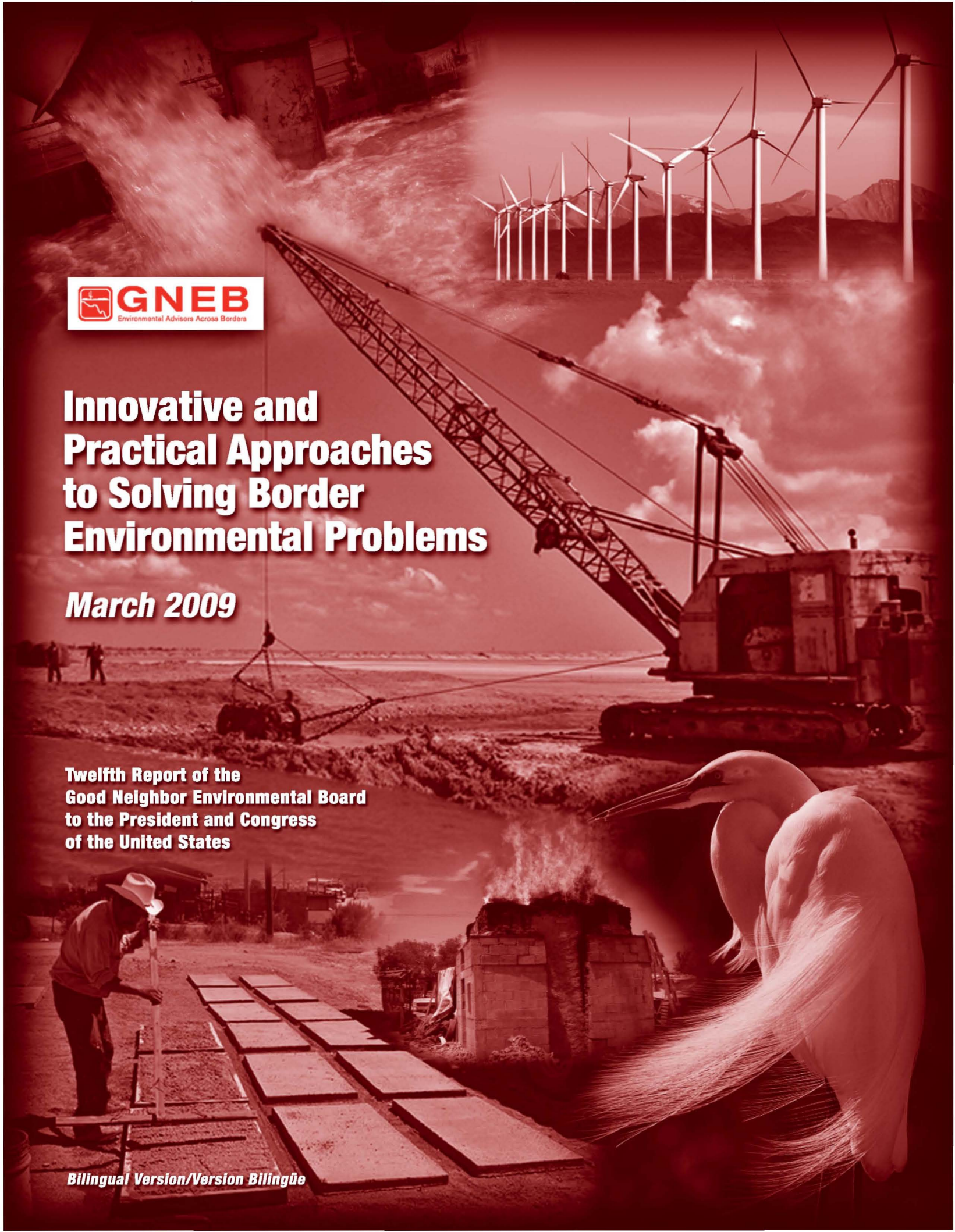

Innovative and Practical Approaches to Solving Border Environmental Problems

March 2009

Twelfth Report of the Good Neighbor Environmental Board to the President and Congress of the United States

Bilingual Version/Version Bilingüe

About the Board

The Good Neighbor Environmental Board is an independent U.S. Presidential advisory committee that was created in 1992 under the Enterprise for the Americas Initiative Act, Public Law 102-532. It operates under the Federal Advisory Committee Act (FACA), and its mission is to advise the President and Congress of the United States on "good neighbor" environmental and infrastructure practices along the U.S. border with Mexico. The Board does not carry out border-region environmental activities of its own, nor does it have a budget to fund border projects. Rather, its unique role is to step back as an expert, nonpartisan advisor to the President and Congress and recommend how the Federal Government can most effectively work with its many partners to improve the environment along the U.S.-Mexico border. Under Presidential Executive Order 12916, its administrative activities were assigned to the U.S. Environmental Protection Agency (EPA) and are carried out by the EPA Office of Cooperative Environmental Management (OCEM).

Membership on the Board is extremely diverse. It includes senior officials from a number of U.S. Federal Government agencies and from each of the four U.S. border states—Arizona, California, New Mexico, and Texas. It also includes representatives from the tribal, local government, nonprofit, ranching and grazing, business, and academic sectors. In addition, the Board maintains dialogue with its counterpart Mexican environmental agency advisory groups and the Consejos Consultivos para el Desarrollo Sustenable (CCDS)—referred to as Consejos—to help ensure that it remains informed about issues on the Mexico side of the border.

The Board meets twice each calendar year in various U.S. border communities and once in Washington, DC. Its advice is submitted to the U.S. President and Congress in the form of annual reports that contain recommendations for action. These recommendations are submitted after consensus is reached across the entire membership. They are shaped by the combined expertise of the Board members, by the Board's ongoing dialogue with its Consejo counterpart groups, and by the speakers and concerned citizens from both sides of the border who attend its meetings in border communities. The Board also occasionally issues Comment Letters during the year to provide input on timely topics. One of the most frequently recurring themes in its advice is that support for cross-border cooperation is essential if sustained progress is to be made on environmental issues along the U.S.-Mexico border.

All meetings of the Good Neighbor Environmental Board are open to the public. For more information, see the Board Web Site, http://www.epa.gov/ocem/gneb, or contact EPA OCEM at 202-564-2294.

Notice: This report was written to fulfill the mission of the Good Neighbor Environmental Board (the Board); a public advisory committee authorized under Section 6 of the Enterprise for the Americas Initiative Act, 7 USC, Section 5404. It is the Board's Twelfth Report to the President and Congress of the United States. EPA manages the operations of the Board. This report, however, has not been reviewed for approval by EPA and, hence, the report's contents and recommendations do not necessarily represent the views and policies of EPA, nor of other agencies in the Executive Branch of the Federal Government, nor does mention of trade names or commercial products constitute a recommendation for use.

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(English version) http://www.epa.gov/ocem/gneb/gneb12threport/English-GNEB-12th-Report.pdf
(Spanish version) http://www.epa.gov/ocem/gneb/gneb12threport/espanol-gneb-12th-report.pdf

Tribute to Carlos Marin

The Good Neighbor Environmental Board suffered a tragic loss during the year when Board member Carlos Marin, U.S. Commissioner of the International Boundary and Water Commission, died in a plane crash. Commissioner Marin was a passenger in a chartered Cessna 421 four passenger prop plane that was traveling to the area of Presidio, Texas Ojinaga, Chihuahua, to survey flood conditions on the Rio Grande Conchos River and to coordinate joint response efforts with local officials and the Mexican government. The plane crashed in mountainous terrain in Mexico, killing all aboard including Mr. Marin's Mexican counterpart, Arturo Herrera.

Mr. Marin was appointed U.S. Commissioner by President George W. Bush in December 2006, after 27 years of service to the Commission. He had served on the Good Neighbor Environmental Board since 2006, and was instrumental in informing and advising the Board about water infrastructure needs along the U.S. Mexico border.

President Bush issued the following statement regarding the tragedy: "I am deeply saddened by the tragic death of Carlos Marin, a dedicated public servant who died while fulfilling his responsibilities as United States Commissioner of the International Boundary and Water Commission, United States and Mexico. Carlos Marin was an accomplished engineer and capable leader who achieved the American dream while serving at the Commission for over two decades. He quickly rose through the ranks as he worked hard to effectively apply the boundary and water treaties between our country and Mexico. I appreciate his efforts to protect our Nation's interests, raise agency morale, and establish solid and transparent relationships with his Mexican counterparts. I am honored that he served in my Administration."

The Board dedicates this Twelfth report to the memory of our colleague, Carlos Marin.

Innovative and Practical Approaches to Solving Border Environmental Problems

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GNEB
Environmental Advisors Across Borders

GOOD NEIGHBOR
ENVIRONMENTAL BOARD

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March 11, 2009

The President
The Vice President
The Speaker of the House of Representatives

On behalf of the Good Neighbor Environmental Board, your advisor on environmental and infrastructure conditions along the U.S. border with Mexico. I am pleased to submit to you the *Twelfth Report of the Good Neighbor Environmental Board to the President and Congress of the United States.*

The Twelfth Report highlights case studies of successful projects from different areas of the U.S.-Mexico border that address important environmental problems. Although these examples demonstrate the power of mobilizing local, tribal, regional, and state stakeholders from both sides of the border, they also reveal the critical role that federal agencies and the Congress play. To continue and strengthen the federal role in harnessing the power of diverse stakeholders for resolution of border environmental problems that are driven by rapid population growth, trade flows, and poverty, this report recommends:

- Increased federal leadership in fostering markets and support for renewable energy, alternative fuels, and reuse of scrap material, both domestically along the border and across the border with Mexico.
- Enhanced federal support for the Border 2012 Program process—the joint U.S.-Mexico effort that is based on local initiatives to resolve border environmental problems—as well as other border environmental initiatives.
- Continued and enhanced efforts at the federal level to facilitate cross-border cooperation with Mexico on transboundary environmental issues.
- Improved cooperation across media, federal agencies, and other agencies is critical to resolve efficiently many border environmental issues. Fostering of such cooperation by federal agencies is a critical element for successful results in green initiatives.

We appreciate the opportunity to provide these recommendations to you in this, our Twelfth Report, and respectfully request a response. In addition, we welcome continued dialogue on implementation of our advice.

Respectfully yours,

Paul Ganster

Paul Ganster, Chair

Recommendations

The Twelfth Report highlights case studies of successful projects from different border areas that address important environmental problems. These examples demonstrate the power of mobilizing local, regional, and state stakeholders from both sides of the border, and also reveal the critical role that federal agencies and the U.S. Congress play. To continue and strengthen the federal role in resolution of border environmental issues, this report recommends:

- *Continued and enhanced efforts at the federal level to facilitate crossborder cooperation on transboundary environmental issues*. This includes facilitation of direct and formal cooperation among U.S. and Mexican state and local authorities through formal arrangements such as the Joint Advisory Committee (JAC) for the Improvement of Air Quality in the Paso del Norte Air Basin, the Border Environment Cooperation Commission (BECC), the U.S.-Mexico Environmental Program: Border 2012, the Border Liaison Mechanism, and the 1983 La Paz Agreement for binational environmental management. Greater attention and resources from state and federal authorities should be made available to assist local governments and community stakeholders in improving the border environment. In addition, all relevant U.S. and Mexican federal agencies need to cooperate on solving border environmental issues. **(Key Elements** **[see page 4]****: Strategy, Partnerships, Community Mobilization)**

- *Enhanced federal support for the Border 2012 Program process—the joint U.S.-Mexico effort to resolve border environmental problems—as well as other border environmental initiatives.* This includes additional support for the local binational Border 2012 task forces that incorporate all stakeholders and facilitate public participation, transborder networking, and regional capacity building to generate locally effective solutions for border environmental problems. **(Key Elements: Partnerships, Community Mobilization)**

- *Improved cooperation across media, federal agencies, and local and state entities to resolve many border environmental issues efficiently*. Many solutions have wide-reaching impacts but require significant cooperation from relevant agencies and other stakeholders. For example, the utilization of fibrous concrete that is being implemented as an environmental solution in Nogales, Sonora, not only addresses affordable housing issues, but also waste, recycling, and landfill issues. Rubberized asphalt paving, another example, addresses the problem of scrap tires while providing benefits of high-quality paving material, reduced landfilling, and reduced public health threats. Cooperation must be fostered by federal agencies as a critical element for successful results in green initiatives. **(Key Elements: Resources, Technology, Strategy, Partnerships)**

- *Increased federal leadership in fostering markets and support for renewable energy, alternative fuels, and reuse of scrap material, both domestically along the border and across the border with Mexico.* This can be facilitated through practices such as information sharing, regulatory incentives, tax incentives, and subsidies. **(Key Elements: Resources, Technology, Strategy, Financing, Partnerships)**

Executive Summary

Environmental issues affecting the U.S.-Mexico border region can be complex and particularly difficult to resolve. The region suffers from many serious environmental problems, including water pollution and inadequate water supply, air pollution, hazardous and solid waste, habitat and species protection concerns, and conservation challenges. Although U.S. and Mexican border communities are linked by economic integration and social and familial connections, key differences between the two countries present barriers to addressing transborder environmental problems jointly. These barriers include significant economic and wealth asymmetry, different cultural and political traditions, and dissimilar public administration systems that are difficult to coordinate across the international boundary. The U.S. border is characterized by relative poverty and low levels of support for public services, and both U.S. and Mexican border communities are struggling to meet the demand for services produced by decades of rapid population growth, urbanization, and industrial expansion, as well as burgeoning flows of international trade.

For its *Twelfth Report to the President and Congress of the United States*, the Board discusses innovative and practical approaches to advancing pollution prevention and solving environmental problems in the U.S.-Mexico border region. These novel projects and approaches have promoted environmental quality and have brought improvement to the lives of border residents. This report provides case studies of successful efforts to address specific border environmental issues with examples of cooperation involving a range of stakeholders across environmental media, agencies, and borders. These case studies discuss:

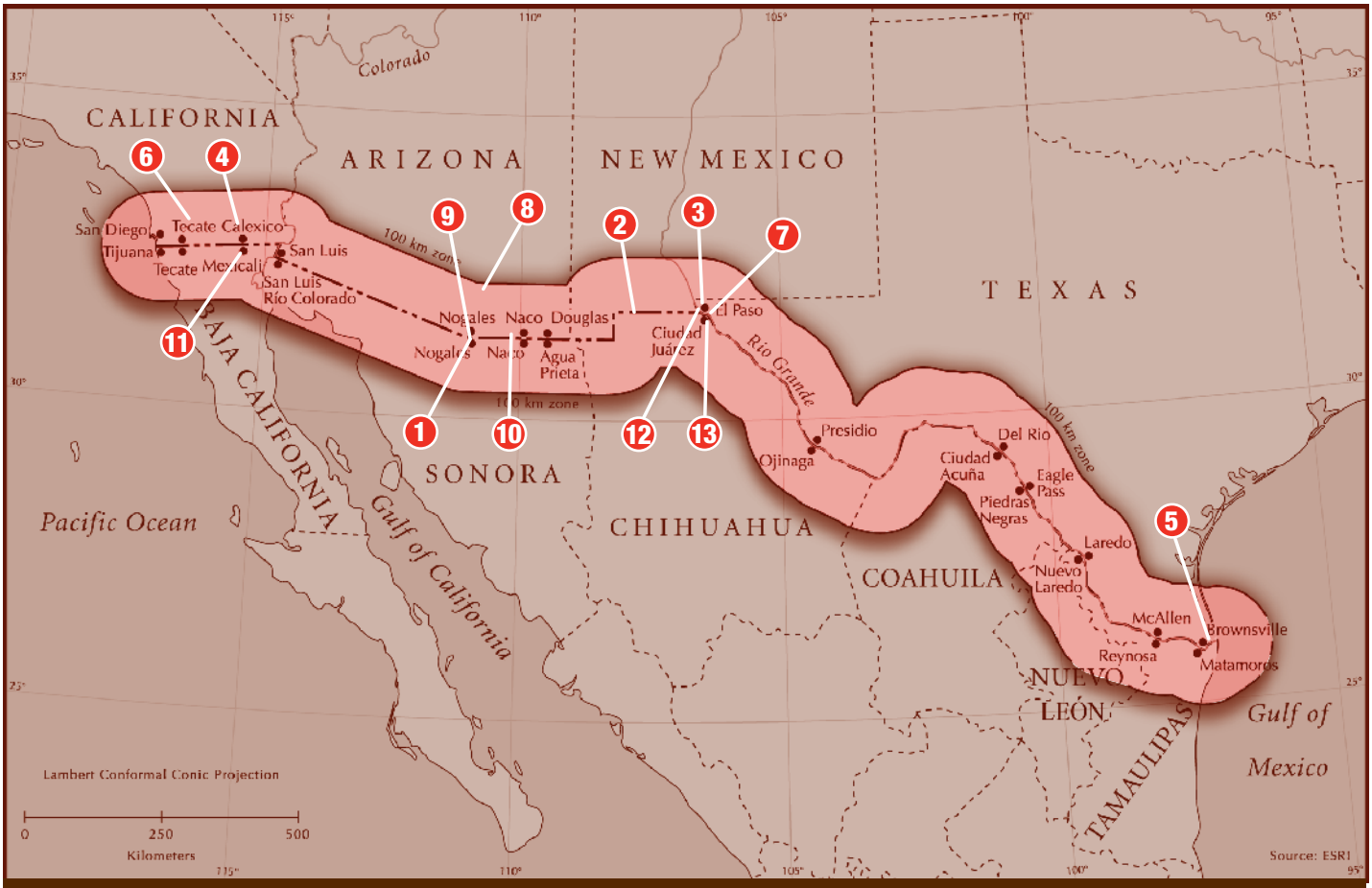
- The use of fibrous concrete blocks to reduce solid waste and provide affordable housing;
- Scrap tire cleanup across and along the border;
- Inland desalination as a new source of water in the arid border region;
- Constructed wetlands to clean contaminated water in agricultural areas;
- Wetland restoration to improve habitat and reduce windborne dust;
- Wind power to address regional demand for clean, renewable energy and the economic needs of a border tribe;
- Transboundary airshed management and emissions trading to reduce transborder air pollution;
- Environmental performance improvement of local businesses through community-based trainers (the *promotora* model); and
- Production of biodiesel from waste vegetable oil and grease to improve air quality while reducing blockages of the sewage conveyance and treatment system.

The case studies involve strong frameworks and leadership by the Federal Government (scrap tires; transboundary airshed management), state governments (biodiesel), local governments (inland desalination; wetland restoration), and a tribal government (wind energy project), with key contributions by universities, the private sector, and local stakeholders to assure continuity and community participation. Others (fibrous concrete blocks and improved environmental performance of local businesses) represent local initiatives of non-governmental organizations (NGOs), the private sector, and universities. Almost all involved a diverse group of Mexican and U.S. partners. Many of the case studies that successfully addressed transboundary issues required the participation of the two Federal Governments to formally bring together U.S. and Mexican partners. Others involved informal and non-diplomatic coordination across the border of the sort that has characterized border communities for decades.

In addition to the case studies, four case highlights are included in the report. Less detailed than the case studies, they provide additional examples of innovative and practical approaches to solving border environmental problems.

The positive outcomes of many of these case studies and broader border efforts suggest that the task of environmental improvement in the border region is best served by a proactive U.S. Federal Government working to:

- Support and facilitate the efforts of the private sector, community organizations, local governments, state governments, universities, and other stakeholders engaged in projects to address specific environmental issues and improve the environment.
- Address the growing environmental infrastructure deficit that affects most U.S. and Mexican border communities with increased funding through traditional channels such as the U.S. Environmental Protection Agency (EPA), the Border Environment Infrastructure Fund, the Border Environment Cooperation Commission (BECC), the North American Development Bank (NADB), International Boundary and Water Commission (IBWC), and grants to local and state agencies, NGOs, and universities.
- Continue to enhance cooperation among all appropriate federal, state, and local agencies on border environmental issues through the bottom-up Border 2012 Program process.
- Foster cooperation on environmental problem solving across the border at all levels through strong U.S. and Mexican federal leadership and support. ●



Locations of Case Studies and Case Highlights.

1. Waste to Resource: Fibrous Concrete
2. Scrap Tire Cleanup
3. Kay Bailey Hutchison Desalination Plant
4. Brawley and Imperial Wetlands
5. Bahía Grande Wetland Restoration
6. Campo Kumeyaay Wind Project
7. Transboundary Emissions Trading
8. Community Assist of Southern Arizona (CASA)
9. Waste-Based Biodiesel
10. Upper San Pedro Partnership
11. CETYS Universidad, Environment and Sustainable Development Program
12. Joint Advisory Committee, Paso del Norte
13. New Spray Guns

Introduction

For its *Twelfth Report to the President and Congress*, the Board examines innovation and environmental quality along the U.S.-Mexico border. The approach taken by the Board was to identify six key elements to successful innovation—resources, technology, strategy, financing, partnerships, and community mobilization—and use case studies to illustrate how those elements operate. Innovation is, by nature, a dynamic process, and the U.S.-Mexico border is an ever-changing place. None of the cases represent the ideal; instead they illustrate both the opportunities and challenges of developing and implementing new and practical approaches to solving environmental problems in the region.

Although the border region is unique, in many ways the problems facing the region are similar to problems throughout the United States. Numerous accomplishments and solutions are readily transferable and applicable to other communities in the country. Successful efforts turn wastes (waste oil, scrap tires, waste paper, and stormwater) into resources; promote education and new ways of thinking about these issues; build rapport and trust across borders, sectors, and levels of government; and bring energy producers and information closer to the users. These efforts frequently are community driven but supported by people and institutions outside of the region. This report will highlight some of those endeavors.

The report is organized in two major sections. The first section describes the region, its characteristics, and some of the pressing environmental issues faced there. The second section includes the case studies and highlights. Many promising ideas, programs, and projects are in the early stages of development, but to be included in this report, the program or project had to have been in existence a minimum of 1 year to ensure that early results were available and both successes and challenges could be examined.

The key elements of successful innovations and problem solving are illustrated through nine case studies, each highlighting one or more of these elements (See text box below). Each case study is introduced by a brief background on the specific issues being addressed. A description of the case study follows, incorporating most of the elements described above. Subsequently, the specific elements for which the case study was chosen are discussed at greater length.

KEY ELEMENTS FOR SUCCESSFUL INNOVATION AND PROBLEM SOLVING ALONG THE U.S. MEXICO BORDER

Resources: The conservation of resources or the efficient and effective use of resources.

Technology: The use of new technology or a novel use of existing technology.

Strategy: The application of new strategies to solve problems or the utilization of existing strategies in new or unique manners.

Financing: Financing that allows for innovation, capacity building, and problem solving.

Partnerships: Strong collaborations among stakeholders in which all are involved in the problem-solving effort and decision-making process.

Community Mobilization: Broad-based community support and participation in problem-solving activities.

Waste to Resource: Fibrous Concrete as an Alternative to Landfilling and Burning Paper— Since 2004, a stable network of individuals and organizations has developed on the Arizona-Sonora border, focused within the communities of Ambos Nogales, to develop, test, and use waste paper to produce fibrous concrete building blocks for the construction of housing for low-income families. This initiative has brought together a diverse group of partners and has succeeded in constructing benches for schoolyards in Nogales, Arizona, and low-income housing in Nogales, Sonora.

Scrap Tire Cleanup in the Border Region—Large numbers of scrap tires accumulate in the border region, presenting cleanup and disposal or recycling challenges. In rural areas in the New Mexico-Chihuahua border region, residents and community leaders launched an effort to locate, collect, and transport scrap tires for safe disposal. Some of the tires were used as fuel at the Cementos de Chihuahua cement plant at Samalayuca, which uses state-of-the-art emissions control equipment.

Kay Bailey Hutchison Desalination Plant—Water utilities and other entities in the sister cities of El Paso and Ciudad Juárez have worked together to characterize groundwater supplies in the Hueco Bolson aquifer. El Paso then developed a desalination plant to supplement existing water supplies. The desalination plant uses reverse osmosis to obtain potable water from brackish water drawn from the aquifer.

Brawley and Imperial Wetlands in the Imperial Valley, California—Two pilot wetlands were constructed in Imperial and Brawley in 1999 to improve water quality in the New River, which flows into the Salton Sea north of the California-Baja California border. These sites have been monitored since 2001.

The Bahía Grande: Achieving Multiple Environmental Benefits Through Wetland Restoration—The Bahía Grande tract sprawls over 21,000 acres in southeastern Cameron County, Texas, next to the Gulf of Mexico, and its revival restored the estuary to the vital nursery for recreationally and commercially important aquatic species that it was in the 1940s. Returning water to the Bahía Grande also had the immediate effect of reducing the amount of dust in neighboring communities.

The Campo Kumeyaay Wind Project—The first commercial-scale wind energy project on a Native American reservation in the United States also is the first phase in a long-term plan by the Campo Kumeyaay Nation to tap into the considerable wind resources on its reservation. It represents the culmination of a 15-year process to evaluate and quantify the adequacy of the wind resource while educating the community on its costs and benefits.

Transboundary Emissions Trading in the Paso del Norte Area—In 2001, the Texas Legislature passed a law allowing transboundary and cross-pollutant emissions trading in the Paso del Norte airshed, which includes El Paso County, Texas; Ciudad Juárez, Chihuahua; and Doña Ana County, New Mexico. The legislation opened the way for the El Paso Electric Company to substitute emission reductions achieved elsewhere in the Paso del Norte airshed for NO_x reductions in El Paso if the substitution results in overall air quality improvement for the airshed.

Community Assist of Southern Arizona (CASA): Promotora Business Visit Program—Nonprofit organizations, local and state agencies, businesses, and academic organizations partnered to develop a program to train community members to work with local businesses to improve environmental conditions in their neighborhoods. The program uses the *promotora* model, developed in Mexico, in which lay health advisors provide information to community members.

Waste-Based Biodiesel: Altering Present Use and Disposition of Waste Vegetable Oil and Grease—In 2004, this project began to establish and operate facilities for small-scale biodiesel production and testing on both sides of the Arizona-Sonora border. Student researchers from Arizona and Sonora identified sufficient waste vegetable oil and grease in cafeterias and restaurants in both states and in *maquiladoras* in Sonora, and by the fall of 2008, biodiesel production was underway.

In addition to the detailed case studies, four examples of innovation along the border are highlighted in text boxes throughout the report. These examples further illustrate how the six key elements (defined in the text box on page 4) support innovation and problem solving. The case studies and case highlights represent only a sample of many successful projects that address environmental issues along the U.S.-Mexico border. ●

Table 1

Key Elements of Case Studies and Case Highlights:

Resources, Technology, Strategy, Financing, Partnerships, and Community Mobilization

CASE STUDIES	Key Elements Illustrated	Page
Waste to Resource: Fibrous Concrete as an Alternative to Landfilling and Burning Paper	Resources and Community Mobilization	11
Scrap Tire Cleanup in the Border Region	Resources and Community Mobilization	15
Kay Bailey Hutchison Desalination Plant	Technology and Partnerships	20
Brawley and Imperial Wetlands in the Imperial Valley, California	Technology and Partnerships	24
The Bahía Grande: Achieving Multiple Environmental Benefits Through Wetland Restoration	Strategy and Financing	28
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Community Assist of Southern Arizona (CASA): *Promotora* Business Visit Program	Partnerships and Community Mobilization	40
Waste-Based Biodiesel: Altering Present Use and Disposition of Waste Vegetable Oil and Grease	Resources and Partnerships	45
CASE HIGHLIGHTS	**Key Elements Illustrated**	**Page**
Upper San Pedro Partnership	Resources	19
CETYS Universidad Master's Degree Program in Environment and Sustainable Development	Strategy	34
Joint Advisory Committee (JAC) for the Improvement of Air Quality in the Paso del Norte Air Basin	Community Mobilization	39
New Spray Guns for Auto Paint Body Shops: The Great Border Trade Out	Partnerships	44

Border Context

The U.S.-Mexico border region exists in the space where the developed and developing worlds intersect, and is therefore characterized by marked economic and development disparities. This juxtaposition generates many asymmetries, both within each country and between the two nations. Economic development and wealth generation are needed, but can be hindered by a lack of knowledge, investment, and technology.

The environmental and social challenges of the border are by their nature binational and transboundary. Events and factors that originate on one side have major impacts on the other. Watersheds and airsheds as well as people and ideas cross political boundaries, creating both challenges and opportunities. Environmental and social problems from U.S. border counties affect their Mexican neighbors and vice versa.

The U.S. and Mexican structures of public administration and governance struggle to address the growing environmental needs of the border region. In Mexico, power and resources are centralized in the Federal Government and although decentralization is occurring, state and local entities on the northern Mexican border still lack the resources and authority needed to address many environmental issues effectively. The government in Mexico turns over every 3 years at the municipal level and every 6 years at the state and federal levels. Because Mexican law does not allow re-election and the civil service sector is not well developed, ensuring continuity of policies is difficult, especially with respect to cooperation across the border with U.S. governmental counterparts.

Transborder cooperation also has been difficult for all levels of U.S. border governmental entities. The environmental policies of U.S. border states have been inconsistent, there often are prohibitions on spending state funds on transborder projects, and travel by state officials to Mexican border communities often is complicated by requirements of long lead times for travel authorization and other restrictions. U.S. cities and counties often lack the support of elected officials necessary for effective transborder cooperation, even on issues such as hazardous materials incident response, transborder sewage flows, and endangered species and habitat protection—issues that affect both sides of the border. At the federal level, the U.S. EPA has taken the lead in implementing the binational border environmental programs under the umbrella of the 1983 La Paz Agreement, including the most recent program of Border 2012. Also, the U.S. Department of State and its Mexican counterpart have fostered the use of the Border Liaison Mechanism (BLM) to convene the governmental and other stakeholders from both sides of the border under the auspices of the consuls general of border sister cities to discuss and resolve local issues. However, EPA's efforts to address border environmental problems have been slowed by limited participation of other federal agencies as well as decade-long declining federal funding in the face of increasing border needs. Border tribal governments, although integrated into the Border 2012 process, face significant funding challenges and difficulties in interacting directly with tribal members who live across the border in Mexico.

Deteriorating environmental conditions in the border region have been exacerbated by rapid population growth, unplanned or poorly planned urbanization, and an impressive expansion of the economy and trade. Border populations began to grow rapidly in the post-World War II period with the increase in Mexican migration to the northern border. A boom in assembly manufacturing (*maquiladoras*) in Mexican border cities in the 1980s, followed by the opening of the Mexican economy and implementation of the North American Free Trade Agreement (NAFTA) in 1994, further stimulated border growth. By 1990, the population of the border counties and municipalities had reached 9.1 million and by 2000, that figure was at 12.4 million people. By 2009, more residents lived on the Mexican side of the border than that of the United States. By 2010, the border population is projected to reach 17.1 million, and by 2020 it is projected to reach 24.1 million.

Most of the population growth has occurred in urban areas—sister cities along the San Diego-Tijuana border in the west to the Brownsville-Matamoros border in the east. By 2005,

based on U.S. and Mexican census figures, these binational metropolitan cities were home to 4.5 million people in San Diego-Tijuana, 0.2 million in Ambos Nogales, 1.9 million in El Paso-Ciudad Juárez, and 0.6 million in Brownsville-Matamoros. The Mexican sister cities have grown very rapidly, with populations doubling every 10 to 15 years, usually at more than twice the rate of the U.S. city across the border. Local governments, especially on the Mexican side, have not been able to meet fully the demand for urban services engendered by such huge population increases.

Much of the urbanization in cities such as Tijuana, Mexicali, and Ciudad Juárez has been unplanned, with a high percentage of housing that is self-constructed by residents who have settled on unoccupied lands. Although electrical connections generally follow soon after the establishment of informal settlements, water and sewage services can be delayed up to a decade or more and paved streets and sidewalks even longer. Adequate systems for collection and disposal of solid waste and hazardous waste have been lacking. Residents of these informal settlements on both sides of the border (in the United States they are called "colonias") construct houses of locally available materials, build pit privies, and dig shallow wells or obtain water by other means, such as delivery by tanker trucks. Heating and cooking often are accomplished using scrap wood or other combustible materials that produce dangerous contaminants when burned.

The shortage of basic infrastructure in unplanned communities on both sides of the border persists due to a lack of funding for water and sewage systems, pavement, and other basic urban services such as green areas and parks. Creation of the BECC and the NADB for border environmental infrastructure investment and considerable state, federal, and local investment on both sides of the border have helped address the problems. However, the dynamic population base and urban and economic expansion have increased infrastructure needs faster than they could be met. Estimates made in 2000 from the analysis of nine studies suggest a deficit of $5.8 to $10.4 billion in water, wastewater, and solid waste infrastructure; this could reach $20 billion by 2020.[1]

Conditions are not uniform from one border community to the next. For example, Native American tribes located along the U.S.-Mexico border often face even greater challenges because many of their communities are located in areas with little arable land and are split by the international boundary, which hinders travel and inter-tribal relations.

The border is largely an arid region. The eastern part of the border has the most rainfall, with an annual average of 27 inches per year at Brownsville. Elsewhere, major population centers are in very dry areas. El Paso receives less than 9 inches and San Diego less than 11 inches of rain per year. In San Diego, long periods of drought broken by periods of heavy and uneven rainfall are not unusual. During heavy rainfall events in dry regions with land cover that is disturbed by urbanization, overgrazing, harvesting of native brush and trees for firewood, and other activities, the soil is not protected and erosion often is dramatic. Erosion degrades the soil; affects native plants, animals, and habitats; and reduces the quality and quantity of water in the region.

Insufficient water for growing urban populations, agriculture, industry, and maintenance of ecosystems is a problem throughout the border region. The water produced by the two major river systems of the border, the Colorado River and the Rio Grande, is over allocated. Current usage, as well as climatological conditions, may require that U.S. and Mexican allocations be reduced. Border areas such as the El Paso-Ciudad Juárez region, Ambos Nogales, and Columbus-Palomas rely heavily on declining groundwater resources to supplement available surface water. All border communities, both in coastal areas and inland regions, are attempting to extend the existing supplies, using strategies such as conservation, reuse and groundwater recharge, and desalination. Through conventional and innovative treatment of sewage and contaminated water, additional water is generated for maintenance of riparian areas, wetlands, and other habitats.

Since the early 1960s, a number of national and international programs have been implemented in the border region to stimulate economic

growth and development, investment, and trade. These include the Mexican Programa Nacional Fronterizo (National Border Program, 1961) and the Border Industrialization Program (1965), which established the *maquiladora* program. The U.S. Southwest Border Regional Commission (1977) was a regional development effort modeled on the Appalachian Regional Commission. Finally, NAFTA was designed to stimulate trade and investment flows among Mexico, Canada, and the United States. All of these economic development efforts also stimulated urbanization, population growth, and industrialization along the U.S.-Mexico border.

The Mexican border is one of the wealthiest areas of Mexico, along with Guadalajara, Mexico City, and Monterrey. The Mexican border region, however, does not compare well with that of the United States. For example, minimum wages in Mexican border communities are about 1/10th of those just across the border in the United States. On a per capita basis, local government budgets in Mexican border cities are approximately 1/20th of those of their U.S. counterparts. Paradoxically, the U.S. border counties show significant asymmetries when compared to the rest of the United States. If the border counties were the 51st state, they would compare quite unfavorably with the other states. **The adjacent text box provides specific indicators.**

These factors strain existing infrastructure and exacerbate environmental (water, air, and land pollution) and human (substandard housing, lack of adequate infrastructure, and health-related) challenges. For example, unpaved roads and parking lots generate large volumes of dust that degrade air quality and spread contaminants. Garbage burning is highest in areas with insufficient waste management systems and inadequate collection, storage, and disposal facilities. Millions of scrap tires accumulate in border communities and pose both environmental and health risks, serving as a potential breeding ground for mosquitoes carrying diseases such as the West Nile Virus, and as a potential source for fires with severe environmental and health impacts. The unintended consequences of border economic and urban growth are many, and few efforts have been made to anticipate such consequences and address them proactively.

If the U.S. border counties were the 51st state, they would compare with the rest of the United States as follows:

- 1st in federal crimes, mainly immigration and drug crimes;
- 2nd in incidence of tuberculosis;
- 5th in diabetes-related deaths;
- 5th in unemployment;
- 13th in population;
- 16th in violent crime;
- 27th in percentage of adults with a 4-year college degree;
- 40th in per capita income;
- 50th in insurance coverage for adults and children;
- 51st in number of health care professionals.

Source: U.S.-Mexico Border Counties Coalition.

In response to a lack of long-term planning and management systems, especially since the passage of NAFTA, a number of initiatives have been established sequentially to address border environmental problems, all under the umbrella of the 1983 La Paz Agreement. These include: the Integrated Border Environmental Plan (IBEP), Border XXI, and Border 2012. Some of the projects and case studies described in this report grew out of or received support from these programs. The previously mentioned BECC and NADB were created specifically to solve the problem of border environmental infrastructure deficits.

Although efforts have been made to address border environmental problems, and particularly to respond to issues anticipated by the passage of NAFTA, gaps remain. For example, insufficient and inadequate management of non-hazardous solid waste is a significant problem for most U.S.-Mexico border communities. Border manufacturing enterprises contribute to the solid waste problem by producing large volumes of waste

paper, wood, and other materials. Although some companies now are recycling most of their solid waste, additional efforts are needed. Landfill capacity frequently is inadequate, and alternative waste management strategies, such as composting and recycling, generally are lacking. This report includes several examples of efforts to convert waste products into useful resources.

The rapid population growth and industrialization of the border region also have resulted in increased energy demands in border communities. The eastern half of the border region has ready access to petroleum, natural gas, and coal. Only a few indigenous energy sources are developed in the western part of the border, including geothermal energy in the Imperial and Mexicali valleys, solar energy at many locations, and wind energy in eastern San Diego County. Border communities are making efforts to develop their considerable renewable energy resources for several reasons. First, fossil fuels are subject to significant price instability due to global market conditions, which not only is a burden for border citizens but also complicates business investment in the region. Second, the use of fossil fuels to generate electricity produces substantial amounts of air pollution in already non-compliant border air basins, and some of the technologies use large amounts of water for cooling generating plants. All four border states have developed policies to encourage the production and use of alternative energy sources with the goal of lowering and stabilizing future energy costs by reducing exposure to volatile fossil fuel prices and keeping energy and investment dollars to benefit local economies. Each state has developed a Renewable Portfolio Standard, a flexible, market-driven policy aimed at ensuring that the public benefits of wind, solar, biomass, and geothermal energy continue to be recognized as electricity markets become more competitive. These policies ensure that a minimum amount of renewable energy is included in the portfolio of electricity resources serving the state.

The border region is well poised to take advantage of incentives to promote alternative energy. Except at the coasts, the region receives high levels of solar radiation year round. Several areas along the border have sufficient regular winds to support wind farms.

The multicultural, binational character of the border community promotes innovative thinking and problem solving. In the face of diminishing federal resources with which to address border environmental problems, local stakeholders have developed partnerships to create effective and innovative solutions to a range of these problems. This report highlights and explores a number of case studies that provide solutions to some of the complex problems facing border communities.

Environmental problems have tended to be separated according to the media in which they occur—air or water, for example—and both policies and bureaucracies have been developed along those lines. Recent initiatives have mirrored those divisions as well. Local Border 2012 task forces are organized to address air, water, and waste issues. However, innovations often occur when problems are reframed in a manner that makes solutions suddenly evident. For instance, two seemingly unrelated environmental problems that plague a number of communities along the U.S.-Mexico border—the negative impacts to wastewater conveyance systems caused by the improper disposal of waste vegetable oil and grease and the contamination of air from diesel emissions—can be addressed through the conversion of waste oil and grease to biodiesel. Likewise, the need for alternative energy and for economic development both can be met through a tribal wind farm.

Most of the projects and programs highlighted in this report grew out of single-issue efforts, but many of the innovations have been successful because they have crossed the artificial boundaries of classification or political subdivisions that do not coincide with the environmental realities. The projects stem from and support durable, often binational, partnerships. In addition, critical to a region characterized by high rates of poverty, many of these projects provide opportunities for community and economic development. ●

Reference

1. Southwest Consortium for Environmental Research and Policy, Border Institute II, Economy and Environment for a Sustainable Border Region: Now and in 2020, Executive Summary of Recommendations, Rio Rico, AZ, April 2000. http://scerp.org/BI-II.html.

Waste to Resource: Fibrous Concrete as an Alternative to Landfilling and Burning Paper

A binational effort in Ambos Nogales utilizes waste paper in the construction of housing for low-income families.

Key Points

- Fibrous concrete is a highly-insulative and fire-resistant material composed of 50 to 80 percent recycled paper, other waste materials, sand, ash, and cement.
- This is the first known community effort to utilize fibrous concrete to divert paper from the waste stream (mostly generated by the *maquiladora* industry in Nogales, Sonora) to construct housing for low-income families.
- This initiative has brought together a diverse group of partners and has led to the construction of benches for schoolyards in Nogales, Arizona, and low-cost housing for families in Nogales, Sonora.
- Fibrous concrete structures are similar in appearance but are more thermally efficient than standard cinder block (cement block) buildings.
- Binational cooperation was essential for the success of this initiative.

Background

Nogales, Sonora, is home to nearly 100 *maquiladoras,* or manufacturing and assembly plants. The 2005 Mexican census reported the population to be 189,759, but unofficial estimates suggest that the total is higher. Municipal government budgets are insufficient for the size of the population, and therefore, urban services, including waste management, are inadequate to meet local needs. Much of the urbanization of Mexican border cities like Nogales is informal, and a high percentage of the low-income housing is self-constructed by residents using low-cost, easily accessible materials.

Paper and cardboard constitute a large proportion of a city's solid waste. According to city officials, 52,000 pounds of paper are deposited in municipal landfills each year. In addition, an unknown amount of paper is burned and contributes to air quality problems in both Nogales, Sonora, and its sister city, Nogales, Arizona (collectively known as Ambos Nogales), despite recent efforts to reduce burning. From 2004 to 2008, an additional 330,000 pounds of paper per year on average was transported out of the region for recycling. With rising fuel prices, the economic downturn, and weaker demand for scrap paper on the regional and global markets, shipping waste paper for processing and management purposes will become increasingly less attractive, and much of this is likely to be deposited at the landfill.

At the same time, there is a significant shortage of low-cost housing in Nogales. According to a March 2006 report by Hipotecaria Nacional, in 2005 the demand for low-cost housing (defined as less than 210,000 pesos—U.S. $21,000) in Nogales, Sonora, exceeded supply by 1,800 homes.[1] A successful alternative must be affordable, made of readily available materials, easy to build using local knowledge and skills, amenable to construction in phases, secure, private, and of low fire risk. Fibrous concrete functions well under the climatic conditions found in Nogales that include freezing in the winter and temperatures in the 90s (°F) in the summer, as well as periods of wind, snow, and rain. Fibrous concrete can be used to construct cement blocks and roof panels and to

make mortar, resulting in homes that look like the concrete block structures that are built locally. Currently, enough paper is going to the Nogales, Sonora, landfill to construct one home every 3 weeks.

Approach

The Nogales Fibrous Concrete Initiative has attracted support from a diverse group of individuals and organizations because project proponents have successfully demonstrated that both the need for low-cost housing and the excess of waste paper can be addressed through the development of processes and prototypes for producing fibrous concrete (also known as papercrete). This initiative represents a binational, multisectoral effort involving U.S. and Mexican businesses, *maquiladoras*, local and state government agencies, non-governmental and neighborhood organizations, and academic institutions. The partnership has been facilitated by binational organizations such as the Arizona-Mexico International Green Organization (AMIGO), the Arizona-Mexico Commission, and the Border 2012 Ambos Nogales Air Quality Task Force, all of which bring together individuals and organizations to find creative solutions to the unique problems of border communities.

An affordable alternative for constructing comfortable, dignified housing is needed in regions with significant climate extremes like the Arizona-Sonora border. The technology for constructing homes in Nogales was adapted from the approach developed at the Center for Alternative Building Studies in Tempe, Arizona. Although numerous individuals and groups from the United States and elsewhere in the world have built structures of fibrous concrete, the Nogales initiative is among the first to develop and utilize the material to divert paper from the waste stream and to construct housing for low-income families at the community level. As of December 2008, two homes had been completed, a third was under construction, and another was being planned. The two completed houses diverted more than 2,600 pounds of paper from the waste stream. Despite delays in construction, the time to complete each was similar to that of other custom homes being built by individuals in Nogales.

Efficient Use of Material Resources

The production of fibrous concrete begins with a paper and water slurry created by hand by tearing and mashing the paper, or by using a mixer with a large, slowly rotating blade.[2] Almost any type of paper can be used, including cardboard, glossy paper, and catalogs. Waterproofed paper requires more processing time because it does not break down readily in water. Publications with a spine, such as student workbooks, require that the spines be removed from the mix by hand.

After the paper is pulped, sand and Portland cement are added to the mixture to increase its strength. The cement adheres to the paper fiber and renders it resistant to insects, mold, and fire. The Nogales builders used a 1:1 ratio of cement to paper. The mixture is poured into molds, either by hand or machine, and allowed to dry. The standard-sized blocks are 1 by 2 feet and can be connected using mortar made of the same fibrous concrete material. The resulting structures are high in thermal mass and remain cool in summer and warm in winter.

Teamwork by Nogales, Sonora, maquiladora ***workers produces hundreds of fibrous concrete blocks in a day.***

Because of the time needed to acquire land, design the houses, lay the foundations, make all of the blocks and roof panels, and build the structures, the three initial Nogales structures were under construction for more than a year. During this period, the blocks and partial structures were exposed to the elements, and the fibrous concrete

material was observed to function well under the local climatic conditions. Construction engineers in Nogales, Sonora, and Tempe, Arizona, have conducted tests for fire, water, strength, and breakage. Plans to scale up the production and use of fibrous concrete are underway.

Community Mobilization

The first explorations into fibrous concrete in Ambos Nogales occurred with separate efforts by Borderlinks Mexico, Inc., in 2001 and the Instituto Tecnológico de Nogales (ITN) in 2004. In 2005 and 2006, a team of researchers from the University of Arizona (UA) worked with various community partners, with support from the Arizona Department of Environmental Quality (ADEQ), to conduct a project titled "Thermal Construction and Alternative Heating and Cooking Technologies." The team assessed various technologies with the potential to improve the air quality in Ambos Nogales by reducing garbage and wood burning.

Of the possible alternative building materials studied and presented to civic leaders and community members in several Nogales neighborhoods, fibrous concrete was identified as the most likely to succeed as a locally appropriate alternative. Its principal advantage for this border region is that it can be used to construct homes that: resemble standard cinder block homes and are secure from theft; are made of readily available materials using local expertise with masonry; and are inexpensive, thermally efficient, and both fire- and insect-resistant. In addition to the initial groups, four schools, a neighborhood leader, and a professional association expressed interest in further experimentation with fibrous concrete and worked with university faculty and students to hold workshops and develop projects for their sites.

The two high schools in Nogales, Sonora, both held workshops on fibrous concrete. Students from one school's ecology club began experimenting with the material, and the second school utilized its metal shop to construct a mixer for use throughout Nogales. Two schools in Nogales, Arizona, helped test the fibrous concrete by constructing schoolyard benches from the material.

After the first workshop, the neighborhood leader began to produce fibrous concrete blocks by hand. He built a wall near his house to test the material and demonstrate its potential to his neighbors. After completing the wall and observing how well it held up in Nogales' climate, but still facing much skepticism, he constructed a small apartment of fibrous concrete near his house. Shortly thereafter, a neighbor began constructing a room on his own property. In the fall of 2007, the leader organized Grupo ConFib, a grassroots organization dedicated to promoting and producing fibrous concrete blocks. Despite delays caused by acquiring and transporting materials, working around other jobs and responsibilities, and halting construction through the summer monsoon season, by summer of 2008, both structures were nearly complete. The neighborhood leader stayed in his two-room apartment during the summer because it was much cooler than his own house. The apartment is attached to a bathroom with running water and a flush toilet, and received a coat of stucco, electricity, and glass windows by late fall.

Completed Alcatel Lucent fibrous concrete house, Nogales, Sonora.

Meanwhile, members of the Asociación de Profesionales en Seguridad y Ambiente A.C. [3] (APSA), a professional association dedicated to improving health and safety within businesses and industries operating in Nogales and the larger community, had attended some of the workshops and meetings about fibrous concrete and discussed various projects, including constructing their office building out of fibrous concrete. In April 2007, the group

held a contest among its *maquiladora* members who made more than 800 blocks. One *maquiladora*, Alcatel-Lucent S.A. de C.V. [4], donated land for the contest and used the blocks to construct a home for one of its employees to demonstrate the material's potential. The company solicited and received assistance from a local construction company and manufacturer. Construction was slowed by the need to obtain materials, make more blocks and roof panels, and recruit volunteers to help with various tasks such as painting. Connection to water, sewer, and electricity was delayed until the city completed main trunk lines to the neighborhood. Finally, the house was completed in August 2008, and the new tenants, a mother and her three children, moved in.

The next step is to scale up production and monitor carefully the economic and environmental characteristics of construction with fibrous concrete. Schools on both sides of the border will continue to participate in educational and outreach activities on fibrous concrete and related topics such as air quality, solid waste and recycling, and climate and the use of thermally efficient construction materials.

Conclusions

This initiative demonstrates that fibrous concrete is a potentially viable alternative for addressing two problems common in border communities: large volumes of waste paper and insufficient housing for low-income residents. The material produces structures that are more thermally efficient than standard cinder block buildings. Especially in regions with significant climate extremes like the U.S.-Mexico border, an affordable alternative for constructing comfortable, dignified housing is much needed. This initiative also demonstrates the benefits of multisectoral partnerships and binational collaboration, both of which are needed urgently today. ●

..... POINTS TO CONSIDER .....

Successful efforts to use fibrous concrete to address both waste and low-income housing issues involve many segments of the community and international collaboration. Developing partnerships and introducing alternative technologies takes time.

Creating a system to meet local needs minimizes energy and transportation requirements and increases the environmental benefits of the program.

Fibrous concrete construction will never replace other forms of construction for the mass market but instead can fill an important niche market for self-constructed housing in Mexican border towns.

Fibrous concrete construction can be accomplished through small-scale, low technology approaches or by a large-scale commercial operation. Evaluating the size and stability of the resource stream is critical for determining the size of the operation that can be sustained at any location and for attracting financing. Federal government support could be used to develop a binational source for scrap paper as well as a regional market to facilitate economies of scale.

A two room self built fibrous concrete house under construction, Nogales, Sonora.

References

1. Hipotecaria Nacional, Estudio del Mercado de Vivienda en Sonora, http://www.hipnal.com.mx/not_sonora.html.
2. Living in Paper, Introduction to Papercrete, www.livinginpaper.com.
3. Asociación Civil, a non-for-profit civic organization.
4. Sociedad Anónima de Capital Variable, a private business enterprise.

Scrap Tire Cleanup in the Border Region

Community projects remove illegally dumped scrap tires and look for reuse options.

Key Points

- Millions of scrap tires accumulate in border communities, especially in Mexico.
- Scrap tires pose a health risk because tire fires adversely affect air quality, and inadequately managed tire piles provide a habitat for disease-carrying vectors such as mosquitoes that transmit West Nile Virus.
- Scrap tire pile cleanup is a major goal and success of the U.S.-Mexico Border 2012 border environmental program.
- Community participation has been critical for cleanup efforts in urban and rural areas across all border states, including coordinated binational efforts such as those in Luna County, New Mexico, and the Palomas and Ascensión areas in Chihuahua, Mexico.
- Developing markets and productive end uses for scrap tires continues to be a challenge for the entire border region.
- Cross-agency and cross-border cooperation on market development is needed to find productive end uses for scrap tires.

Background

Discarded tires have become a growing threat to the environment and public health in both rural and urban areas along the border. The accumulation of millions of scrap tires is particularly severe in Mexican border communities, where approximately 6.4 million scrap tires are present in large and small piles, according to a May 2007 Border 2012 scrap tire inventory.[1] These piles present environmental and public health threats to border residents, contribute to urban and rural blight, and are breeding grounds for mosquitoes and other disease vectors. Scrap tire pile fires are extremely difficult to extinguish, contaminate soils and watercourses, and produce dangerous emissions that affect both sides of the border. Scrap collectors often burn tires to retrieve scrap metal, releasing toxic fumes into the air. Tires are burned as fuel in brick kilns and adjacent to agricultural fields to protect sensitive crops during periods when freezing temperatures are expected. Emissions from these burning practices generate dense smoke that can be seen for miles and result in harmful levels of particulates and other contaminants that affect surrounding communities.

In some border communities such as Tijuana, homeowners use thousands of scrap tires to build structures such as residential retaining walls, stairways, and foundations. Companies that build retaining walls and embankments for highways also use scrap tires. Civil engineering applications are one of the most productive uses of scrap tires in both the United States and Mexico. However, poorly engineered residential structures and retaining walls are commonplace in border communities. In Tijuana, heavy rains that saturate highly erodible soils can produce structural failures, causing some scrap tires to flow into local watersheds.

Although EPA and Mexico's federal environmental agency, Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), in cooperation with state and local authorities, have made

Scrap tires used as foundations for informal housing, Los Laureles Canyon, Tijuana.

progress in cleaning up a number of large scrap tire piles, the mechanisms that led to the initial creation of these piles remain intact. One binational factor considered to significantly increase the rate at which tire piles are generated in the border region is the fact that consumers in the U.S. border region tend to replace automobile tires when the tires are still serviceable. These tires are exported to Mexico, both formally and informally, where they find a market based on their relatively low cost. As a result, U.S. border communities export part of the problem of scrap tire disposal to Mexico, and Mexican border communities rapidly accumulate scrap tires. Scrap tires are left curbside, stored in backyards, placed in municipal landfills, or illegally dumped in vacant areas.

Approach

Both the United States and Mexico, through the Border 2012 Program, have worked to promote stronger binational cooperation to address scrap tire issues. The U.S. and Mexican governments signed a letter of commitment to support a more integrated binational approach to scrap tire management as a result of a 2003 U.S. and Mexico Binational Commission conference. Most recently, all 10 border governors signed the Binational Integrated Scrap Tire Initiative (Strategy) at a 2008 meeting of the Border Governors Conference. The Strategy offers guidelines and promotes actions such as strengthening laws, regulations, and policies; developing innovative technologies and markets through economic or regulatory incentives; and educating and mobilizing stakeholders through local and community-based programs. The Border 2012 Program's most significant success can be attributed to a public-private partnership that has resulted in the cleanup of almost 4 million tires border-wide and the use of these scrap tires as tire-derived fuel in Mexican cement plants engineered with appropriate air pollution controls. However, a key message from Border 2012 and state and local government efforts is the need to promote diverse reuse practices and markets based on regional considerations.

Mexico, through SEMARNAT, also has worked with state and local authorities on coordinated campaigns to clean up legacy tire piles and has developed preliminary guidelines for safe storage of scrap tires. In addition, Mexican border states have begun to develop specific legislation to deal with scrap tires in response to the 2003 federal law on Prevention and Integrated Waste Management that makes states responsible for the solid waste and special waste category that includes tires.

U.S. border states have participated in addressing the problem through cooperation in the Border 2012 projects and through state-specific initiatives. Arizona has pursued the use of scrap tires for rubberized asphalt paving, Texas has supported alternate uses for scrap tires, and California has invested heavily in market development for scrap tires and tire-derived products, as well as a tire-hauler registry and tire manifest program, and has cooperated with Mexican authorities on information exchange regarding all aspects of scrap tires, particularly illegal cross-border flows. In addition to its close work with Chihuahua on cleanup activities, New Mexico is continuing its efforts on the use of ground rubber and rubberized asphalt, use of scrap tires for safeguarding abandoned mines, and research on civil engineering applications using tire bales.

Community Mobilization

The Border 2012 New Mexico-Chihuahua Rural Task Force (Task Force) has conducted several activities to address scrap tire issues. Rural communities in Luna County, New Mexico, and the Mexican municipalities of Ascensión and

Palomas mobilized to address scrap tires in their communities. The project included a technical workshop on scrap tire management and disposal options, a scrap tire inventory, and education and outreach about the proper disposal of scrap tires.

Field data were gathered in the spring of 2007 to inventory scrap tires from tire shops, clandestine dumps, and municipal dumps. Roughly 2,100 tires were located in Ascensión and approximately 600 in Palomas. Utilizing global positioning system (GPS) data, students from secondary schools with training from the Autonomous University of Ciudad Juárez and New Mexico State University (NMSU) created maps of tire locations using geographic information systems (GIS) software. The maps assisted cleanup efforts and were included in the U.S.-Mexico Border Tire Inventory Summary Report (May 2007), the first inventory of scrap tires for the entire U.S.-Mexico border region.

A technical workshop on scrap tire management and disposal options for rural communities was held in Palomas in April 2007. Fifty-two participants attended presentations on scrap tire management and disposal options by experts from the United States and Mexico. The Municipality of Ascensión and the Task Force also developed an educational brochure on the project explaining the problems scrap tires pose to public health and their communities. The brochures were distributed throughout the communities of Ascensión, Palomas, Modelo, 6 de Enero, and Guadalupe Victoria, during the cleanup. Students used the brochure as a vehicle to discuss the scrap tire problem and proper disposal with community members. In November 2007, the project removed approximately 5,000 to 6,000 tires from Palomas and other small villages—more than double the number of tires expected to be removed based on the results of the tire inventory.

The Luna County Project, funded by the New Mexico Environment Department (NMED) and EPA, removed approximately 100,000 scrap tires from the Deming and Columbus, New Mexico, area. The illegal tire dump was estimated to hold approximately 67,000 tires and had no fire prevention plans. The scrap tire pile was removed with the assistance of the Luna County Road Department and NMSU students and faculty. The project also developed outreach materials in English and Spanish to educate Luna County residents about the proper disposal of scrap tires.

Efficient Use of Material Resources

The New Mexico-Chihuahua Scrap Tire Initiative focused both on cleanup of the scrap tires and their ultimate reuse. Two reuse options that matched regional needs were proposed, but both required funding to transport tires. The Task Force covered part of the transportation costs from Ascensión and Palomas and the municipalities covered the remaining costs themselves. Scrap tires from Ascensión and Palomas were taken to the Grupo de Cementos de Chihuahua plant at Samalayuca. The plant's emissions control equipment allowed the tires to be used safely as fuel. For the Luna County Project, the scrap tires were taken to the Luna County Road Department where they were baled into 1-ton bales. The New Mexico Department of Transportation used some of the tires for erosion control along a rural highway. In addition, Luna County used some of the bales in closure of its old landfill.

The Municipality of Juárez, Chihuahua, along with the State of Chihuahua, the Grupo de Cementos de Chihuahua, EPA, and SEMARNAT signed an agreement (referred to as an Annex) that covers economic contributions and mandated legal procedures for the disposal of scrap tires at the largest tire pile site (approximately 6 million at that time) along the U.S.-Mexico border, located south of Ciudad Juárez. Every year the Annex is updated, and to date more than 2 million tires have been processed as fuel at the Samalayuca facility. The 2009 Annex goal is to process approximately 1.8 million tires annually. This would eliminate the three largest scrap tire piles in the border region by the year 2012, a Border 2012 goal.

The New Mexico-Chihuahua cleanup was the final event of a project funded by EPA and SEMARNAT through the Border 2012 Program to reduce the number of discarded tires in the border area. Border 2012 provided funding to the New Mexico-Chihuahua Rural Task Force to locate, col-

Some of the approximately 4 million tires stockpiled near the Juárez municipal landfill in Chihuahua.

lect, and transport discarded tires for safe disposal from the rural area. The Luna County Project was funded through grants supported by EPA and NMED and in conjunction with Luna County.

Conclusions

Although many scrap tire cleanup programs have been initiated, additional efforts are needed to reduce scrap tire piles and ensure that newly generated scrap tires are managed properly. Continued information gathering is needed to better understand scrap tire generation and disposal, encourage development and implementation of environmentally acceptable and economically promising end-use markets, continue cleanup, and continue outreach programs for a diverse audience of stakeholders. Scrap tires present the U.S. Federal Government with an opportunity to facilitate market development by linking solid waste disposal to civil engineering applications, road paving, public health concerns, and air quality issues across federal, state, and local agencies, and across the international boundary. The U.S.-Mexico Scrap Tire Management Initiative, under the Border 2012 Program, is spearheading the effort to address these issues and create long-term, sustainable solutions. ●

Reference

1. Border 2012: U.S.-Mexico Border Scrap Tire Inventory Summary Report. May 2007. Pub. No. EPA 530-R-07-007. http://www.epa.gov/waste/conserve/materials/tires/pubs/2012-tires.pdf.

..... POINTS TO CONSIDER .....

The U.S. and Mexican Federal Governments can play a critical role in facilitating the coordination of border state governments to control the flow of used and scrap tires in the region. They also can promote education and community-based programs to support cleanup and prevention efforts.

U.S. and Mexican authorities and the private sector have struggled with the scrap tire issue for years. Success in scrap tire reuse and recycling has been limited by the lack of funding, binational coordination, and cooperation between the public sector and private sector.

Civil engineering applications for scrap tires include the use of crumb rubber in asphalt, concrete paving, and sports fields. Scrap tire-derived fuel has been used successfully for 10 years in Mexico and longer in the United States. However, cement plants are limited in the number of scrap tires that they can utilize, so market diversification is crucial. To date, proposals to break down scrap tires into marketable materials such as carbon black, steel, and oil have not proved to be economically and environmentally feasible.

Innovation in Conserving Resources: Upper San Pedro Partnership

Management strategies reduce groundwater usage per capita per day by 10 percent.

In the Sierra Vista Subwatershed in Cochise County, Arizona, groundwater extraction exceeds groundwater recharge. This poses a concern not only for the region's future water supply, but also for the well being of the San Pedro River ecosystem, which is highly dependent on groundwater, and the San Pedro Riparian National Conservation Area. The goal of the Upper San Pedro Partnership is to implement water management measures to reach a sustainable yield of groundwater withdrawals from the regional aquifer.

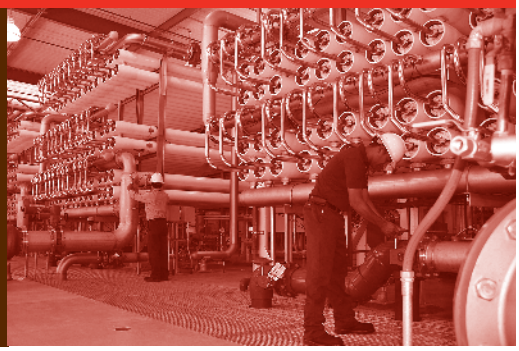
The Upper San Pedro Partnership has implemented various conservation and groundwater recharge projects, including effluent reuse, code changes, reductions in irrigated agriculture, public education campaigns, and effluent and stormwater recharge projects. From 2002 to 2005, groundwater pumping in Sierra Vista was reduced from 174 gallons per capita per day (gcpd) to 156 gcpd. The Partnership's management strategies, coupled with other factors, are estimated to have yielded 7,230 acre feet of water in 2005. (See http://www.usppartnership.com/docs/Sec3212006Rept907Hill(2).pdf for more details.) These projects link activities of different agencies with stakeholder participation to create sustainable solutions to various environmental problems.

The Upper San Pedro Partnership was formed in 1998 as a consortium of federal, state, and local agencies and organizations. The purpose of the Partnership is to coordinate and collaborate in the identification, prioritization, and implementation of comprehensive policies and projects that assist in meeting the long term water needs of the Sierra Vista subwatershed.

The San Pedro River riparian corridor is a lush ribbon of green in the Arizona desert.

Cottonwood and willow forest along the San Pedro River.

Kay Bailey Hutchison Desalination Plant



El Paso Water Utilities and Fort Bliss partner together on a desalination plant to augment existing water supplies and protect fresh groundwater supplies from brackish water intrusion.

Key Points

- The plant utilizes advanced reverse osmosis technology that made construction economically feasible.
- The desalination facilities increase El Paso Water Utilities' fresh water production by approximately 25 percent.
- The desalination removes salts and other pollutants from the water utilizing the most comprehensive water treatment technology available.
- The facility serves as a model and center of learning for other inland cities facing diminishing supplies of fresh water in both the United States and Mexico.
- The disposal of brine produced by the reverse osmosis process is accomplished by pumping the water 22 miles and injecting it into a 3,500-foot deep dolomite formation.

Background

Throughout the U.S.-Mexico border region, the demand for water to accommodate an ever larger population base is increasing. Many border communities have established aggressive water conservation measures that include water efficient appliances and landscaping, reclaimed water for irrigation and industrial use, and pricing structures to encourage demand reduction. At the same time, many communities have moved to expand supply, and desalination is the likely choice in a number of areas. Seawater desalination projects are moving forward in the San Diego and Brownsville areas.

Inland areas of the border, isolated from the ocean as both a source of water to process and a location for disposal of brine, face many challenges in diversifying and expanding potable water supply. The demand for water in the growing El Paso area requires access to a greater water supply. The city's water sources include groundwater from the Hueco and Mesilla bolsons (aquifers) and surface water from the Rio Grande. Water from the Rio Grande is only available during the spring, summer, and early fall months and is further limited in years of reduced flows. The Hueco Bolson, on the east side of the Franklin Mountains, also is the source of water for Ciudad Juárez in Mexico and other communities in the area. Historically, pumping from the bolsons has exceeded recharge rates and water levels have declined.

The El Paso Water Utilities (EPWU) was facing two significant groundwater management issues in the Hueco Bolson: declining groundwater levels and brackish groundwater intrusion into wells that had historically pumped fresh groundwater. EPWU pumping in the Hueco Bolson peaked at about 80,000 acre-feet per year (AF/yr) in 1989, but through conservation and an increase in use of reclaimed and Rio Grande water, pumping was reduced to below 40,000 AF/yr in 2002, or approximately one-third of the total demand for EPWU. Under these operating conditions, the 84 Hueco Bolson wells had a well capacity of about 117 million gallons per day (mgd).

Approach

EPWU long has recognized the need for efficient use of water resources. EPWU's conservation initiatives have been very successful, and include strict controls on landscape irrigation and incentives for the use of water-efficient appliances. Water use per day per person was 200 gallons in 1991, but had declined to 133 gallons by the end of 2008, according to EPWU. Additionally, EPWU's strategic plan calls for reclaimed water to reach 15 percent of the annual potable water use by 2012. However, growing water demand, declining aquifer resources, brackish groundwater intrusion into wellfield areas, and the risk of severe drought led EPWU to diversify its water supply through desalination.

In the early 1990s, EPWU began to explore the idea of desalinating the brackish water in the bolsons. The amount of brackish water in the Hueco Bolson exceeds the amount of potable water by approximately 600 percent. The brackish water contains more salt than is allowed in drinking water, but significantly less than ocean water. In 1997, EPWU and the Ciudad Juárez water utility, the Junta Municipal de Aqua y Saneamiento, along with other agencies on both sides of the border, commissioned the U.S. Geological Survey to conduct a detailed analysis of the amount of fresh water remaining in the Hueco Bolson, the amount of brackish water available, and a determination of flow patterns. Reduced groundwater levels from historic pumping in and around wellfields resulted in changed flow patterns. Because brackish groundwater is in close proximity to fresh groundwater in many areas of the Hueco Bolson, these altered flow patterns have caused brackish groundwater to intrude into areas that had contained fresh groundwater. EPWU used data from the study to determine where to locate the desalination plant and source wells, and obtained critical information needed to characterize the injection well site. The plant's wells are designed to intercept brackish groundwater and protect fresh groundwater.

In 2002, EPWU drilled and monitored nine test wells to characterize a section of the Hueco Bolson selected to provide the source water. EPWU consultants also completed an extensive analysis of existing wells that might be used to supply the desalination facility. A reverse osmosis pilot plant was constructed to test the chemicals, filters, and membranes used in the reverse osmosis process, and determine which worked best with local water. In February 2005, U.S. Army consultants completed environmental studies and published a Final Environmental Impact Study. The most complex studies, however, were directed toward the problem of concentrate disposal.

A comprehensive initial study examined six alternatives for disposal, with deep-well injection selected as the preferred method. After the University of Texas at El Paso conducted a geophysical study, geologic modeling, and drilling of test wells, a site for disposal was selected 22 miles northeast of the desalination plant. This site prevents migration of the injected brine to fresh water, provides storage volume sufficient for 50 years of operation, and meets all of the requirements of the Texas Commission on Environmental Quality for injection wells.

Fort Bliss and EPWU Partnership

Because Fort Bliss, a U.S. Army post located adjacent to El Paso and extending into New Mexico, was considering a similar facility, a public-public partnership was formed to meet the needs of both Fort Bliss and EPWU. The partnership involved the U.S. Department of Defense and a municipality, and drew on the private, municipal, academic, political, and regulatory sectors in El Paso, the State of Texas, and the United States.

Fort Bliss also was facing problems of a sustainable water supply. The base's future operations were threatened because of concern about limited fresh water supplies; therefore, the Department of Defense decided to partner with EPWU on the inland desalination plant. The region's new long-term water supply served as a key factor in the decision to increase personnel and operations at Fort Bliss under the Base Realignment and Closure Process. With a military and civilian population of approximately 43,000 in 2008, Fort Bliss is slated to grow rapidly for the next several years.

This inland plant was built following the construction of a similar plant in the Brownsville,

Texas, area. In that case, surface water supplies were augmented by five water utilities partnering to obtain potable water from desalination of brackish groundwater.

Innovative Use of Technology

Built at a cost of $87 million, the El Paso facility contains: a state-of-the-art, two-stage reverse osmosis treatment process; more than 30 supply and blend wells; approximately 19 miles of collector and transmission pipelines; pumping stations; and a concentrate disposal system consisting of 22 miles of cross-desert pipeline and three surface injection facilities. With very few treatment plants of this type in the United States, the design was accomplished without the benefit of experience and information from similar scale prototypes. Factoring in operational expenses, the desalination project delivers water for considerably less than other options that were evaluated by EPWU, including indirect potable reuse of reclaimed water or importing water from remote areas in western Texas.

At the EPWU facility, raw water from new and existing wells is pumped to the plant and filtered before being sent to reverse osmosis membranes. Through a pressurized process, raw water is forced through fine membranes that separate salts and other contaminants from the water. Approximately 83 percent of the water is recovered, while the remainder is output as brine. At the conclusion of the reverse osmosis process, the permeate, or desalted water, is piped to a storage tank and the concentrate is routed to a disposal facility. The permeate is blended with water from new wells. Following pH adjustment and disinfection, the finished water is sent to the distribution system. Safe disposal of the brine is a challenge—the concentrate is pumped across the desert to three individual injection wells located in a remote area of Fort Bliss. Solar-powered surface facilities at each well site include buffer tanks, communication equipment, and valves and controls that regulate flow through deep wells to the brackish water aquifer more than 3,500 feet below the ground surface in a fractured dolomite formation.

Kay Bailey Hutchison Desalination Plant, El Paso.

The facility incorporates two innovative uses of technology: an inland application of reverse osmosis membranes and a unique industrial application of deep-well injection. EPWU operates North America's largest inland application of reverse osmosis. Although it commonly is used in the petroleum industry, deep-well injection of concentrate from groundwater desalination plants had seldom been conducted in the United States, and never at this scale. Surface injection facilities were designed for each well site. The facility's design garnered an award for excellence in environmental engineering.

Conclusions

The regional impact of the EPWU desalination project is considerable. The desalination plant can produce 27.5 mgd of fresh water, making it a critical component of the region's water portfolio. By developing an untapped resource and diversifying its water supply, the desalination plant contributes to more sustainable use of water resources in the three-state international Paso del Norte region: New Mexico, Texas, and Chihuahua, Mexico. ●

References

1. EPWU Public Service Board, *Desalination Plant: Setting the Stage for the Future*, http://www.epwu.org/water/desal_info.html.
2. American Academy of Environmental Engineers, 2008 E3 Competition Winners, Superior Achievement: Kay Bailey Hutchison Desalination Facilities, http://www.aaee.net/Website/E3SA.htm.
3. William R. Hutchison, P.G., EPWU Hydrogeology Report 04-01, *Hueco Bolson Groundwater Conditions and Management in the El Paso Area*, March 2004, http://www.epwu.org/water/hueco_bolson.html.

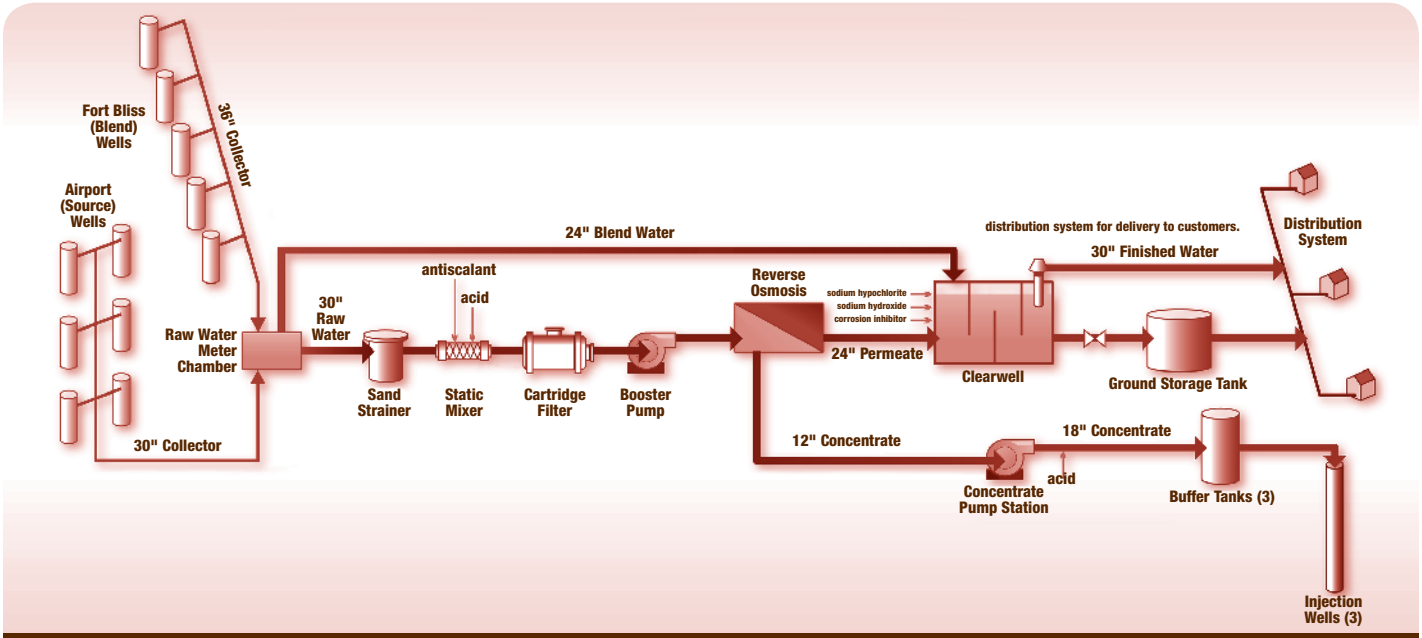
..... POINTS TO CONSIDER .....

The availability of fresh water is a serious challenge facing not only the desert Southwest but also the world. The demand for a reliable and secure supply of water for a growing region must be met by the carefully selected and economically efficient development of new water sources.

The extensive research involved in the design and construction of the facilities—studies, pilot plants, research, and the state/federal permitting processes—provides a wealth of information and a model for other inland cities facing diminishing supplies of fresh water and with access to brackish groundwater.

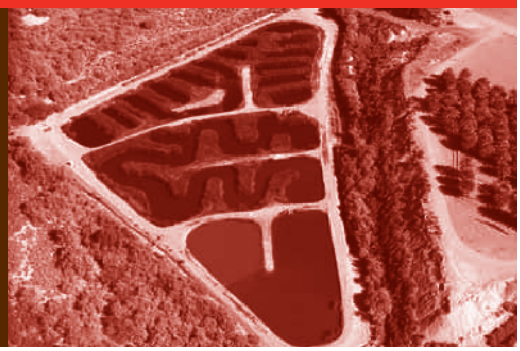
The project illustrates the importance of linking water conservation measures with efforts to generate new sources of water in desert border communities.

The desalination project demonstrates the necessity of partnering among agencies and with other entities.



Schematic for desalination process, Kay Bailey Hutchison Desalination Plant, El Paso.

The Brawley and Imperial Wetlands in the Imperial Valley, California



Constructed wetlands, utilizing low-cost technology, provide an effective solution to treat polluted surface water.

Key Points

- The New River, which flows northward from the Mexicali Valley into the Imperial Valley and terminates in the Salton Sea, is heavily polluted. The New River carries untreated sewage, industrial waste, and agricultural chemicals.
- Two constructed wetlands, the Brawley and Imperial, treat polluted water and provide a habitat for migratory bird species traveling within the Pacific Flyway.
- The wetlands remove more than 90 percent of suspended sediments and pathogens in the water. However, accumulation of selenium in the wetlands and food chain remains a problem.
- The project demonstrates how grassroots efforts and effective partnerships, often employing low-cost technologies, can provide effective solutions to environmental problems. The project also illustrates the importance of federal start-up assistance in mobilizing local support and participation.

Background

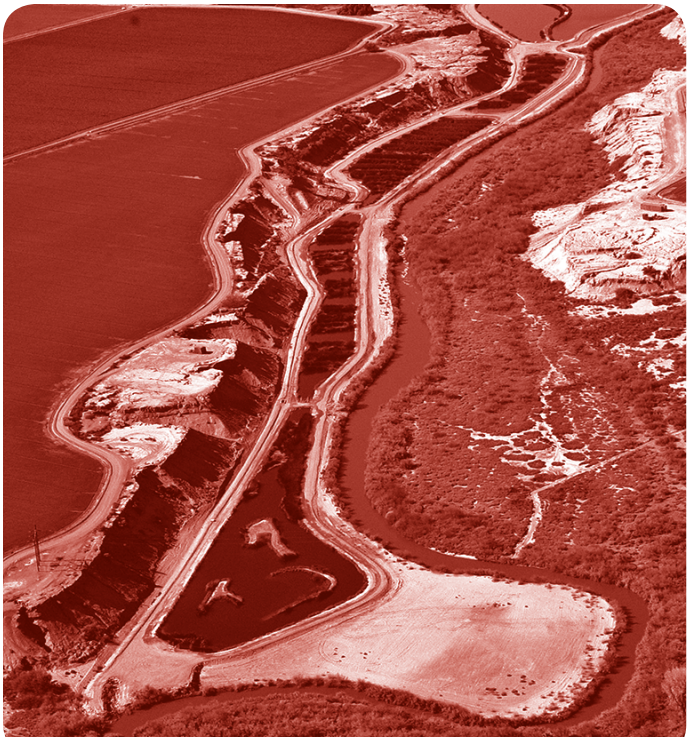
Much of the U.S.-Mexico border region is arid with low annual rainfall. As the region's population has grown, especially in the years following NAFTA, new demands have been placed on limited water supplies. In border communities in both countries, but especially in Mexico where funding constraints are greater, population growth may outpace efforts to build water and wastewater infrastructure. All too often, communities struggle to secure a reliable long-term water supply. As the urban footprint grows and new water sources are tapped, wetlands and green spaces have disappeared. In some communities, the deficit in wastewater treatment and collection poses a threat to public and environmental health.

To address these challenges, border communities have implemented innovative strategies to reduce water pollution, restore or create new wetlands and green space, and reduce the strain on limited water supplies. Often, they have done so by viewing wastewater as a resource rather than as a problem. A partnership led by a local organization, the Citizens Congressional Task Force on the New River, is reducing water pollution in the New River in Imperial Valley, California, by creating new wetlands. Although wetlands traditionally have been nature's filters, more than 90 percent of natural wetlands have been lost in California, leading to loss of wildlife habitat and degradation of water quality. Although wetlands have been constructed in the border region with the intent of restoring habitat, the use of constructed wetlands primarily for the improvement of water quality is less common. Typically, wetlands developed to improve water quality have urban wastewater, which has different characteristics than river water, as their source. For example, selenium levels in urban wastewater may not be as high as in the New River, which also is fed by agricultural drain waters. Therefore, special considerations are needed in the design and monitoring of wetlands used to treat river water.

The New River originates in Mexico, flows through Mexicali, Mexico, into Calexico, California, and through Imperial County before emptying

into the Salton Sea, a saline lake in the Sonoran desert located 40 miles north of the international boundary. The New River at the international border is considered one of the most polluted streams in the United States due to sewage arriving from Mexico. The river carries urban runoff, agricultural drainage, and domestic and industrial waste from both countries. According to the California Regional Water Quality Control Board, New River flow at the border is about 150 to 200 cubic feet per second (cfs), increasing to 600 cfs where it enters the Salton Sea. The Alamo River, which also flows into the Salton Sea, originates in Mexico approximately 2 miles south of the border and eventually will be the site of wetlands similar to those developed for the New River. The Alamo River is dominated by agricultural return flows from the Imperial Valley. The Regional Water Quality Control Board calculates flow at the border at 3 to 5 cfs, increasing up to 1,000 cfs at the Salton Sea Delta.

Water quality is impaired by the presence of high levels of suspended sediments, nutrients (nitrogen and phosphorus), selenium, coliform bacteria, and various pathogens. Sediments, suspended solids, and turbidity of the New and Alamo rivers exceed the limits established by the State of California Regional Water Quality Control Board. The New and Alamo rivers account for 80 percent of the flow into the Salton Sea, and the pollutants they carry are degrading its waters.



Imperial Wetlands adjacent to the New River.

The Salton Sea has important ecological connections with the Colorado River Delta in Mexico. Both are key stops on the Pacific Flyway for migrating birds, linked by the riparian corridors along the Colorado, Hardy, New, and Alamo rivers. More than 400 bird species are found in this region, and the Salton Sea is considered to be the Nation's most productive fishery. Yet, the Salton Sea's survival is at risk due to increasing salinity, pollution, and decreased inflow. Selenium, a naturally occurring element in the region, is leached from agricultural fields and deposited in the Salton Sea, accumulating in the food chain and threatening wildlife and human health.

Approach

Two treatment wetlands, the Brawley and Imperial, were constructed in 1999 adjacent to the New River in the Imperial Valley with the goal of providing wetland habitat while removing sediment, nutrients, and contaminants that were degrading the New and Alamo rivers and the Salton Sea. A key element of the project has been a multi-year monitoring effort that began in 2001. The monitoring was designed to evaluate the effectiveness of the constructed wetlands in treating pollutants in the water column and the sediments and to evaluate the outcomes for living organisms.

An important feature of the project is the use of surface water, which requires sediment removal as a key aspect of treatment. Although research has documented the effectiveness of wetlands in improving water quality in other parts of North America, the Salton Sea region has a unique climate, with extreme heat (an annual average daily maximum temperature of 88 °F) and little precipitation (less than 3 inches per year). Localized testing was needed to evaluate the use of wetlands to improve water quality in this region. Other important aspects of the project are creation of habitat for fish and birds, and educational outreach that has involved hundreds of students in classroom activities, field trips, and work days.

Monitoring has been conducted for several years for the following parameters at wetland inlets and outlets: water temperature, dissolved oxygen (DO), specific conductance, pH, barometric pressure, dissolved and total concentrations of organic carbon, phosphorus species (orthophosphate and total phosphorus), nitrogen species (nitrate, nitrite, ammonia, total Kjeldahl nitrogen, and total nitrogen), total suspended solids (TSS), dissolved selenium, bacteria (total and fecal coliforms and *E. coli*), biological oxygen demand (BOD), calcium, magnesium, sodium, potassium, total alkalinity, hydroxide, carbonate, bicarbonate, sulfate, chloride, fluoride, total silica, and perchlorate. Monitoring and analysis were conducted to characterize the removal of pollutants from the two pilot wetlands to assist in development of designs for other wetlands in the region. **Results for key parameters are shown in Table 2, page 27.**

Both the Brawley and Imperial wetlands significantly reduced the amount of selenium, nitrogen, and phosphorus, and removed more than 90 percent of suspended sediments and pathogens (measured as fecal coliform) in the water. Researchers from San Diego State University, supported by the Southwest Consortium for Environmental Research and Policy (SCERP)[1] have been evaluating the fate and removal of selenium in these constructed wetlands. Their findings determined that constructed wetlands are an efficient method for removing selenium from agricultural drainwater; however, after 6 years of operation of these wetlands, concentrations of selenium in fish and invertebrates were at or above threshold ranges for reproductive effects in birds and fish.[2]

Partnership

In early 1997, a local organization, Desert Wildlife Unlimited, sought a solution to the pollution problem of the Alamo and New rivers. This group worked with local, state, and federal agencies to obtain grant funds. Under the auspices of Desert Wildlife Unlimited, the Citizen's Congressional Task Force on the New River was formed to develop the project. Congressman Duncan Hunter was key in the effort to obtain federal funding for the project. The U.S. Bureau of Reclamation, the lead federal agency on the project, acquired permits from the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service (USFWS) and completed the National Environmental Policy Act requirements. The California Department of Fish and Game was the lead agency in completing the requirements for the California Environmental Quality Act. The partners in the project hope eventually to establish 4,000 acres of constructed wetlands to improve the quality of the New River and Alamo River water flowing into the Salton Sea and provide wildlife habitat.

Novel Use of Technology

The two wetlands were constructed using a combination of sedimentation basins and wetland cells. The Imperial Wetland, located approximately 13 miles north of the international boundary near Imperial, California, contains 22.7 wet acres. The source water is entirely agricultural drainage, and the treated water flows into the New River. The site has two sedimentation basins and four wetland cells in series, a capacity of 127 acre-feet, a flow rate of 6 cfs, and retention time of 18 days.

The Brawley Wetland, near Brawley, California, approximately 20 miles north of the border, contains 6 wet acres with a capacity of 21 acre-feet. It treats water from the New River. The wetland has one sedimentation basin and two wetland cells in series with a flow rate of 1 cfs and retention time of 9 days.

Flowing water enters the wetlands in areas where contaminants settle into bottom sediments or are subject to microbial-mediated reactions that may transform contaminants into volatile (or bioavailable) forms that may be incorporated into algae and plants. Fish and invertebrates may eat these plants, causing the contaminant to move up the food chain (or bioaccumulate). As plants and animals die, they also settle into the bottom sediments. With long-term sediment build-up, a permanent sequestration of contaminants in the sediment occurs.

Conclusions

The project demonstrated that wetlands with sedimentation basins can provide highly effective reduction of total suspended solids. This suggests that wetlands can be used effectively to treat sediment-laden streams. Differences in perfor-

mance of the Brawley and Imperial sites provide guidance for the design of future wetlands in the region. These differences relate to the effectiveness of treatment and operation and maintenance issues. Pumps rather than gravity were used at the Brawley site; because of the extra operation and maintenance associated with pumping, designs and sites with gravity flow are preferred. ●

References

1. SCERP is a consortium of U.S. and Mexican universities that was created by Congress in 1991 and funded through a cooperative agreement with EPA. It supports applied research and outreach on environmental problems of the U.S.-Mexico border region. All projects include researchers from U.S. and Mexican SCERP universities as well as community and agency partners. For more information, see: www.scerp.org.

Table 2

Imperial Site Water Quality Monitoring Summary (Averages) January 2001 to April 2007

Parameter	Inlet	Outlet	% Change
DO	8.2	6.9	-16.2
Total Nitrogen (mg/L)	6.8	3.6	-48.5
Total Phosphorus (mg/L)	1.39	0.85	-38.1
Selenium (µg/L)	7.9	6.2	-21.5
BOD (mg/L)	12.0	11.2	-6.7
Fecal Coliform (MPN/100 mL)	91,441	518	-99.4
TSS (mg/L)	192	11	-94.3

Brawley Site Water Quality Monitoring Summary (Averages) January 2001 – April 2007

Parameter	Inlet	Outlet	% Change
DO	3.43	7.73	+125
Total Nitrogen (mg/L)	7.9	2.2	-72.2
Total Phosphorous (mg/L)	1.45	0.74	-49.0
Selenium (µg/L)	10.3	10.2	-1.0
BOD (mg/L)	11.6	10.8	-6.9
Fecal Coliform (MPN/100 mL)	1.3 million	547	- 99.9
TSS (mg/L)	185	14	- 92.4

Source: The New River Wetlands Project, International Boundary and Water Commission, http://ponce.sdsu.edu/brawley_imperial_wetlands_doc.html.

2. Johnson, P.I., Gersberg, R.M., Rigby, M. and S. Roy. The fate of selenium in the Imperial and Brawley constructed wetlands in Imperial Valley, California. *Ecological Engineering*. In Press.

For sources of information and data on the wetlands, see:

- New River Wetlands Project Brochure and Web Site, www.newriverwetlands.com.
- Performance Evaluation of the New River Demonstration Wetlands, March 24, 2006. Prepared for Citizen's Congressional Task Force on New River. Prepared by Tetra Tech, Inc., in association with Wetlands Management Services. Available at: www.newriverwetlands.com.
- Colorado River Basin Regional Water Quality Control Board, Salton Sea, http://www.swrcb.ca.gov/rwqcb7/water_issues/programs/salton_sea/index.shtml.
- Salton Sea Authority, http://www.saltonsea.ca.gov/.

..... POINTS TO CONSIDER .....

The research and monitoring efforts associated with the constructed wetlands provide valuable information that can be used to address problems and design new projects for other areas along the border, including the threatened Colorado River Delta region.

The effects of filtration into groundwater at the wetland sites are not understood. Groundwater concentration data are needed to help understand these effects.

Long-term monitoring is critical for assessing the ongoing functioning of the wetlands and potential risks from bioaccumulation of contaminants such as selenium.

Flow through the wetlands must be carefully controlled. Attempts to increase flow through the Imperial site beyond the design flow caused the wetland cell levees to be overtopped.

Constructed wetlands are an efficient method for removing many contaminants from polluted water, but challenges that need further study include:

- Continued accumulation of selenium in the sediments of the wetlands.
- Organochlorine pesticides that have been detected in tissue samples from fish and invertebrates.
- The decrease in the rate of removal of phosphorus over time.

The Bahía Grande: Achieving Multiple Environmental Benefits Through Wetland Restoration

The coordinated efforts of dozens of partners bring an estuary back to life and lead to significant air quality improvements in south Texas.

Key Points

- Returning water to the Bahía Grande was advanced to reduce dust clouds from dried wetlands, and has led to a major ecological restoration project.
- Securing monetary and human resources to undertake a large, multi-year effort has required extensive partnering and creative problem solving across media and across agencies and stakeholder groups.
- Within the first few months after the Bahía Grande was flooded, marine organisms resumed their historic migration patterns.

Background

The Bahía Grande Unit is located in Cameron County west of Port Isabel, Texas, and adjacent to the Gulf of Mexico. It lies within the Laguna Madre, a large lagoon covering 609 square miles of estuarine and coastal marine systems, which separates South Padre Island from the south Texas mainland. It consists of wind tidal flats and high ground, including clay dunes that can reach heights of up to 30 feet. At present, it covers about 34 square miles, including a bay, basins, lomas (hillocks), low-lying flats, resacas (depressions or lakes left by meandering rivers), and native brush. The Bahía Grande, historically a shallow bay, covers approximately 6,500 acres.

Between the 1930s and 1950s, construction of the Brownsville Ship Channel and State Highway 48 gradually isolated the Bahía Grande basin from the marine waters it needed to flourish. The wetland receded, and the newly arid and exposed region became vulnerable to erosion. The constant winds created clouds of dust as they accumulated salt-encrusted sand and blew it into the surrounding communities. The sand caused continual problems for residents, affecting both the environment and the economy. Specific negative impacts included clogged air conditioning systems that led to power outages because of electrical line build-up, and piles of sand that destroyed vegetation and created safety hazards on major roads. The dust also exacerbated respiratory health problems for many area residents.

Approach

The Bahía Grande restoration initiative was designed to restore a natural tidal hydrological pattern in the Bahía Grande to achieve the level of biodiversity currently present at nearby San Martin Lake. The effort is aimed at providing needed habitat for waterfowl, shorebirds, wading birds, and other wildlife; creating new recreational fishing opportunities; and contributing to the commercial shellfish and finfish industries. Another important goal, already achieved, was to reduce the blowing sediment problem that affected air quality in nearby communities.

In 2000, the Conservation Fund, the Natural Resources Conservation Service, and the USFWS came together to buy the Bahía Grande basin. The basin became part of the Laguna Atascosa National Wildlife Refuge. Scientists studied the

area and devised a plan to re-flood and re-vegetate three large, dry basins covering 11,000 acres of the basin, and re-establish tidal exchange. In 2001, an *ad hoc* committee formed to examine dust abatement alternatives, and project proponents realized the value of collaborating with a wide range of stakeholders who shared an interest in the Bahía Grande. The partnership grew and diversified into the Bahía Grande Restoration Partnership, a community-based collaborative effort of more than 70 groups, including local, state, and federal agencies; municipalities; educational institutions; fishery organizations; corporations; foundations; private citizens; and landowners.

Innovative Strategy

In 2003, using funds from the National Oceanic and Atmospheric Administration (NOAA), scientists built greenhouses to propagate native plants that could be used to stabilize soil and re-establish ecological functions of the estuary. They recruited local biology teachers from the neighboring school systems of Brownsville, Los Fresnos, and Port Isabel, Texas, to participate in classroom mangrove restoration projects. Representatives of the Ocean Trust and the USFWS gave presentations to 925 students who then grew 1,425 mangrove propagules into seedlings during the school year. In May 2003, the school children transplanted their seedlings to the banks of Bahía Grande. To augment school plantings and support transplanting efforts, project leaders and volunteers constructed a mangrove nursery in the Laguna Atascosa National Wildlife Refuge near the shores of Bahía Grande. They planted 3,000 black mangrove seedlings that are valued for their help in protecting and stabilizing low-lying coastal lands. They also planted Gulf cord grass, salt grass, and other native wetland species.

Wildlife has returned to the formerly dry and barren Bahía Grande.

Lack of regular water flow into the basin continued to create problems. In July 2005, the Brownsville Navigation District and Cameron County opened a pilot channel connecting the Bahía Grande basin to the Brownsville Ship Channel and the Gulf of Mexico. The constructed pilot channel began refilling 6,500 acres of the Bahía Grande tidal basin. The benefits of a reduction in airborne particulate matter (PM) immediately were visible with the reduction of wind-blown salts. At the same time, this action initiated one of the largest wetland restoration projects in the United States.

Within the first few months after the Bahía Grande was flooded, marine organisms resumed their historic migration patterns. Still, the challenges of creating a fully functioning ecosystem are many, and attention now is focused on critically important monitoring to ensure that the system functions well. The region is subject to significant climate variation. The basin received sufficient rainfall during 2008 to reduce salinity to estuarine levels, and the numbers of shrimp and fish rose. However, scientists are concerned that the current channel is not sufficiently wide, and that during a drought the salinity levels will become elevated enough to cause massive fish kills. Even under optimal climatic conditions, re-vegetation at the perimeter of the flooded areas is expected to take another 8 years.

Funds now are being secured to dig a much wider and deeper primary channel that will fill the basin to its maximum capacity, increasing tidal flow for ongoing habitat restoration, research and monitoring, and future public recreational opportunities. Project partners plan to continue experiments with propagating native sea grasses. In addition to research being conducted by faculty and students from Texas A&M University–Corpus Christi and the University of Texas at Brownsville and Texas Southmost College, a student from the Universidad Autónoma de Nuevo León in Monter-

rey, Mexico, is using the basin as a research site to study changes in sedimentation.

Financing

More than $14.6 million has been spent to date on the Bahía Grande restoration. Initial funds for purchasing the property were secured by the Conservation Fund, the Natural Resources Conservation Service, and the USFWS, and the property was transferred to the USFWS as part of the Laguna Atascosa National Wildlife Refuge.

Restoring the property required resources from numerous additional partners. In 2003, the Gulf of Mexico Foundation awarded Ocean Trust a NOAA Community-based Restoration Program (NOAA-CRP) grant. The money was used to build greenhouses and begin plant propagation. NOAA-CRP-funded projects are selected based on their technical merit, level of community involvement, ecological benefits to marine and fish habitat, and partnership opportunities. Projects must show significant leveraging of non-federal dollars.

Reintroducing water in the Bahía Grande required opening a channel, which required major funding. Cameron County secured a Coastal Impact Assistance Program (CIAP) grant to create the initial channel. The CIAP was authorized by the Energy Policy Act of 2005 to be distributed to oil- and gas-producing states on the Outer Continental Shelf to mitigate the impacts of their production.

Conclusions

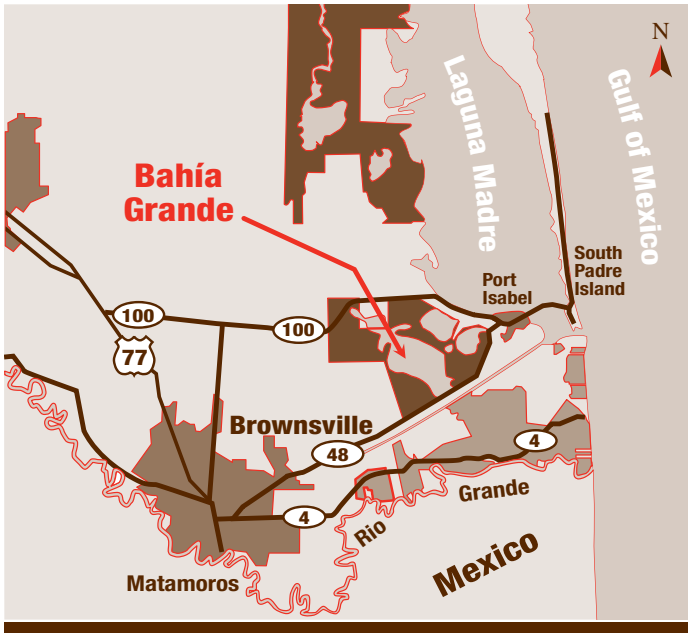
The Bahía Grande restoration initiative restored a natural tidal hydrological pattern in the Bahía Grande and provided needed wildlife habitat while meeting the goal of a reduction in the blowing sediment that affected air quality in nearby communities. The partners still are working on increasing the tidal exchange of the estuary and stabilizing water salinity to ensure recovery of marine and avian species. One of the challenges of undertaking a large restoration project was to bring together multiple parties from different public and private sectors. Another major challenge, obtaining funding, was solved by a collaborative effort from the partners, who sought funds from diversified sources. ●

..... POINTS TO CONSIDER .....

The Bahía Grande restoration has offered scientists valuable insights on wetland restoration and native-plant propagation and involved a diverse partnership.

Refilling the Bahía Grande caused an immediate reduction in blowing dust and airborne particulates.

Long-term monitoring and adaptive response by project managers are critical if the Bahía Grande is to become a fully functioning ecosystem. However, preliminary results have shown important ecosystem restoration, and the project already has garnered awards.



Bahía Grande location.

The Campo Kumeyaay Wind Project

The Campo Kumeyaay Nation, a small community of 350, becomes a major player in providing solutions to some of our Nation's critical energy needs.

Key Points

- The Campo Kumeyaay Nation created successful partnerships to complete the wind project, the first of its kind on an American Indian reservation. It provides a template for other Indian nations as well as other border communities on how to become equity stakeholders in energy projects.
- The project provides enough electricity for up to 30,000 homes, offsets the generation of 110,000 tons of CO_2 in the border region, and provides more than $300,000 per year in income to the Campo Kumeyaay Nation.
- The Kumeyaay Wind Project is an excellent example of matching existing resources to a proposed project. The project makes use of two resources in plentiful supply on the reservation: wind and open space.
- The project provides a secure and clean source of local renewable energy in an area of the border that is heavily dependent on imports of fossil fuel-based energy.
- The project underscores the key role the Federal Government has in providing incentives and removing barriers for environmentally friendly energy projects on the border and elsewhere.

Background

The traditional lands of the Kumeyaay extend from northern San Diego County to 60 miles south of the Mexican border, and range from the Pacific Coast to the deserts of Imperial County. In 1893, 25 square miles of land situated at the crest of the Laguna Mountains about 60 miles east of San Diego were set aside as the Campo Indian Reservation, one of 12 reservations for the Kumeyaay people. With very little arable land and localized sand deposits as the primary mineral resource on the reservation, the Campo people historically have struggled to survive. Therefore, tribal leaders have explored the potential use of wind as a resource to help meet the needs of the tribal members and residents of surrounding areas.

Concerns about energy shortages, energy security, and excessive reliance on fossil fuels have led both the State of California and the U.S. Federal Government to initiate programs and offer incentives to increase the use of renewable energy sources. Established in 2002, California's Renewables Portfolio Standard Program requires electric corporations to increase procurement from eligible renewable energy resources by at least 1 percent of their retail sales annually, until they reach 20 percent by 2010. Governor Arnold Schwarzenegger has set a state goal of 33 percent by 2020. Publicly owned utilities are responsible for implementing and enforcing a Renewables Portfolio Standard that recognizes the intent of the state legislature to encourage renewable resources, while taking into consideration the effect of the standard on rates, reliability, financial resources, and the goal of environmental improvement. The Kumeyaay Wind Project provides income and diversification for the Campo Kumeyaay Nation, while helping to supply a renewable energy resource to the San Diego Gas & Electric Company.

Approach

The Campo Kumeyaay Nation began negotiations with Kenetech Windpower in the early 1990s to evaluate the wind potential on the reservation. Unfortunately, at that time, insufficient wind energy incentives, technology, and demand prevented the development of a project. Still, the support for a wind energy project remained, and as the technology for large-scale wind energy production improved, the Nation again began to consider its options. In 2000, the tribal government entered into a partnership with Superior Renewables, LLC, and signed a lease agreement in 2005. In 2006, Superior Renewables, LLC, was bought by Babcock and Brown Renewable Holdings, Inc. Energy sales were negotiated with Sempra Energy, the parent company of San Diego Gas & Electric, for a 20-year power purchase agreement. The U.S. Bureau of Indian Affairs (BIA) acted on behalf of the Federal Government in its role as trustee in approving the Environmental Assessment and the lease. The Campo Environmental Protection Agency acted as a cooperating agency in the preparation of the lease and the environmental assessment.

By situating the wind farm on a north-south facing ridge, project proponents took advantage of the abundance of wind and naturally occurring features. In 2008, the Wind Project included 25 two-megawatt turbines occupying approximately 45 acres of tribal land in a 2.5 square mile restricted-use lease area. The project provides enough electricity for up to 30,000 homes and offsets the generation of 110,000 tons of CO_2 (based on an average mix of sources). In addition, it provides more than $300,000 per year in income to the Nation and job opportunities for tribal members.

Strategy

The U.S. Supreme Court and Congress manage the unique constitutional status of Native American tribes through the doctrine of trust that specifies the responsibility of the Federal Government to protect tribes' property, treaty rights, and way of life.

State governments and their political subdivisions cannot tax tribes and their members on Indian trust land within a reservation. However, the Courts have increasingly allowed the states to tax non-Indians and non-Indian property located on Indian reservations regardless of the level of governmental services provided by the Nation to the non-Indian property owner. Consequently, tribes often are forced into difficult decisions of having to decide between assessing a duplicative tax on reservation property or forgoing the tax to make development feasible.

More than 50 percent of the profitability of a wind energy project can be directly tied to federal tax incentives. Because tribal governments (and all governments) are neither tax-paying nor taxable entities, tribally owned projects do not receive federal incentives. To overcome this gap, the Kumeyaay tribal government took the role of lessor, enabling its business partner, Superior Renewables, to qualify for the tax incentives. County taxes are assessed on the facility, however, and San Diego County receives more revenue than the Nation receives from its lease payments, even though the county provides virtually no governmental services within the Campo Reservation. In addition to $300,000 resulting from an assessed value of $30 million, the County receives additional revenues through its possessory interest tax, under which the lease itself is considered a form of property eligible for county assessment.

Despite the absence of tribal tax revenues, the lease for the Kumeyaay Wind Project was determined to be a valuable economic investment for the Campo Kumeyaay Nation. Because of the tribal trust relationship, a lease is not federally enforceable unless it is approved by the BIA. Because the Kumeyaay was the first commercial lease for wind energy production in Indian country, it took several months for the realty personnel at the BIA to determine that the Nation was receiving fair value in the deal. Under the terms of the lease, the Campo Kumeyaay Nation continues to enjoy the full utilization of the leased lands, provided there is no interference with the wind energy production. The primary implication of this restriction is that building height is limited to two stories.

Financing

Completion of the Kumeyaay Wind Project required the successful capture and use of federal financial incentives. Superior Renewables, LLC, entered into a partnership with General Electric Energy Financial Services for the Campo project. A renewable energy Production Tax Credit was created under the Energy Policy Act of 1992, providing an allowable income tax credit of 2.1 cents/kilowatt-hour for the production of electricity from utility-scale wind turbines. This incentive initially was created at the value of 1.5 cents/kilowatt-hour, which has since been adjusted annually for inflation. By utilizing the tax credit, Superior Renewables, LLC, was able to make the project profitable.

In October 2008, the Production Tax Credit was renewed until December 31, 2009. Since it was first established in 1992, the tax credit has undergone a series of short-term extensions, and was allowed to lapse in 1999, 2001, and 2003. The uncertainty associated with the tax credit has created instability in the wind energy industry. In the year following each expiration of the tax credit, wind energy installations dropped by 73 to 93 percent.

Another potential federal incentive being explored by the Campo Kumeyaay Nation that targets investors in low-income communities is the New Markets Tax Credit Program. The program permits taxpayers to receive a federal income tax credit of 39 percent of the cost of the investment, claimed during a 7-year period, for making qualified equity investments in designated Community Development Entities. These entities must use the qualified equity investment in low-income communities.

Conclusions

The Kumeyaay Wind Project demonstrates the potential of alternative energy projects for tribal communities across the United States. By sharing the details of their project, the Campo Kumeyaay Nation provides a baseline for other communities to evaluate the terms of agreements they are negotiating. With this project, the Campo Kumeyaay Nation substantiates the need for legislative fixes to the incentive problems, and demonstrates that a small community of 350 persons can play an important role in providing solutions to some of our critical national energy needs. ●

..... POINTS TO CONSIDER .....

Initial research into both wind energy potential and financing mechanisms was critical for the success of this project.

Changes in the federal tax policies related to alternative energy, which would allow owners without the ability to use tax incentives to transfer their tax credits and/or depreciation to their partnering companies, could encourage greater investment in alternative energy technologies such as wind and solar energy and address both energy and economic development needs of tribal border communities.

Increased stability in the federal incentives programs and market prices is needed to encourage further investment.

Cross-border sustainable energy projects provide opportunities in the region, yet face many legal, administrative, and other barriers.

Innovation in Strategy: CETYS Universidad Master's Degree Program in Environment and Sustainable Development

A new approach to educating environmental professionals in Mexicali, Mexico

CETYS Universidad, Mexicali, Baja California, Mexico, has developed a Master's Degree Program in Environment and Sustainable Development in partnership with the Latin American Scholarship Program of American Universities (LASPAU), a nonprofit organization affiliated with Harvard University and governed by an independent, inter American board of trustees. The Master's Program was developed to address the need for professionals in Mexicali to understand and appreciate border environmental issues and sustainable development. It primarily targets professionals in the *maquiladora* industry in hopes that they will develop an understanding that profits and sustainable development are not mutually exclusive.

The Master's Program specializes in applied research and generates knowledge, networks, and collaborations focused on environmental issues along the U.S. Mexico border. Projects recognize the relationship between society and the environment while addressing needs and priority problems. Students develop information technology skills to implement and track business processes, gain strategic skills to use computational tools applied in models of their own area of expertise, and apply leadership skills in resolving problems through applied research projects.

The Program is attempting to change the way border environmental issues are viewed, particularly in industry, through education. Although open to all students, by focusing on students who are already professionals and who choose and implement projects in their area of expertise, the Program can make a direct impact on environmental conditions in Mexicali. If the Program continues to draw students from the *maquiladora* industry, it can contribute to a shift in the industry's thinking toward sustainable development as a good business practice and could result in improved environmental and health conditions.

Transboundary Emissions Trading in the Paso del Norte Area

Change in legislation allows a new strategy to improve air quality in the shared airshed of El Paso, Texas; Sunland Park, New Mexico; and Ciudad Juárez, Chihuahua.

Key Points

- El Paso and other border cities face distinctive air quality challenges because of shared airsheds. Binational cooperation is required for success.
- Transboundary emissions trading under Texas state law allows for efficient reduction of pollutant emissions in the binational Paso del Norte airshed.
- El Paso Electric Company (EPE) replaced high-polluting brick kilns used in Ciudad Juárez with new cleaner burning brick kilns to receive air pollution credits.
- According to studies by EPE and the Texas Commission on Environmental Quality (TCEQ), the new kilns significantly reduced emissions.
- Barriers still exist for efficient and rational cooperation across the border for emissions trading and binational airshed management.

Background

The area where Texas, New Mexico, and Chihuahua converge is known as the Paso del Norte, receiving its name from a pass created by the Rio Grande in the Franklin Mountains. The river marks the border between the United States and Mexico, and the area includes Ciudad Juárez in Chihuahua, Mexico; El Paso, Texas; and Sunland Park, New Mexico. Although these cities are separated by an international boundary, they form a single metropolitan area. Like many communities along the U.S.-Mexico border, the Paso del Norte region has experienced rapid population growth and increased economic activity during the last few decades. In combination with the persistence of poverty along the border, poor air quality has taken a toll on the region's environment and public health. In the early 1990s, El Paso was the only city in Texas designated as a nonattainment area for three federal criteria pollutants: carbon monoxide, ozone, and particulate matter (PM_{10}).

Texas statutory requirements enacted in 1999 required El Paso Electric Company (EPE) to reduce its nitrogen oxide (NO_x) emissions from its previously grandfathered electric power generating facilities in the El Paso area by 50 percent or submit an alternative compliance plan. NO_x is a generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. In the presence of sunlight, NO_x reacts with volatile organic compounds (VOCs) to form smog.

Although other utilities in Texas (such as Dallas-Fort Worth and Houston) facing a similar situation could use cap and trade to reduce NO_x emissions, EPE was unable to do so because of the limited number of industrial facilities in the area. A cap and trade program sets a cap, or maximum limit, on emissions by source in an area. Sources receive authorization to emit in the form of emissions allowances, with the total amount

of allowances limited by the cap. Each source can design its own compliance strategy to meet the overall reduction requirement, including sale or purchase of allowances from other industrial sources, installation of pollution controls, and/or implementation of efficiency measures.

Approach

In 2000, EPE submitted an alternative compliance plan to the Texas Commission on Environmental Quality (TCEQ) to use a transboundary and cross-pollutant emissions trading program to meet its regulatory requirements; however, new legislation was needed for such a program. In 2001, with the support of local elected officials, the Texas Legislature enacted legislation creating an alternative means by which grandfathered electric utilities in border areas could meet their emission allowance obligations. Facilities can substitute emissions reductions achieved in Ciudad Juárez, Chihuahua, or in Sunland Park, New Mexico, as long as the substitution results in an overall improvement in air quality in the Paso del Norte airshed. It should be noted that the emissions reductions were acceptable only for credit under the state permit requirements. Credit was never sought to meet requirements of the U.S. Federal Clean Air Act. International emission reduction credits for Clean Air Act purposes have never been tested. EPE employed this novel transboundary and cross-pollutant emissions trading program to replace high-polluting brick kilns located in Ciudad Juárez with new, cleaner-burning brick kilns. The project substituted reductions in VOCs, PM, and carbon monoxide (CO) for the NO_x allowances. EPE could receive air pollution credits for these reductions in the Paso del Norte airshed and a higher pollution allowance for its older power facilities that otherwise would have needed significant overhauls.

More than 250 brick kilns exist in Ciudad Juárez, although far fewer operate at any one time. They are a major source of particulate pollution

Traditional brick kiln burning scrap materials near homes and businesses in Ciudad Juárez. The domed brick kiln in the photo graph on page 35 is the cleaner burning design introduced by EPE.

and carbon monoxide, and depending on the fuels used, may produce VOCs. The brick industry is important to the city as it provides the primary construction material for many buildings. In a growing city like Ciudad Juárez, demand for bricks is high. The industry's impact on employment is significant, with individuals employed in the direct production of bricks as well as in transportation and construction.

A typical kiln can hold 6,000 bricks, although some hold as many as 16,000. Most kilns operate uncovered and fire bricks for 16 to 24 hours. The most common fuel used for firing is scrap wood or sawdust, but any waste fuel that can be obtained at virtually no cost to the owners is used, including tires, battery cases, plastics, particle board, and used motor oil.

Strategy

In 2000, Dr. Robert Marquez, then a New Mexico State University (NMSU) researcher, through an EPA-funded grant from the Southwest Consortium for Environmental Research and Policy (SCERP) and in conjunction with TCEQ and EPE, developed kilns that are smaller and burn cleaner than the conventional brick kilns. The new kiln design includes a dome covering the kiln and a channel connecting the kiln to a second identical kiln. Simply covering the kiln provides a significant reduction in emissions because the kiln is more thermally efficient and burns cleaner; the old kiln design basically allows an open burn. To further reduce emissions, the kiln is connected to a second kiln filled with unfired bricks, which serve as a passive filter to capture the effluent. While one kiln is fired, the other traps the pollutants. The role of each kiln is reversed at the next firing and the original pollutants are then efficiently combusted.[1]

To implement the project, new kilns were built in each of the brick-making areas throughout the city as old ones were destroyed. EPE also entered into an agreement with the Juárez municipal administration to construct a brick-making community on property adjacent to the city landfill that opened in 2004. Compared to the conventional brick kilns, the new kilns reduced PM emissions by 83 percent, NO_x by 63 percent, CO by 46 percent, and VOCs by 69 percent.[2] Tests conducted by EPE found that the new kilns produced a total of 397 pounds of emissions per burn, a reduction of 466 pounds of total pollutants per burn compared to the old unmodified kilns, which emitted 863 pounds of total emissions per burn.

Originally EPE had intended to replace roughly 32 conventional kilns; however, because of delays in working with kiln owners and a deadline for compliance with Texas law, the company decided to replace fewer kilns and retrofitted one of its conventional generation facilities to meet its goal in a timely manner. EPE filed a report with the TCEQ demonstrating that a combination of five kilns and the retrofit would fulfill its attainment obligations. The company later funded the replacement of 27 more kilns, for a total of 32. The cost to replace each kiln was approximately $8,000.

The new kilns offer many benefits to the brick makers. The kilns are more productive and less expensive to operate. Reduced operating cycles and decreased fuel consumption offset the smaller size of the new kilns and actually increase production. Previously, most brick makers could not prepare bricks in the rain or wind, because the old kilns were exposed to the elements. The new kilns also are cleaner and easier to load.

Although significant emissions reductions were achieved with the prototype system, a connection problem with the more recent kiln pairs has limited the degree of operational success. A number of the new systems have failed to obtain an adequate flow rate between the two kilns, causing emissions to escape through the first kiln. Recent tests have demonstrated that significant emissions reductions still are achieved, justifying the change-out of kilns.[3] The average reduction is a factor of at least 5 and for some burns is a factor of 10. Proper flow to the second kiln reduces emissions further by a factor of two. Because communities have a strong desire to build more kilns, further research is needed to address the design faults and to institute changes.

Partnerships

The project required a strong partnership among EPE, TCEQ, NMSU, the brick makers, the Municipality of Juárez, SEMARNAT, UACJ (Universidad Autónoma de Ciudad Juárez), FEMAP (Federacion Mexicana de Asociaciones Privadas), and NGOs. For more than 2 years before construction of the new kilns, the partners collaborated on developing and garnering support for the program, kiln design, model kiln construction, and controlled studies of kiln emissions. In 2002, EPE formally submitted a full-scale proposal for creating NO_x allowances. TCEQ approved the proposal, and kiln construction began.

Along with the participation of the institutional partners, greater participation by the kiln owners would have improved the effectiveness of the project. Delays that arose in working with the kiln owners were caused by a number of social factors. The homes of the brick makers are extremely modest and often erected on land next to the kilns. Although some brick makers were supportive of moving the kilns south of town, many were concerned about being forced to uproot family businesses that they had established near their homes. The project also was hindered by kiln owners' lack of trust of the other partners and disbelief that the new kilns would achieve production levels similar to those of the conventional kilns. Production concerns were addressed once the new kilns were operating; however, some of the new kilns are not in use because families have not been willing to relocate. The brick kiln construction project was dealt a serious blow when torrential rains flooded the municipal brick-making facility in 2006 and eight kilns collapsed. To date, EPE-constructed kilns continue to operate in the three communities of *Mexico-68*, *Estrella del Poniente*, and *Kilometro-20*.

Conclusions

This project has generated improvements in air quality in the binational Paso del Norte airshed. It also has helped EPE to meet its NO_x reduction obligations. The success of the construction of alternative brick kilns has led to pilot projects focused on the reduction of particulate emissions and research of alternative fuel sources in Baja California, Querétaro, and Sonora. The State of Chihuahua also is working to replace similar kilns outside of Ciudad Juárez. Transboundary emissions trading can be explored in border areas that are in nonattainment as a possible way to improve air pollution. However, it should be noted that transborder trading currently is not allowed under the Federal Clean Air Act or under state law in New Mexico, Arizona, or California. ●

References

1. Border Environment Research Reports (Number 2, June 1996), "Reducing Emissions from Brick Kilns in Ciudad Juárez: Three Approaches", www.scerp.org/docs/berr2.html.
2. Texas Commission on Environmental Quality. A study of brick-making processes along the Texas Portion of the U.S.-Mexico border: Senate Bill 749. SFR-081. December 2002.
3. Bruce, C.W., Corral, A.Y. and A.S. Lara. Development of Cleaner-Burning Brick Kilns in Ciudad Juárez, Chihuahua, Mexico. *Journal of the Air & Waste Management Association* 2007;57:444-456.

..... POINTS TO CONSIDER .....

Transboundary emissions trading offers a potential solution for border communities. Legal, technical, and policy issues should be considered fully before implementing cross-border trading in other areas of the border.

Alternative brick kilns can reduce levels of airborne pollutants. However, attempts to reduce pollution must take into consideration the quality of life of workers and their dependents and gain the support of those who will be directly affected by the new technologies.

Sufficient testing of brick kiln prototypes and monitoring of their use are required for long-term project success. Lessons learned from the initial pilot project must be incorporated into the kiln design for other communities.

Joint Advisory Committee (JAC) for the Improvement of Air Quality in the Paso del Norte Air Basin

A binational committee collaborates with all stakeholders to improve air quality.

One innovative strategy for the improvement of air quality along the border was the creation and continued operation of the JAC (the full name is the Joint Advisory Committee for the Improvement of Air Quality in the Ciudad Juárez, Chihuahua/El Paso, Texas/Doña Ana County, New Mexico Air Basin). The JAC is a binational committee established in May 1996, under the framework of the 1983 U.S. Mexico La Paz Agreement. The Paso del Norte Air Quality Task Force, a grassroots organization composed of business and civic leaders, government officials, scientists, health and environmental professionals, and concerned citizens, was instrumental in the formation of the JAC. The JAC consists of 20 members (10 U.S. and 10 Mexican) that represent federal, state, and local governments; universities; the private sector; NGOs; and public health organizations. The innovative structure of the JAC allows for participation by all stakeholders from community residents to federal officials. This attribute has been a major factor in its success. Also key is that it includes federal co-chairs from both countries who can take recommendations directly to EPA and SEMARNAT. This is important because in Mexico the Federal Government is still very centralized, and even though the State of Texas may have authority from EPA to address certain issues, federal to federal level communication is necessary.

The JAC has led and supported numerous projects in the Paso del Norte airshed and yielded excellent results. Shortly after its inception, the JAC spearheaded the use of oxygenated gasoline during winter months in Ciudad Juárez, Mexico, to reduce carbon monoxide emissions. Since then, the number of carbon monoxide exceedances in the area has dropped from 25 to 50 annually to one to two occurrences in the past 3 years. The JAC participated in the development of Texas state law allowing for transboundary emissions trading and led the Great Border Trade Out (both highlighted in this report).

Because the JAC works on a consensus basis, some matters require great effort to arrive at a conclusion that is satisfactory to all stakeholders. The JAC emphasizes community participation in its projects but discovered that the public needed more information on air quality improvement strategies to provide meaningful input. The JAC works to ensure that all stakeholders are included in the decision making process and has extensive public outreach programs.

Among the most informative of outreach mechanisms is the JAC Web Site, www.jac ccc.org. The Web site provides an extensive record of activities, meetings, and recommendations undertaken by the JAC since its 1996 establishment. The Web site also includes a page on the West Texas Visibility Monitoring Network, which tracks regional transport of air pollutants and records the effects of high wind events. The JAC currently serves as one of the air task forces of the Border 2012 Program established by EPA, SEMARNAT, U.S. and Mexican border states, and U.S. border tribes.

The strategies that the JAC has applied successfully could be translated into other areas with state and/or federal borders, especially other border sister cities with air quality issues. It provides an excellent example of how border cities and counties that share and contribute to a common airshed can collaborate to achieve emissions reductions that positively affect both sides of the border.

The JAC model also can transfer to other transboundary environmental problems. Although not formally established, the Mimbres Basin Dialogue in Columbus, New Mexico, and Palomas, Chihuahua, is applying the JAC model to address transboundary water issues in the Mimbres Basin Aquifer. The JAC also demonstrates the key federal role, building on local initiatives, of facilitating transborder cooperation on environmental issues.

Community Assist of Southern Arizona (CASA): Promotora Business Visit Program

Trained community members work with businesses to improve their community's environmental health.

Key Points

- Onsite technical assistance is provided to businesses by trained *promotoras* (community outreach specialists) from the target area and focuses on pollution source reduction.
- Researchers from Arizona and Mexico provide technical expertise and training to the *promotoras* on innovative approaches and measures.
- The *promotoras* are well received, and the owners/operators of the businesses are receptive to information and training on pollution prevention (P2).
- The program is community-run and has formed strong partnerships with local agencies.

Background

The *promotora* idea, developed in Mexico, slowly is being adopted in the U.S. Southwest. *Promotora*, the Spanish word meaning "expert" or "advocate," is used to describe a lay health advisor within the Latino community. Although "*promotora/promotor/promotores*" are the correct terms in Spanish, because most of these advisors are women, "*promotora*" is used in this document to describe the advisors. Public and environmental health scientists are beginning to appreciate the *promotora* as a health professional who is perfectly poised to reduce environmental health disparities within underserved Latino communities. Projects along the U.S.-Mexico border have included information campaigns regarding environmental exposures to agricultural pesticides, household chemicals, and air toxics and have increased awareness of the importance of preventive health care and community participation. The *promotora* is a member of the community and generally is accepted and trusted when many times agency personnel are not. Community Assist of Southern Arizona (CASA) uses the *promotora* model to provide environmental health information to families and pollution prevention (P2) strategies to businesses.

CASA is a program of Sonora Environmental Research Institute, Inc. (SERI), an NGO founded in 1994 to fulfill the need for research and technical assistance on environmental issues. CASA partners with neighborhoods that are under economic, environmental, and health stress, and helps to determine the neighborhoods' environmental risks and actions to be taken to reduce those risks. CASA's primary focus has been home visits, but since 2006, *promotoras* have visited businesses to discuss P2 measures. In 2006 and 2007, *promotoras* conducted business surveys that identified the top barriers to implementing P2 programs. These included a lack of culturally appropriate information, a distrust of government agencies, and a perceived high cost of implementation. CASA addresses those barriers by providing information in a culturally appropriate manner and language, and by providing information on potential cost savings.

The business visit program is funded by SERI, grants from EPA, and donations and in-kind contributions from the CASA advisory board. The CASA program previously received funding from

the EPA Community Action for a Renewed Environment (CARE) program. CARE is a competitive grant program that offers an innovative way for a community to organize and take action to reduce toxic pollution in its local environment. Through CARE, a community creates a partnership that implements solutions to reduce releases of toxic pollutants and minimize people's exposure to them. By providing financial and technical assistance, EPA helps CARE communities get on the path to a renewed environment.

Approach

The project targets portions of six ZIP codes in metropolitan Tucson, Arizona. This area was chosen because it was identified by the team's previous research as a potential air toxics hot spot and by the Arizona Department of Health Services as an area at high risk for childhood lead poisoning. Most of the industries and waste management facilities in Tucson are located in the area, as are the main traffic corridors, and the childhood asthma rates, at 13 to 25 percent, are higher than the national average of 8 percent. For the three ZIP codes with the highest concentration of businesses, approximately 35 percent of the families live below the poverty level, almost 80 percent of the population is Hispanic, more than 60 percent speak Spanish at home, and less than 60 percent have high school diplomas (Source: 2000 census and SERI data).

Trained *promotoras* from the target area provide onsite technical assistance that focuses on source reduction methods rather than recycling, treatment, or disposal. The *promotoras* work with businesses to implement P2 plans and to track progress. In addition to methods to reduce the use of hazardous substances, onsite visits include discussions about water and energy conservation at the facilities and ways to reduce hazards to public health and the environment from releases. Businesses are referred to the Tucson Fire Department (TFD) Business Assistance Program for assistance with fire code requirements and the Tucson/Pima County Household Hazardous Waste Program-Small Business Waste Assistance Program (SBWAP) for assistance with hazardous waste management.

Researchers from five colleges at the University of Arizona (UA) and 11 universities in Mexico provide technical expertise and training on innovative approaches and measures. Onsite visits are supplemented by industry-specific workshops. Additional workshops for *promotoras*, their families, and community members help to create community leaders in P2 and strengthen the community's ability to make informed environmental health-related decisions and to participate in long-term solutions.

The business visits have been very successful. The *promotoras* are well-received, the owners/operators are interested in the subject, and the overall procedures work well. The *promotoras* reach businesses that are not usually successfully reached by other outreach programs.

In 2008, the *promotoras* completed more than 500 business visits to auto repair shops, auto paint and body shops, print shops, and nail salons. Sixty percent of the businesses participated in some P2 activity within 3 months of the initial *promotora* visit. Eighty-six people attended a P2 workshop for auto paint and body shops. Nail shops switching to nail polish removers without acetone reduced acetone emissions by an estimated 10,560 lbs/yr. By covering and/or replacing their solvent degreasers, auto repair shops reduced emissions of VOCs by an estimated 129,100 lbs/yr.

Lourdes Vera, SERI environmental health promotora, reviewing the packet of pollution prevention information with Dago Enriquez, owner of McElroy's Automotive, Tucson.

Community Mobilization

SERI's *promotora* program is a proven method of disseminating information about environmental health issues, receiving feedback, assessing community needs, and promoting decision-making in the communities in which SERI works. Many residents obtain their health and environmental information by word-of-mouth rather than through a visit to the doctor, from a computer, through training classes, or via general announcements. In-home and business visits are culturally acceptable methods and provide the one-on-one contact that best serves the community. SERI has trained *promotoras* in the target area who have conducted more than 3,500 home visits since 2005.

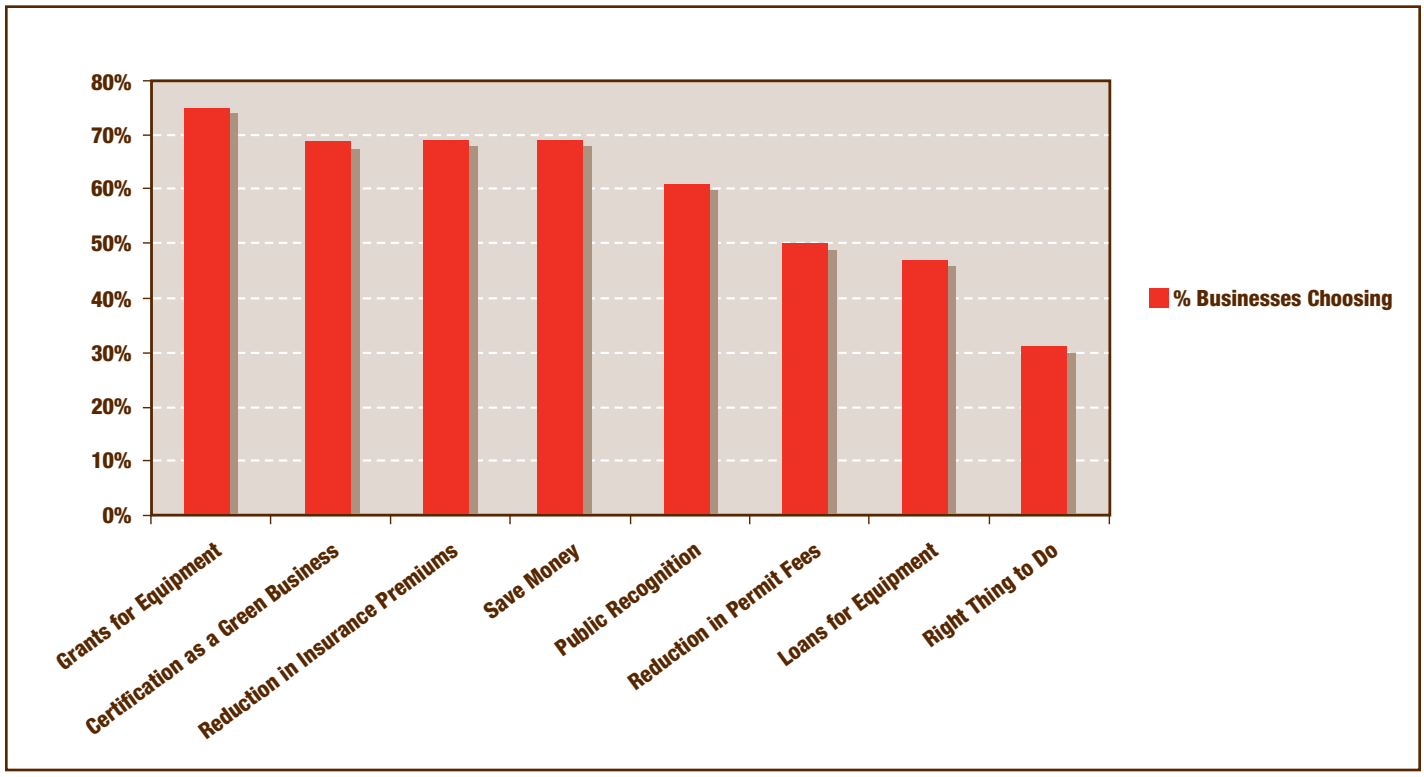
Promotoras are mothers, students, grandmothers, or anyone who has identified him or herself as a community leader and is seeking to increase his or her knowledge on environmental and health issues. *Promotoras* visit families and businesses and provide skills, information, training, and connections that result in true improvements in their neighborhoods. They build the capacity of neighborhoods one by one as they knock on doors.

Promotoras visit businesses as neighbors, not as agency personnel. Their approach is "This is our neighborhood. What can we all do to work together to improve its environmental health?" Armed with technical training, business packets, and a team of technical experts for support, the *promotoras* can work effectively with businesses to develop and implement P2 plans and collect P2 outcome measures.

Partnerships

The CASA advisory board has a diversified membership, including health and environmental agencies, school districts, community members, UA, government officials, medical centers, and businesses. The U.S.-Mexico Binational Center for Environmental Sciences and Toxicology (Binational Center) and Superfund Basic Research Program (SBRP) at UA develop many of the *promotora* P2 strategy training classes. The *promotoras* work closely with researchers to gather accurate scientific information and "translate" it into a more digestible and accessible format. This methodology is used to develop industry-specific *promotora* P2 training classes. These classes exemplify the Bina-

Results of Survey of Preferred Incentives in Tucson for Implementing Pollution Prevention Measures (Print, Automotive Repair, and Auto Body Shops, N=535)



tional Center and SBRP efforts to decrease the gap between academia and the community and are proving to be an effective, empowering tool for communities.

The biggest challenge in implementing the program was preparing the *promotoras* for the business visits. Because it was a new program, they were worried about their ability to complete the task and whether they would be respected by business owners. After the first series of technical trainings, no *promotoras* conducted business visits. Consequently, the CASA partners helped build the confidence of the *promotoras* by revamping the training modules, including additional classes with business owners, conducting onsite training classes, and offering leadership training. After the new training, the *promotoras* felt comfortable with conducting visits. The partnership recognized that the *promotoras* needed not only technical training but also ongoing leadership training. For many of the *promotoras*, this is their first experience working outside of their homes. SERI and its partners are developing a *promotora* leadership development program in coordination with other *promotora* programs in Arizona.

Conclusions

The CASA *Promotora* Business Visit Program has demonstrated that trained community members can be effective in conducting outreach to businesses not usually reached by traditional measures. The community benefits not only from the information disseminated, but also from the manner in which the program is implemented. CASA mobilizes local resources and utilizes voluntary programs to carry out risk reduction activities. CASA creates a positive environment that encourages all members of the community to join a collaborative partnership to promote community wellness and environmental stewardship. ●

..... POINTS TO CONSIDER .....

The *promotora* model for business visits and implementation of P2 strategies can be used throughout the Southwest. The CASA program already is working with other communities in California and Arizona to implement similar business programs.

Although rooted in the Latino culture, the model can be modified for other communities. The key element for success in any community is involving community members who are respected, well-trained, and devoted to improving their community's environmental health.

The CASA model is suitable for adaptation to Mexican border communities where small business P2 needs are great.

Innovation in Partnerships: New Spray Guns for Auto Paint Body Shops: The Great Border Trade Out

A public and private-sector partnership on both sides of the Texas border reduces air pollution.

The El Paso Hispanic Chamber of Commerce, the Ciudad Juárez Dirección General de Ecologia, Home Depot, SEMARNAT, the TCEQ Border Quality Campaign, and Campbell Hausfeld partnered on a spray gun trade out project to provide outreach to small businesses, primarily automotive body shops that conduct painting operations, in the Paso del Norte airshed on both sides of the Texas border. The goal of the project was to encourage the voluntary reduction of PM and VOC emissions through education and equipment exchange. The approach of exchanging high polluting equipment for free, more efficient, and less polluting equipment previously had not been attempted in the area.

Through an EPA Border 2012 grant to the El Paso Hispanic Chamber of Commerce, supplemented by matching resources from local participants, nine workshops were conducted in both El Paso, Texas, and Ciudad Juárez, Mexico. Workshop participants received regulatory compliance training, and Campbell Hausfeld, the manufacturer of the High Volume Low Pressure (HVLP) spray guns, sent technicians to provide auto body shop employees with hands on training. At the conclusion of each workshop, participants were given free HVLP spray guns in exchange for their older air atomization spray guns. In addition to the workshops, free HVLP spray guns were exchanged with small painting operations in rural areas of El Paso County by going door to door. In total, 250 HVLP spray guns were exchanged. This project targeted air quality issues in a region that has a binational airshed. By focusing on small businesses in both countries, greater reductions were possible in the airshed as a whole. The project has achieved annual measurable reductions in pollution of 7.5 tons of VOCs and 11 tons of PM, and 320 pounds of aluminum have been recycled through the air atomization gun exchange.

This project highlights how border cities that share a common airshed can work together to achieve emissions reductions that positively affect both sides of the border. It also demonstrates how the Border 2012 process can link with different partners and the private sector to address environmental issues on both sides of the border.

Waste-Based Biodiesel: Altering Present Use and Disposition of Waste Vegetable Oil and Grease

A community project removes cooking oil and grease from the waste stream to produce a cleaner fuel and a cleansing soap.

Key Points

- Waste vegetable oil and grease can be used to produce biodiesel and soap.
- Biodiesel is an EPA-approved alternative fuel, which carries an ASTM International standard and may be blended with petroleum-based diesels and used directly in diesel engines with little or no retrofitting.
- The use of biodiesel, either alone or in a mixture with petroleum diesel, reduces negative emissions such as particulate matter and carbon monoxide by at least 10 percent.
- Sufficient waste vegetable oil and grease is generated in cafeterias and restaurants on both sides of the Arizona-Sonora border and in *maquiladoras* in Sonora to produce at least 1,300 gallons of finished biodiesel per month.
- This project provides a model for municipalities on both sides of the U.S.-Mexico border for how a waste/regulatory problem can be turned into an economically viable industry with positive environmental benefits.
- The project demonstrates the importance of involving a range of partners—community organizations, higher education, the private sector, local government, Border 2012, and others—to address local transborder environmental issues.

Background

The Municipality of Nogales, Sonora, is served by a binational wastewater conveyance system that forwards waste to the Nogales International Wastewater Treatment Plant in Rio Rico, Arizona. Water quality sampling at both the primary binational outfall as well as within the Nogales (Sonora) collection system indicated that waste vegetable oil and grease was a problem for plant maintenance and was leading to sewer clogs and overflows.

Ambos Nogales also is negatively affected by poor air quality. Both Nogales, Arizona, and Nogales, Sonora, regularly violate the national ambient air quality standards of their respective countries. Particulate matter (PM) is the primary cause of those violations and has been identified as a key factor in respiratory illness and as an asthma trigger in both communities.

Diesel fuel, which consists of a complex mixture of engine oils and organic and inorganic materials, is a major contributor to PM emissions. Diesel emissions adversely affect respiratory function. According to EPA, a 20 percent blend of biodiesel to petroleum diesel (referred to as B20) can reduce PM by 10.1 percent, hydrocarbons by 21.1 percent, and carbon monoxide by 11.0 percent while also reducing sulfate emissions.

Through a relatively simple transesterification production process, waste vegetable oil and grease can be converted to biodiesel and glycerin. Glycerin, which is a byproduct of the production process, is a non-hazardous substance that can be made into soap or composted. The harvesting of waste vegetable oil feedstock for biodiesel production does not contribute significantly to greenhouse gas emissions and does not compete with food crops. In addition, the production of biodiesel from waste

materials is economically competitive relative to its production from agricultural feedstocks, and the byproducts of biodiesel production are non-hazardous and have economic value.

Approach

The Biodiesel Capacity Building and Demonstration Project in Ambos Nogales was designed and implemented to address both air and water quality concerns in Ambos Nogales (Nogales, Sonora, and Nogales and Rio Rico, Arizona) by developing the capacity for the production and use of biodiesel in these border communities. The goal of the project was to establish and operate facilities for small-scale biodiesel production and testing on both sides of the Arizona-Sonora border. It was initiated in the fall of 2004 when the Arizona Department of Environmental Quality (ADEQ) Air Outreach Coordinator recruited a group of students from a graduate course in applied environmental anthropology at the University of Arizona (UA) to carry out an initial investigation of the feasibility of biodiesel production in Nogales, Sonora. As part of their study, the students established relationships with other ADEQ staff members and a professor and students from Instituto Tecnológico de Nogales (ITN). As part of their semester project, the UA students worked with the ITN professor to conduct surveys at restaurants in Nogales, Sonora, and organized a workshop on biodiesel production for the ITN students. The following semester, two students from the ITN class continued the investigation of biodiesel as their student project and, for their thesis, demonstrated that they could produce biodiesel in small quantities. A third ITN student expanded the study and began laying the groundwork for a campus biodiesel laboratory.

The success of the initial efforts led the faculty and students to work with members of the Ambos Nogales Air Quality Task Force to develop a proposal to advance the biodiesel project in Ambos Nogales for the Border 2012 program. A parallel effort had been initiated by the ADEQ Border Program hydrologist to work with the Rio Rico Fire Chief to develop a project that would remove waste vegetable oil and grease from the Nogales wastewater conveyance system. The two groups were encouraged to work together to develop a more comprehensive initiative for Ambos Nogales. Thus began a multi-year effort to address both air and water quality issues through the conversion of waste vegetable oil and grease to biodiesel.

Developing and Maintaining Partnerships

The effort to bring the diverse group of organizations and individuals together to develop the Biodiesel Project began with a series of face-to-face meetings, phone calls, and electronic exchanges of documents and information, all of which took place during a period of 11 months. The project team grew to include high school students working through the Southeast Arizona Area Health Education Center (SEAHEC) Health Career Clubs in Arizona, fire fighters in Sonora, and a private company that operated on both sides of the border. The Asociación de Profesionales en Seguridad y Ambiente (APSA) assisted by recruiting *maquiladoras* and managing the grant funds for the Sonoran partners. The Public Safety Association of Santa Cruz County and the Pima County Association of Governments Clean Cities Coalition were included to help with education and outreach efforts.

The Biodiesel Project team was awarded a Border 2012 grant during the first quarter of 2006. Due to challenges in contracting and subcontracting, learning to work with a new international bureaucracy, and changes in stakeholder participation, project funding was delayed. Regardless, participants from educational institutions continued to pursue at least some of the project goals without external funding. By incorporating the project in their courses, internships, and clubs, students were able to coordinate workshops on the process of converting cooking oil and grease to biodiesel. They also developed a survey of restaurants, institutional cafeterias, and *maquiladoras* to characterize waste vegetable oil sources and information regarding the final disposition of this waste material. Through the participation of 50 students, surveys were completed by the winter of 2007 and results were presented at schools and universities and in local, regional, and national conferences.

During this time, ADEQ developed a manual outlining equipment needs and steps required for producing biodiesel from waste vegetable oil.

ADEQ engaged the BECC for translation of the manual to Spanish so that it could be shared with stakeholders in Sonora. In addition, ADEQ engaged commercial and nonprofit entities in Arizona to coordinate donations of laboratory and biodiesel-rendering equipment in support of the project objectives. With ADEQ's support and generous donations from Turner Laboratories, Friends of the Santa Cruz River, and Alcoa Fastening Systems, a biodiesel rendering facility and laboratory was established at ITN prior to the release of any Border 2012 funding.

ITN Biodiesel Rendering Facility.

By the fall of 2007, Border 2012 funds had been released. In response, ITN hired a chemist to serve as the laboratory manager responsible for implementing additional renovations to the ITN laboratory and biodiesel rendering facility. Faculty and students began producing soap from the residual glycerin generated by the process. The Rio Rico Fire District (RRFD) also initiated construction of its own biodiesel rendering facility in Arizona. The project partners completed maps of local producers of waste vegetable oil and grease, and continued to compile data about the quality and quantity of the waste.

By the fall of 2008, the project participants from the RRFD had completed construction of a facility to produce biodiesel. Through training provided by ADEQ, RRFD produced its first test batch in November 2008. The ITN faculty and students produced sufficient quantities of biodiesel to use in the school's bus in a 20 percent blend and also conducted training sessions for the Nogales, Sonora, fire fighters in anticipation of future construction of an additional biodiesel rendering facility in Sonora.

The partners are working on a strategy to expand the production and use of biodiesel within the broader Ambos Nogales region. The project may be further sustained through the marketing and sale of products such as bearing grease and glycerin soap produced from the residual glycerin. In addition, in response to requests from others, both in Nogales and in other border communities, representatives from ADEQ and ITN are seeking support to develop outreach materials such as manuals, a bibliography, and a training program.

Efficient Use of Material Resources

University and high school students from both sides of the Arizona-Sonora border surveyed restaurants and cafeterias. The Sonoran students also surveyed *maquiladoras*. Their findings reflected differences based on the size of the respective communities, the presence of large numbers of *maquiladoras*, and the existing infrastructure for collecting waste cooking oil and grease. In addition, the amount of waste oil reported to be disposed of per week varied considerably from one entity to the next.

Still, the results indicated that sufficient waste vegetable oil and grease exist on both sides of the border to produce biodiesel. In both communities, the local restaurants and *maquiladoras* overwhelmingly supported the project, especially those in Sonora that had limited options for waste disposal.

Although the Biodiesel Project has yet to develop a formal mechanism for collecting waste oil and grease, several *maquiladoras*, restaurants, and a cafeteria have donated their waste to the ITN laboratory. ITN students fulfilling their social service requirements are responsible for collecting and transporting waste oil and grease to the school's laboratory. Currently, they use a faculty member's personal vehicle, but are seeking a small diesel pickup for this purpose. ITN is scheduled to receive additional EPA funding to develop an industrial-scale biodiesel rendering facility on its campus and has donated a 1,000 square foot area in-kind for this purpose.

Maquiladora *donations of used oil and grease in 5 gallon carboys for biodiesel production.*

Conclusions

In addition to the benefits of converting waste vegetable oil and grease to biodiesel to help protect infrastructure and water quality resources from the impacts of improper waste disposal and reduce negative diesel emissions, the process also can help offset CO_2 emissions. ITN students found that Sonoran *maquiladoras* generate approximately 400 gallons of waste oil and grease per week. This waste stream alone can generate at least 1,300 gallons of finished biodiesel per month for use in municipal diesel vehicles and industrial diesel equipment. Assuming 1 gallon of petroleum diesel generates 22.2 lbs of CO_2 emissions[1], ITN's facility could potentially offset 175 tons of CO_2 emissions per year that would otherwise be released through fossil fuel sources. Similar benefits could result when the RRFD in Arizona brings its biodiesel program fully on line. ●

Reference

1. U.S. EPA Overview: Pollutants and Programs, "Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel," http://www.epa.gov/otaq/climate/420f05001.htm.

..... POINTS TO CONSIDER .....

The Biodiesel Project was particularly successful in capturing and utilizing resources to achieve results. Academic partners, especially students, were key to keeping the project moving forward in the absence of financial resources. By linking the project to specific academic goals of the participating institutions, the leaders were able to extend its reach into the community.

The production of biodiesel from waste oil and grease can be distinguished from other alternatives because it is a process of recycling rather than producing new oil from plants or algae. Using recycled oils offers environmental benefits over using raw crops for biodiesel because it does not involve clearing of forests, use of pesticides, irrigation, or long-distance shipping.

The Biodiesel Project illustrates how border communities have successfully applied existing technologies in innovative ways to improve the border environment and, in doing so, have developed a valuable, local institutional knowledge base. To ensure that these innovative technologies are adopted and extended throughout the region, successful project stakeholders should be supported in development of formal training and outreach capabilities, and linked to a mechanism for information dissemination and capacity building.

Appendices

GLOSSARY OF ACRONYMS

ADEQ	Arizona Department of Environmental Quality
AMIGO	Arizona-Mexico International Green Organization
APSA	Asociación de Profesionales en Seguridad y Ambiente
BECC	Border Environment Cooperation Commission
BIA	Bureau of Indian Affairs
BLM	Border Liaison Mechanism
BN	Bomberos de Nogales
BOD	Biological Oxygen Demand
CARE	Community Action for a Renewed Environment
CASA	Community Assist of Southern Arizona
CCDS	Consejos Consultivos para el Desarrollo Sustenable
CIAP	Coastal Impact Assistance Program
CO	Carbon Monoxide
CRP	Community-based Restoration Program
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
EPE	El Paso Electric Company
EPWU	El Paso Water Utilities
FACA	Federal Advisory Committee Act
FEMAP	Federacion Mexicana de Asociaciones Privadas
FOSCR	Friends of the Santa Cruz River
GIS	Geographic Information System
GPS	Global Positioning System
HVLP	High Volume Low Pressure
IBEP	Integrated Border Environmental Plan
IBWC	International Boundary and Water Commission
ITN	Instituto Tecnológico de Nogales
JAC	Joint Advisory Committee for the Improvement of Air Quality in the Paso del Norte Air Basin
LASPAU	Latin American Scholarship Program of American Universities
NADB	North American Development Bank
NAFTA	North American Free Trade Agreement
NGO	Non-Governmental Organization
NMED	New Mexico Environment Department
NMSU	New Mexico State University
NOAA	National Oceanic and Atmospheric Administration
OCEM	Office of Cooperative Environmental Management
P2	Pollution Prevention
PM	Particulate Matter
RRFD	Rio Rico Fire District
SBRP	Superfund Basic Research Program
SBWAP	Tucson/Pima County Household Hazardous Waste Program–Small Business Waste Assistance Program
SCERP	Southwest Consortium for Environmental Research and Policy
SEAHEC	Southeast Arizona Area Health Education Center
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales
SERI	Sonora Environmental Research Institute, Inc.
TCEQ	Texas Commission on Environmental Quality
TFD	Tucson Fire Department
TL	Turner Laboratories
TSS	Total Suspended Solids
UA	University of Arizona
UACJ	Universidad Autónoma de Ciudad Juárez
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound

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Presidential advisory committee on environmental and infrastructure issues along the U.S. border with Mexico

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August 12, 2008

President George W. Bush
The White House
1600 Pennsylvania Avenue, NW
Washington, D.C. 20006

Dear Mr. President:

As your federal advisory committee on environmental and infrastructure issues along the U.S. border with Mexico, we write to express our continued concern over the inability of emergency responders to cross the border quickly to provide assistance. This issue has been complicated by the new Western Hemisphere Travel Initiative (WHTI) requirements that U.S. citizens provide proof of citizenship upon re-entry into the United States.

Although we are as concerned as you over the physical and economic security of the nation, we are all too aware that many emergency situations on the border require immediate response and/or assistance from one side of the border to the other. While this situation presents many challenges, some of which we have communicated to you previously in our Tenth and Eleventh reports, we believe documentation requirements merit review to ensure that this does not hinder emergency responders from assisting their neighbors on the other side of the border.

We are aware that the Environmental Protection Agency is currently working with other federal agencies in the United States and Mexico to find ways to address various issues, such as liability, that are related to the crossing of equipment into Mexico. We also understand, as it was communicated to us earlier this year by Chairman James Connaughton of the Council on Environmental Quality, that through the Security and Prosperity Partnership there is a commitment to better manage the movements of emergency responders across shared borders during and following an emergency.

In spite of these efforts, we see the need for prompt action and thus request that the administration find ways to help local and state responders on the border comply with WHTI without creating undue crossing delays or financial burdens for their members. In many instances, such as in Presidio, Texas, the fire department is comprised totally of volunteer firefighters and their participation in assisting binational communities is to be encouraged.

Some recommendations that we present in our advisory capacity include:

- That the Departments of Homeland Security and State work with local authorities and emergency responders in the counties bordering Mexico to expedite processing of their Passport or PASS card applications.

- That the PASS card application fee be waived for members of emergency responder units in all U.S. counties bordering Mexico.

- That Customs and Border Protection work with local responders at each border Port of Entry to create a registry of the members of any responder team that might cross the border. The registry would allow registered emergency responders to return to the United States without their passports. The focus should be on ensuring responders have their equipment and can cross expeditiously, not on their documents.

- That in communities with SENTRI lanes, such as San Diego, Nogales, El Paso, Laredo, and Brownsville, emergency vehicles that cross the border be permitted to use these lanes to allow the fastest possible re-entry into the United States and return to their point of origin.

We know that in some cases local border leaders have taken the initiative to establish arrangements similar to those we recommend above. However, as stated in our Eleventh report, emergency response should not be left to *ad hoc* needs evaluations but should have integrated response management systems so that we are better prepared for the next disaster. Public health, lives, property, and natural resources are at stake.

We appreciate the opportunity to provide you with advice on this very important policy issue and thank you for the consideration that you give it. We would be happy to meet with your advisors and discuss the Board's views in more detail.

Respectfully,

Paul Ganster

Paul Ganster

NOTE: Good Neighbor Environmental Board representatives from Federal Departments and Agencies have recused their organizations from this Comment Letter.

cc: The Honorable Dick Cheney
The Vice President of the United States

The Honorable Stephen L. Johnson
Administrator, Environmental Protection Agency

The Honorable Nancy Pelosi
Speaker, House of Representatives

The Honorable Condoleezza Rice
Secretary, Department of State

The Honorable James Connaughton
Chairman, Council on Environmental Quality

The Honorable Michael Chertoff
Secretary, Department of Homeland Security

Key Partners and Contact Information for Case Studies

Waste to Resource: Fibrous Concrete as an Alternative to Landfilling and Burning Paper

Key Partners

- A.J. Mitchell Elementary School, Nogales, Arizona
- Alcatel-Lucent, S.A. de C.V., Nogales, Sonora
- Arizona Department of Environmental Quality, Office of Border Environment Protection, Tucson, Arizona
- Asociación de Profesionales en Seguridad y Ambiente, A.C., Nogales, Sonora
- Center for Alternative Building Studies, Tempe, Arizona
- Centro de Estudios Tecnológicos Industrial y de Servicios N. 128, Nogales, Sonora
- Colegio Nacional de Educación Profesional Técnica, Nogales, Sonora
- Desert Shadows Middle School, Nogales, Arizona
- Edinosa (Edificación Integral del Noroeste, S.A. de C.V.), Nogales, Sonora
- Grupo ConFib de Flores Magón, Nogales, Sonora
- Instituto Tecnológico de Nogales
- Kyrco, S.A. de C.V., Nogales, Sonora
- Maquiladora Association of Sonora, A.C., Nogales
- Municipality of Nogales, Sonora
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Scrap Tire Cleanup in the Border Region

Key Partners

- New Mexico-Chihuahua Rural Task Force
- ProNatura NE
- Municipality of Ascensión, Chihuahua
- Presidencia Seccional de Palomas, Chihuahua
- Luna County Road Department
- City of Deming
- Municipality of Ciudad Juárez
- Secondary schools in Palomas and Ascensión
- New Mexico Department of Transportation
- New Mexico Environment Department
- Texas Commission on Environmental Quality
- SEMARNAT- Chihuahua
- EPA El Paso Border Office
- New Mexico State University
- Universidad Autónoma de Ciudad Juárez, Centro de Información Geográfica
- Cementos de Chihuahua Samalayuca Plant
- Rubber Manufacturers Association
- TAG Associates
- U.S.-Mexico Scrap Tire Management Initiative

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Key Partners

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- Fort Bliss, U.S. Army
- Ciudad Juárez Junta Municipal de Agua y Saneamiento
- University of Texas at El Paso

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Key Partners and Contact Information for Case Studies *(continued)*

The Brawley and Imperial Wetlands in the Imperial Valley California

Key Partners
- Citizen's Congressional Task Force on the New River
- Desert Wildlife Unlimited
- Imperial Irrigation District
- U.S. Bureau of Reclamation
- Imperial County
- California Regional Water Quality Control Board
- California Department of Fish and Game
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Environmental Protection Agency
- Salton Sea Authority
- San Diego State University

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The Bahía Grande: Achieving Multiple Environmental Benefits Through Wetland Restoration

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- NOAA Restoration Center
- Gulf of Mexico Foundation
- Ocean Trust
- Texas A&M Kingsville Kika de la Garza Plant Material Center
- U.S. Fish & Wildlife South Texas Refuge Complex
- Laguna Atascosa Nacional Wildlife Refuge
- Marco Sales
- Episcopal Day School
- University of Brownsville/Texas Southmost College
- JASON Project
- Coastal Conservation Association Texas
- Brownsville/Port Isabel Shrimp Association
- AEP Texas
- Coastal Navigation Districts

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The Campo Kumeyaay Wind Project

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- Bureau of Indian Affairs, U.S. Department of Interior
- Campo Kumeyaay Nation
- General Electric Energy Financial Services
- Sempra Energy
- Superior Renewable Energy LLC, which was purchased by Babcock and Brown Renewable Holdings, Inc., in 2006

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Transboundary Emissions Trading in the Paso del Norte Area

Key Partners
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- El Paso Electric Company (EPE)
- New Mexico State University
- Southwest Consortium for Environmental Research and Policy (SCERP)
- Brick kiln owners
- FEMAP
- SEMARNAT
- Municipality of Ciudad Juárez

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Key Partners and Contact Information for Case Studies *(continued)*

Community Assist of Southern Arizona (CASA): Promotora Business Visit Program

Key Partners

- Sonora Environmental Research Institute, Inc. (SERI)
- University of Arizona - Department of Atmospheric Sciences, U.S.-Mexico Binational Center for Environmental Sciences and Toxicology and Superfund Basic Research Program
- Tucson Fire Department Business Assistance Program
- Tucson/Pima County Household Hazardous Waste Program - Small Business Assistance Program

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Waste-Based Biodiesel: Altering Present Use and Disposition of Waste Vegetable Oil and Grease

Key Partners

- Rio Rico Fire District (RRFD)
- Instituto Tecnológico de Nogales (ITN)
- Bomberos de Nogales (BN)
- Southeast Arizona Area Health Education Center (SEAHEC)
- University of Arizona (UA)
- Arizona Department of Environmental Quality (ADEQ)
- Asociación de Profesionales en Seguridad y Ambiente (APSA)
- Border Environment Cooperation Commission
- U.S. Environmental Protection Agency, Region IX (EPA)

Additional thanks to: Friends of the Santa Cruz River (FOSCR), Turner Laboratories (TL), Alcoa Fastening Systems, and Pima Association of Governments–Clean Cities Coalition.

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Membership Roster and Resource Specialists – 2008 Membership Roster

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