction costs are thus spread over a number of projects and, collectively, the projects generate enough credits to meet the market's demands. In practice, this approach has proven difficult.

However, Mexico, and northern Mexico in particular, has a comparative advantage in the greenhouse gas (GHG) marketplace vis-à-vis many other developing countries:

- It is a large country with a carbon-intensive economy and growing energy demand
- Energy-saving opportunities are relatively homogeneous and highly replicable
- It is the only developing country in the world with free trade agreements with Canada, the United States, the European Union, and Japan, and it has several bilateral agreements with Annex-I countries, including Canada and Japan, to promote CDM
- Mexico's business culture is more familiar to many of the multinational businesses that will be prominent buyers of carbon credits, and this may translate into preference for Mexican-sourced credits vis-à-vis credits from other potential suppliers

Many organizations and institutions are currently engaged in EE-related activities in northern Mexico. Their interests are clearly convergent and there is an opportunity to align their various activities to work collaboratively toward their common goal. The various organizations should explore the potential to collaborate more closely. This begins as an exploratory process and, if successful, converges to a commitment to a framework for collaborative action. The aim is to identify synergies, align activities, and mobilize the resources required to initiate and sustain a program for CDM EE activities.

With the first Kyoto commitment period beginning in less than three years and the uncertain value of post-2012 credits, it is critical to act quickly. With U.S. and international cooperation, it is possible to develop Mexico's advantage and capitalize on the opportunity to use carbon finance to promote energy efficiency and other air quality improvement opportunities.

Fomento de Mejoras a la Calidad del Aire con Financiamiento de Carbono

David Noble

RESUMEN

Este capítulo examina el potencial para fomentar una mejor calidad del aire en el norte de México con el financiamiento de carbono e identifica los elementos de un marco institucional para facilitar el desarrollo de proyectos. El enfoque es en las actividades de eficiencia energética (EE por sus siglas en inglés) amparadas en el Mecanismo de Desarrollo Limpio (MDL) del Protocolo Kyoto ya que existe un claro potencial en esta área. Sin embargo, la discusión general puede extenderse a muchos otros tipos de proyectos incluyendo la conversión del gas de los rellenos sanitarios a energía y otros proyectos de energía renovable, proyectos relativos a la agricultura, proyectos de sustitución de combustible y de vehículos/flotas limpias y mercados de carbono sin un CDM.

Existe una gran oportunidad para mejorar la calidad del aire a través de medidas de eficiencia energética en el norte de México. Desafortunadamente, existen numerosos obstáculos para proyectos de EE, y no se logran realizar muchas ganancias de eficiencia y mejoras a la calidad del aire.

La participación en el CDM pudiera ser un catalizador para un desarrollo de proyectos de EE más exitosos. Los ahorros de energía generan créditos de carbono que podrían venderse bajo el MDL. Las ganancias pudieran ser utilizadas para remediar ciertos obstáculos financieros para la implementación de la EE. Oportunidades de crédito de alta calidad pudieran también inducir asistencia técnica (como ya lo han hecho) y transferencia de tecnología proveniente de países industrializados.

Los altos costos de las transacciones y un flujo bajo de ingresos de carbono son barreras para el desarrollo de proyectos de EE bajo el MDL. La solución hipotética es adelantar una cartera de proyectos y agrupar los créditos a través de un intermediario. Los costos de las transacciones son por lo tanto extendidos en diversos proyectos y colectivamente, los proyectos generan suficientes créditos para satisfacer las demandas del mercado. En la práctica, este enfoque ha resultado difícil.

No obstante, México, y en particular en el norte de México, tiene una ventaja comparativa en el mercado de los gases de efecto invernadero (GHG, por sus siglas en inglés), con relación a muchos otros países en vías de desarrollo.

- México es un país grande con una economía intensiva de carbono y creciente demanda de energía.
- Las oportunidades de ahorro energético son relativamente homogéneas y altamente reproducibles.
- Es el único país en el mundo en vías de desarrollo con tratados de libre comercio con Canadá, los Estados Unidos, la Unión Europea y Japón, y tiene varios acuerdos bilaterales con países Anexo-I, incluyendo Canadá y Japón, para fomentar el MDL.
- La cultura empresarial de México es más familiar para muchos de las empresas multinacionales que serán los compradores prominentes de créditos de carbono. Esto podría traducirse como una preferencia créditos de fuentes mexicanas en relación con créditos de otros posibles proveedores.

Numerosas organizaciones e instituciones actualmente participan en actividades relacionadas con la EE en la parte del norte de México. Existe claramente una convergencia de sus intereses y existe una

oportunidad para alinear sus diversas actividades para trabajar en colaboración hacia su fin común. Las diferentes organizaciones deberían explorar el potencial de colaborar más estrechamente. Esto comienza como un proceso de exploración y, si resultara exitoso, converge en un compromiso de un marco para acciones en colaboración. El objetivo es identificar sinergias, alinear las actividades y movilizar los recursos requeridos para iniciar y sustentar un programa para las actividades de EE del MDL.

Con el primer periodo de compromiso de Kyoto que inicia en menos de tres años y con el valor incierto de créditos post-2012, es crítico actuar rápidamente. Con la cooperación estadounidense e internacional, es posible desarrollar la ventaja de México y capitalizar sobre la oportunidad de utilizar el financiamiento del carbono para fomentar la eficiencia energética y otras oportunidades para mejorar la calidad del aire.

INTRODUCTION

This paper introduces the potential role of carbon finance in facilitating local initiatives to improve air quality in northern Mexico. It reviews some of the carbon finance opportunities in Mexico and examines the specific opportunities and challenges associated with providing carbon financing for energy efficiency (EE) project activities in particular. Numerous organizations are currently involved in carbon finance and/or EE activities in northern Mexico and their interests are clearly convergent. Collectively, and in synergy, they can address many of the challenges to EE, and, it is hoped, catalyze wide-scale project implementation. The challenge is to craft and mobilize an appropriate framework for institutional collaboration.

THE INTERNATIONAL CARBON MARKETS AND CARBON FINANCE

Greenhouse gas (GHG) emission trading has existed for more than 10 years, but has grown substantially in recent years with the entry into force of the Kyoto Protocol and the emergence of numerous voluntary and mandatory trading schemes. For developing coun-

tries, the protocol's Clean Development Mechanism (CDM) is perhaps the most significant international market. CDM is a project-based mechanism intended to provide a cost-effective approach for industrialized (Annex-I) countries to meet their emission reduction commitments under Kyoto, while simultaneously contributing to the sustainable development of developing countries and engaging them in the global climate regime. Under CDM, Annex-I countries (or private entities within those countries) can invest in GHG abatement projects in developing (host) countries so long as those projects result in real and measurable GHG emission reductions and contribute to the host country's sustainable development.

CDM project activities generate certified emission reductions (CERs) equivalent to the GHG emissions offset by the project activities. CERs are fully fungible and tradable carbon credits that can be sold on the international carbon markets. From the perspective of a (host country) project sponsor, leveraging CERs represents an additional revenue stream that enhances a project's overall economics.

For example, Sistemas de Energía Internacional SA (SEISA) recently developed a project to support three landfill gas facilities in Mexico. Decomposition of organic materials in landfills generates methane, which is a much stronger GHG than carbon dioxide (CO₂). Methane from two facilities will be captured and used for power generation with a nominal capacity of 9 megawatts (MW), while methane from the third facility will be flared. Both the power generation and the flaring essentially convert the methane to CO₂ and thus reduce the GHG effect. The World Bank purchased the net reduction of 2 million tons of CO₂ equivalent (tCO₂e) anticipated from the project up to 2012 for \$8.4 million.

The carbon market has grown steadily in recent years. With the Kyoto Protocol recently going into effect, the market is almost certain to expand rapidly in the next few years. The CDM market potential is estimated at 1,250 million tons of CO₂ equivalent (Mt CO₂e) by 2012. As the CDM market grows and matures, CER prices are expected to rise. Haites estimated an average price of \$11/tCO₂e (Haites 2004).

NORTHERN MEXICO: AN ATTRACTIVE SUPPLIER OF CERS

Mexico is widely recognized as an attractive potential supplier of CERS. Mexico has a large and carbon-intensive economy, with ample GHG emission reduction opportunities. Northern Mexico, in particular, offers a tremendous potential supply for several reasons:

1. Power generation is especially carbon-intensive. Five of the six border states rely predominantly on fuel oil or natural gas (50% combined) and coal (41%).
2. Energy demand is growing rapidly. Electricity demand growth is projected at roughly 6% annually over the coming decade. At this rate, electricity consumption will double in 12 years. From an environmental and GHG standpoint, meeting this demand should include both a proportional shift toward using renewable energy sources and a greater emphasis on energy conservation or efficiency.
3. Strong institutional capacity exists. Mexico has strong bi- and trilateral cooperation with the United States and Canada on energy and environmental issues, particularly in the northern region.
4. Several organizations and institutions are actively involved in the development, deployment, and promotion of a wide range of innovative environmental technologies and processes in the border region.
5. Mexico is the only developing country in the world with free trade agreements with Canada, the United States, the European Union, and Japan. Because of these agreements, Mexico can readily access GHG-friendly technologies.
6. The hot, dry climate in northwestern and north-central Mexico tends to favor EE investments. The economic returns on these investments are greatest in regions where seasonal variation in energy and capacity charges is greatest.

Business culture is also an advantage for Mexico. Mexico's business culture and language are more familiar to many of the multinational businesses that will figure prominently as buyers in the carbon markets. This may translate into a greater willingness to pur-

chase Mexican-sourced credits than credits from other major suppliers, such as India or China, where cultural differences are more pronounced.

To date, Mexico has been slow to engage in CDM. The country established its Designated National Authority (the national body, required under CDM, that evaluates projects against the country's sustainable development criteria and approves appropriate projects) in 2004 and is only now developing the capacity to participate effectively. In the north, a strategic focus on GHG emission reductions is lacking. This is partly due to Mexico's close cooperation with U.S. institutions on border environmental management. Because the United States is not engaged in the Kyoto mechanisms, U.S. institutions active in the region are unable or reluctant to focus on GHG emission reductions.

However, Mexico has received heavyweight institutional support from Annex-I countries. The Japan Bank for International Cooperation (JBIC) and the Canadian government have signed bilateral agreements with Mexico to promote CDM opportunities in Mexico, and Canada funded the World Bank to deliver its technical assistance and capacity-building program, CF Assist, in Mexico in 2005.

The Kyoto Protocol sets emission reduction targets for the period between 2008 and 2012. As this commitment period draws near, Mexico appears keen to participate in and benefit from CDM and other carbon markets.

CARBON FINANCE OPPORTUNITIES FOR MEXICO

In 2001, the trilateral Commission for Environmental Cooperation (CEC) produced a report on potential investment opportunities arising from carbon offset projects in the electric power generation, steel production, and land-use change and forestry sectors in Mexico (CEC 2001). The report suggested potential markets of \$31 million in electric power generation from 1999 through 2009 and \$23 million to \$51 million in the land use change and forestry sector from 1999 through 2030 (based on a price estimate of \$10/tCO₂e). A sur-

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vey of 13 large- and medium-sized steel producers suggested carbon emission reductions from various EE projects in the steel sector had a market value of \$1.2 million.

A Canadian government office mandated to facilitate Canadian participation in CDM and Joint Implementation projects, the CDM-JI Office, has studied CDM opportunities in Mexico and ranked those opportunities related to energy (on both the supply and demand sides) and carbon sequestration across various sectors (Table 1).

There is a significant opportunity to support landfill gas-to-energy (LFGTE) projects in Mexico with carbon finance. These important projects simultaneously reduce methane emissions and various environmental impacts associated with municipal solid waste disposal (such as methane migration, odors, and local air and water pollution), and provide a source of renewable energy. At least two LFGTE projects have already been developed in northern Mexico, including the aforementioned SEISA project and a project in Monterrey, Nuevo León, that was developed with support from the Global Environment Facility in the 1990s. The Monterrey project has an installed capacity of 7 MW and is expected to result in GHG emission reductions of 3.6 MtCO₂e over its lifetime. Six more landfill sites are currently being screened for LFGTE development in Mexico under the World Bank's LFGTE Initiative in Latin America.

Mexico and the United States are also founding partners of the newly established Methane to Markets Partnership. The partnership is intended to serve as a framework for international cooperation to advance the recovery and use of methane as a valuable clean energy source to increase energy security, enhance economic growth, improve air quality and industrial safety, and reduce GHG emissions. It initially targets three major methane sources: landfills, underground coal mines, and natural gas and oil systems. Partners will collaborate to develop strategies and markets for methane recovery and use through technology development, demonstration, deployment and diffusion; implementation of policy frameworks; identification of ways and means to support investment; and removal of barriers to collaborative project development and implementation (Methane to Markets Partnership 2006).

Table 1. Overview of Opportunities to Apply the Clean Development Mechanism in Mexico

CDM-JI Projects ¹	Energy Generation	Oil and Gas Industry	Forestry	Commercial Sector	Agriculture	Industrial Processes
Alternative and renewable energy	***	***	*	*	*	***
Co-generation, power plants	***	**				*
Industrial ecology/eco-efficiency	***	***		***		***
Efficient use of electrical energy	*					
Carbon sequestering and capture			***		***	
Waste management		**		***	**	***
Capacity building and infrastructure	***	**	***	**	*	**
Sustainable agriculture					***	
Sustainable buildings				***		***

¹ CDM-JI = Clean Development Mechanism-Joint Implementation

* Fair opportunity

** Good opportunity

*** Excellent opportunity

Source: Clean Development Mechanism-Joint Implementation Office, Government of Canada

CARBON FINANCING FOR ENERGY EFFICIENCY IN NORTHERN MEXICO

Energy conservation is critical to sustainable development in northern Mexico. Energy demand in the Mexican border region is growing rapidly and there are concerns about the continued availability and future cost of electricity in the border region. Energy conservation, distributed generation, and renewable energy must become an integral component of future energy policies and must play a key role in meeting the region's energy needs (Western Governors' Association 2004). Moreover, energy generation from conventional sources is a major source of air emissions that impacts air quality and human health (Table 2)

Significant opportunity for air quality improvements through energy efficiency measures exists in northern Mexico. In 2004, the Western Governors' Association (WGA) investigated the potential energy savings from energy efficiency measures in key customer sub-sectors (manufacturing; hospitality, commerce, and trade; and hospitals, government, and education) in Matamoros, Tamaulipas; Ciudad Juárez, Chihuahua; and Tijuana, Baja California (Western Governors' Association 2004). It estimated a market potential for cost-effective energy savings of approximately 818.8 gigawatt hours per year (GWh/year), mostly from small projects (less than 500,000 kilowatts per year [kWh/year]).

Using the emission rates in Table 2 as proxies for emission rates from northern Mexico power plants and an 18% average transmission and distribution loss, these energy savings, if fully realized, would generate emission reductions crudely estimated at 10,966 tons of sulfur dioxide (SO₂), 1,768 tons of nitrogen oxides (NO_x), and 33 kilograms of mercury (Table 3). Note that the EE measures are end-use electric efficiency measures. Total electric energy savings are approximately 18% higher because they include foregone transmission and distribution losses. Emission reductions are generated at-source, so total emission reductions are calculated from total energy savings. The emission reductions are measured against what would have been emitted in the absence of the EE measures, all else being equal.

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Table 2. Summary of Annual Emissions from Selected Mexican Power Plants

Pollutant	Number of Facilities Included	Average Emission rate Across Facilities	Total Emissions from Included Facilities
SO ₂	82	11.35 kg/MWh	1.6 million tons
NO _x	82	1.83 kg/MWh	0.25 million tons
Hg	3	0.034 kg/GWh	1,025 kilograms
CO ₂	82	688 kg/MWh	94 million tons

Source: Commission for Environmental Cooperation

Table 3. Potential Energy and Emission Reductions from End-Use Energy Efficiency Measures

Category of Saving	Amount of Saving
Potential end-use energy savings	818.8 GWh/year
Additional savings on the grid due to foregone transmission and distribution losses (18%)	179.7 GWh/year
Total potential energy savings	998.5 GWh/year
Emission reductions from energy savings, if fully realized, assuming emission rates identified in Table 2	
SO ₂	10,996 tons/year
NO _x	1,768 tons/year
Hg	33 kilograms/year
CO ₂	664,735 tons/year

Source: Western Governors' Association

If fully realized, the same energy savings would generate annual CO₂ emission reductions of approximately 664,735 tons. If 100% of these reductions generate marketable credits, then at \$5/tCO₂e to \$11/tCO₂e, the CERs would carry an undiscounted market value of between \$16.6 million and \$36.6 million over the five-year period from 2008 through 2012. The actual quantity and value of CERs could differ significantly from the estimates presented here because

both quantity and price depend on many factors. The estimates here are based on a crude analysis and are intended for illustrative purposes only.

Unfortunately, numerous barriers impede EE project development and many opportunities go unrealized. Table 4 shows the barriers identified by WGA and the recommended actions suggested by the organization to overcome them and encourage project development.

Revenues from the sale of CERs could be used to redress certain financial barriers to EE implementation, for example, by financing an EE program and/or enhancing project economics sufficiently to attract customers and energy service companies (ESCOs). High-quality credit opportunities might also induce technical assistance (as it already has) and technology transfer from industrialized countries.

Thus, while the commonly stated purposes of increasing EE in the region are improved air quality and, in certain cases, increased energy security, it is worth recognizing that the same measures can generate GHG emission reductions that can be sold. This is true for many other air quality improvement strategies, including the recommendations being considered through an ongoing binational process initiated at the 2004 Air Policy Forum by the U.S. Environmental Protection Agency (EPA) and Mexico's Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) (EPA 2005). Table 5 indicates that in many cases, GHG emission reductions and local air quality improvement are complementary. Carbon finance should be viewed as a facilitating mechanism rather than a competing strategy.

BARRIERS TO CARBON FINANCING FOR ENERGY EFFICIENCY

However, while the total potential energy savings and emission reductions from EE measures are considerable, the potential credits from individual projects (such as EE measures implemented at a specific facility) are generally quite small. In many cases, projects generate from a few hundred to a few thousand tons of CO₂ emission reductions (Table 6). By contrast, it is generally accepted that the

Table 4. Barriers and Recommendations to Encourage EE in Northern Mexico

Barriers	Recommendations
Lack of program funding for implementing agencies	Assist local agencies and customers in obtaining alternative financing
Lack of financing options for interested customers	Create a revolving loan fund for small projects
Lack of awareness and technical knowledge among potential customers	Initiate educational activities in collaboration with local groups
Insufficient technical assistance for project identification and evaluation	Provide third-party technical expertise to interested customers
An undeveloped energy services industry	Develop business models to deliver energy-efficiency services to the private sector and support the development of energy service industry associations
Insufficient market data to target services to appropriate sectors	Collaborate with national and local agencies to develop energy consumption data at the local level that is classified by sector and sub-sector
Difficulty in establishing project proponents within customer organizations	Develop a coaching system to assist facility managers and aid in completing projects successfully
A regulatory environment that hampers private energy projects	Participate in the utility reform process to support private energy projects

Source: Western Governors' Association

Table 5. Potential Elements of an Air Quality Improvement Strategy

Elements of a Strategy to Limit Local Air Pollution	Elements that would Simultaneously Limit Local Air Pollution and Greenhouse Gases
Pave dirt roads Coordinate U.s.-Mexican fuel standards Develop air/water TEIAs ¹ Develop comparative health risk assessment Set up mobile air pollution lab program Unify common airbasin monitoring and analysis Create binational emissions inventory Develop binational air quality indicators Establish indoor ambient air quality standards Supply safe alternatives Coordinate binational air basin trades Create clean air investment fund Engage private sector with ISEPs ² Facilitate public education Suppress dust/erosion Mitigate agricultural burning Farm deserted areas Monitor open burning activities	Improve vehicular inspection and maintenance Retrofit or remove super-emitters Diversify transit/transport systems Electrify truck stops Plant green windbreaks Mitigate CAFOs ³ Retrofit or remove super-emitters Promote alternative fuels Create/promote alternative/mass transit Provide alternative fuels Substitute fuels Expand natural gas distribution Provide alternative fuels Minimize trash burning Regulate and modify tire burning operations

¹ TEIAs are transboundary environmental impact assessments

² ISEPs are international supplemental environmental projects, implemented in lieu of fines

³ CAFOs are confined animal feeding operations

Source: Author

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smallest viable projects will generate more than 100,000 tons over their lifetime, and World Bank statistics show that the average size of a Latin American project is currently approximately 1 million tons (Business News Americas 2005). (Here, “viable” refers only to the carbon finance element of a project, not the project itself. Projects must generate minimum quantities of credits to attract investors and overcome transaction costs, as described below).

Developing carbon credits is not a cost-free activity. Transaction costs are incurred while completing the project cycle from evaluation to certification of the credits. These costs are over and above costs associated with assessing technical feasibility, project design, or implementation. Most are relatively fixed, one-time costs. Monitoring and verification costs are the exception—these elements can vary according to project size and will recur on a defined schedule.

Table 6. Potential CERs from End-use EE Measures in Selected Mexican Facilities

Facility	Energy Efficiency Measures	Annual Energy Savings (kWh)	Potential Credits (2008–2012)	Value (at \$10/ton)
Aduana Colombia	Lighting	382,798	1,554	\$5,540
Mexsecurit	Lighting	65,354	265	\$2,650
Plasticos Rex	Lighting	271,034	1,100	\$11,000
Nutrimex	Lighting; motors	112,344	456	\$4,560
Asesores Aduanales	HVAC	129,500	526	\$5,260
Dicex	HVAC	203,500	826	\$8,260
Int'l Trade Facility Center	Lighting	131,175	532	\$5,320
Aqua Lung de Mexico	Lighting; HVAC	415,633	1,687	\$16,870
Total		1,711,338	6,946	\$69,460

Source: Information in the first three columns came from Border Energy Case Studies; data in the last two columns were calculated by the author

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Table 7 describes estimated transaction costs for energy efficiency projects in an established Canadian domestic GHG trading system. The estimates are based on a “typical” EE project that would generate 10,000 tons per year.

Table 7. Transaction Costs for Developing Carbon Credits from EE Projects

Transaction Cost	Description	Cost Estimate, Low – High
Project Evaluation	Assess likely net offsets and revenues associated with the project	\$811 – \$4,054
Project Initiation	Establish ownership and/or negotiate ownership contracts	\$4,054 – \$20,267
Project Proposal	Develop project proposal, including establishing eligibility, baselines, boundaries and leakage, quantifying GHG reductions, developing a monitoring and risk management plan	\$2,027 – \$8,107
Validation	Review proposal to confirm eligibility, and confirm accuracy, completeness, and credibility	\$811 – \$4,054
Monitoring and Quantification	Measure GHG emission reductions and quantify the resulting credits	\$811 – \$4,054 in 1st year
		\$811 – \$1,621 in subsequent years
Verification	Third party review to confirm accuracy and quality of the evidence supporting the claim for credits	\$1,621 – \$4,054 in 1st year
		\$811 – \$2,837 in subsequent years
Total		\$16,631 – \$62,468

Source: Marbek Resource Consultants

De Gouvello and Coto (2003) provided similar estimates of transaction costs for small-scale CDM projects with estimates ranging from \$8,168 to \$78,300. They point out that the largest component of the transaction costs relates to fees for validation and verification and suggest that the cost can be reduced either by limiting the recurrent tasks of the Operational Entity (OE) (for example, by opting for multi-annual rather than annual verification), or by promoting the accreditation of low-cost OEs, typically by accrediting local firms that charge “local” rates, which are much lower than “international” consulting rates (De Gouvello and Coto 2003). Thus, in addition to the various traditional barriers that hinder EE project development, two further barriers hinder EE project development under CDM: high transaction costs (relative to total project development costs) and a low CER revenue stream (relative to the purchasing preferences of CER buyers).

The notional solution is to advance a portfolio of projects and bundle the CERs through an intermediary, then streamline the project development scheme as much as possible to minimize transaction costs. Thus, for example, a facilitating entity might be established to target sector-specific, small-scale activities. Ideally, the facility would act as a fund, combining seed capital to support project development with a portfolio of CERs for sale to investors, while simultaneously providing technical assistance to project developers to assist with project structuring, financing, capital-raising, and risk mitigation services throughout the project cycle. This is the general model of the World Bank’s Prototype Carbon Fund and Community Development Carbon Fund.

TOWARD AN INSTITUTIONAL ARCHITECTURE FOR FACILITATING ENERGY EFFICIENCY

Numerous organizations are currently involved in EE activities in northern Mexico and their interests are clearly convergent:

- WGA has formed a border energy task force, which operates the website borderenergy.org, to facilitate the flow of energy efficiency information regionally and is currently working to demonstrate successful energy efficiency programs in industrial facilities in the California-Baja California and El Paso-

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Ciudad Juárez areas. WGA has agreed to finance audits for candidate facilities that commit to a serious effort to implement pilot project opportunities.

- The Border Energy Forum (BEF) brings together government, industry, and non-profit organizations from all 10 U.S. and Mexican border states on an annual basis to encourage information-sharing about energy efficiency, foster energy-related alliances between public and private sector groups throughout the region, and promote viable, innovative projects and policies.
- The Alliance to Save Energy (ASE) planned to implement in fiscal year 2005, with funding from U.S. Agency for International Development, the Watergy program in Tijuana and Monclova-Frontera. The program, aimed at improving EE in municipal water utilities, facilitates EE implementation by delivering training and energy audits and developing case studies to promote replication.
- Econergy International Corporation (EIC) is an energy services company that provides technical and investment advisory services and also manages a private equity investment fund dedicated to clean energy projects in Latin America, with a focus on Mexico.
- The World Bank delivered technical assistance and capacity-building in Mexico in 2005 through its CF Assist program. The program is intended to help build Mexico's capacity to participate effectively in the carbon markets and demonstrate how carbon finance can facilitate project development.
- Mexico's SEMARNAT is implementing, with support from the World Resources Institute (WRI) and the World Business Council for Sustainable Development, the GHG Pilot Program. From 2005 to 2007, the focus is on recruiting participants, developing partnerships, and capacity-building aimed at facilitating project identification and participation in future GHG emission-reduction initiatives.
- The Border Environment Cooperation Commission (BECC) and North American Development Bank (NADB) are sister institutions that work together to finance environmental infrastructure, including EE, in the U.S.-Mexican border region. BECC certifies the environmental integrity of projects

that are then considered for finance by NADB. NADB recently developed a bundling mechanism for EE projects and is arranging its first bundled project financing with several U.S. and Mexican ESCOs.

- The Comisión Nacional para el Ahorro de Energía (CONAE) is the Mexican government agency that specializes in energy efficiency, renewable energy, alternative fuels, and distributed generation. Its mission is to design and promote EE guidelines, foster renewable energy use, and promulgate EE standards.
- Mexico's FIDE (a non-profit, private trust) supports EE activities through audits, demonstration projects, and training.
- The Center for Resource Solutions (CRS) is developing an accounting system for renewable energy certificate trading in North America. The system could be adapted to support verification and certification for EE projects.

It is worth noting the interests of Annex-I countries. In the past, Annex-I countries have contributed resources aimed at developing high-quality CER prospects. For example, Canada partially funded a Project Design Document (PDD) Development Facility for India to stimulate CDM project activities. Similar contributions to promote opportunities in Mexico are certainly possible as the 2008–2012 Kyoto commitment draws near.

With the exception of the World Bank, EIC, and WRI, the organizations working in the region have focused almost exclusively on the energy efficiency and air quality aspects in their activities. There have been some collaborative efforts to promote EE in the region, but these have generally failed to produce significant impacts beyond the immediate project results, due in large part to the barriers identified in Table 4.

CDM could be the catalyst for more collaborative and successful EE project development in the region. For example, CER revenues could help finance an EE program or efforts to address other barriers to EE project development, and it could enhance project economics sufficiently to attract customers and ESCOs. High-quality

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CER opportunities could also induce technical assistance (as it already has) and technology transfer in support of project development.

To work, a collaborative effort to develop EE projects will require at least two minimum conditions:

1. Multiple participants, with all of the required resources and expertise, and convergent and well-represented interests.
2. A framework for collaborative action that ensures an efficient scheme for developing projects and CERs. These conditions may seem intuitively obvious, but they should not be taken for granted. Multi-organizational initiatives are rarely easy. They require careful design and plenty of attention.

The challenge is to craft and mobilize an appropriate framework for institutional collaboration. With the first Kyoto commitment period beginning in less than two years and the uncertain value of post-2012 CERs, it is critical to act quickly. With U.S. participation, it is possible to do so and develop northern Mexico's advantage. Any initiative should thus be advanced under the rubric of energy efficiency and air quality to make U.S. participation more palatable. However, there needs to be a strategic focus on developing and capitalizing on the carbon asset.

Negotiating a framework for collaborative action begins as an exploratory process, and if successful, converges to a commitment by participants. The aim is to identify synergies, align activities, and mobilize the resources required to initiate and sustain a program for developing EE activities under CDM. Participants might consider a facilitating entity that bundles and assists a package of prospects, as described above. The facility could be delivered via a public-private clearinghouse model, with seed capital and technical assistance from the public sector and equity, bundling, and fee-for-service work provided by the private sector. Several examples can be imagined:

- The World Bank, WGA, and NADB (and EIC, if required) contribute seed capital; an Annex-I country government might also be invited to participate, depending on the facility's final design

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- The Border Energy Forum and the Alliance to Save Energy continue to identify pilot projects and support ongoing project identification and PDD development
- SEMARNAT aligns GHG Pilot Program activities with the facility
- The World Bank aligns CF Assist activities with key opportunities and ongoing initiatives in the region, develops baseline methodologies, and delivers capacity-building and technical assistance
- CONAE and FIDE engage Mexican industry associations and workgroups, professional associations, and participants of existing programs, and support activities of the facilitating agency with technical assistance, outreach, and government relations
- EIC provides energy services (such as audit, design, and implementation), GHG measurement, equity investment, bundling, and brokerage services
- CRS coordinates (with EIC and the World Bank) development and implementation of monitoring and verification infrastructure, and assists end-users with monitoring

The role of a private sector participant in the mold of EIC is critical. EIC is both an equity investor and an ESCO with technical and management expertise. It is experienced in carbon finance and brokerage services, and it has a Mexican office and operations. It could serve as equity investor and bundling organization, and could work with NADB and other organizations (such as commercial banks and leasing companies) to structure EE financial packages. With the prospect of involvement across all these areas and a large number of projects, an organization like this has a strong business case for committing and contributing to a major initiative.

Participants should target highly replicable project types (such as lighting efficiency) in targeted sub-sectors (such as manufacturing) and regions (such as north-central Mexico). The facilitating entity could easily adapt and disseminate a decision-support tool, such as the RETScreen International Clean Energy Project Analysis Software, to support low-cost project screening. Participants should seek pre-approval from the Mexican Designated National Authority

for all projects funded through the facility. These measures will help minimize the costs of administering the facility and project transaction costs. The aim here is to create an efficient project development scheme that maximizes the flow-through of projects.

Elements of this approach were shown to be successful by the San Francisco-based Proven Alternatives Capital Corporation (PACC). PACC established a fund to finance investments in commercial, industrial, and institutional EE programs and projects. It established specific technical criteria to create a relatively automatic and smooth approval process. Programs that meet the pre-approved criteria are not required to go through a detailed approval process, thus ensuring a rapid turnaround time and low transaction costs. The net effect is to expedite the approval of projects and expand the market for investment opportunities, thus allowing PACC to allocate fund expenses over a larger number of projects, lowering the fixed cost per dollar invested.

It will be critical to establish a set of default rules and standardized methods for bundling and declaring ownership of CERs generated through the facilitating entity. The costs of establishing ownership, in the absence of default rules, are expected to be highest for projects where there are a number of possible ownership claims, such as in the case of EE projects. Where default rules and standard contracts are in place, the costs of project initiation will decrease.

CONCLUSION

Carbon finance is not a panacea for potential energy efficiency projects (or any other type of air quality improvement projects). It is, however, a means for capturing the value of the GHG benefit and enhancing the economics of environmental investments, which simultaneously reduce GHG and other air pollutant emissions. In the U.S.-Mexican border region, this includes most priority air quality improvement measures, such as those aimed at enhancing clean and efficient energy and reducing vehicle emissions.

Absent any policy initiative to facilitate carbon finance, individual project proponents will use carbon finance to promote individual projects on a limited basis, principally because transaction costs

and market preferences favor large projects. The potential benefit of carbon finance will not then reach the majority of project opportunities that are smaller, and the overall benefit that accrues to the region will be less than otherwise attainable.

Carbon finance can have a much greater impact if delivered via a collaborative approach with broad institutional support, such as following the model of a facilitating entity. In this case, the carbon finance may be directed toward individual projects to support project implementation, or toward operating the facilitating entity itself. In either case, a collaborative and focused initiative to mobilize the carbon asset will enhance financing opportunities and result in more projects being implemented. Ultimately, an increase in project activities will improve air quality across the region.

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