PROGRAM ON ENERGY, THE ENVIRONMENT AND THE ECONOMY

THE MEXICO-U.S. BORDER ENVIRONMENT AND ECONOMY

A Call to Action
To Make the Mexico-US Border Region a Model of Bi-National Cooperation for Sustainability

THE ASPEN INSTITUTE

The Mexico-US Border Environment and Economy

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Preface

This dialogue intended to address the need to influence and engage national actors on both sides of the Mexico-US border to improve the border region's environmental and institutional infrastructure, economy, and quality of life by offering recommendations for action. Co-sponsored by The Aspen Institute Program on Energy, the Environment, and the Economy and the Leadership for Environment and Development (LEAD)-Mexico, the participants in the dialogue convened in Aspen, Colorado, 17-20 October 1999. Twenty-eight leaders participated (see the appendices for list of participants), representing the public, private, academic, and non-government organization(NGO) sectors, and a wide range of views and expertise. The participants used Aspen's roundtable format in a relaxed, informal setting, adopting the not-for-attribution rule in order to encourage candor.

The group met also to:

- clarify environmental, economic, and institutional conditions
- identify trends and linkages
- illuminate alternatives to negative environmental and economic effects and incentives
- illuminate opportunities for governmental, corporate, financial, institutional, and individual initiatives
- suggest strategies for improvements
- help anticipate and prepare ground for enhancing environmental and economic relations between Mexico and the US.

Because of the need expressed in the "Call to Action"(see Introduction), and because growth management encompasses key environmental, economic, and livability challenges, the focus of the dialogue in Aspen was the following:

> *How do we recognize, describe, measure, and invest in the integration of relevant environmental, economic, and social problems to improve growth management along the border; and how do we do this through linked approaches to environmental infrastructure, institutional reform, and private sector involvement?*

We did not discover a concise and pithy answer to these complex issues, but we did discover a shared vision of a sustainable border environment and substantive ground on which to base our Call for Action on a number of useful recommendations.

The Aspen Institute and its Program on Energy, the Environment, and the Economy would like to acknowledge and thank its co-sponsor, LEAD-Mexico, the dialogue's planning group, the papers' authors who gave generously of their time and expertise in preparation, the panel co-chairs, and the dialogue participants for their commitment and continuing spirit of exploration.

We also thank and acknowledge our sponsors, the Charles Stewart Mott and Ford Foundations. Without their generosity and support, this dialogue could not have occurred.

Susan OMalley Wade
Associate Director
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Note:

The Mexico-US Border Environment and Economy: A Call To Action is issued on the authority of The Aspen Institute and its Program on Energy, the Environment, and the Economy. It reflects the collective views of the diverse participants in the dialogue and the agreements they reached over three days and, as such, reflects numerous consolidations and compromises. No individual should be presumed to endorse every word; nor should the participation of individuals imply the endorsement of their organizations.

Introduction

A Call to Action
To Make the Mexico–U.S. Border Region A Model of Bi-National Cooperation for Sustainability

This call to action comes from a diverse group of representatives from both sides of the Mexico-US Border who met recently to consider how to improve the border's environment and economy through better growth management. The Aspen Border Dialogue agreed on a unifying vision to frame the implementation of its recommendations:

The Vision

A healthy sustainable environment in the Border Region that results from an involved bi-national community ensuring proper resource management as a basis for a border economy that provides all its residents a satisfactory quality of life through enhanced employment, education, social, economic and business opportunities.

WHY IS A MODEL FOR SUSTAINABILITY ALONG THE BORDER IMPORTANT TO YOU? NOW?

- The international border, of necessity, makes growth management in this region unique; it is linked with treaties and agreements that require diplomacy and resources unlike what are necessary to managing growth in either country alone. Though local and regional communities must be involved, managing growth along the border cannot be purely a local or regional matter.
- Cross border trade, regional economic activities, and population increase every year. Both countries share costs and benefits, but consequent harmful effects on the environment and quality of life are felt especially along the border. Again this means that managing growth requires resources beyond local or regional capacities—it requires bold, imaginative, and cooperative national leaders.

WHAT ARE THE NEEDS? THE OPPORTUNITIES?

Bi-national environmental cooperation along the border is on the increase. Progress is being made through border institutions and programs such as NADBank, BECC, SEMARNAP, the Border XXI Program, the Region I Regional Council for Sustainable Development, and the Good Neighbor Environmental Board, which are contributing to significant successes and helping clarify present and future trends and needs. This progress in responding to an existing degraded environment and quality of life at the border, however, will be overwhelmed by growth and increasing economic activity unless the infrastructure is crafted to take more preventive measures. Municipalities on the border increasingly face unprecedented challenges in providing municipal services to achieve economic, environmental, and social goals acceptable to both countries. The dialogue participants agree that the roles and responsibilities of the institutions and public and private sectors of this unique, bi-national border region require the attention of our national leaders. We seek to clarify through this call to action the unique oppor-

tunities available to build livable, sustainable border communities; and we make the following recommendations in two areas:

Evaluate and Reform Institutional and Private Sector Roles and Responsibilities

- Key elements, among others, are to establish a Border Advisor within both presidential offices; establish a bi-national Presidential Council, and take other actions to assure sustainable development and to protect the border environment and quality of life for border citizens.

Strengthen Community Capacity and Municipal Authorities

- Key elements, in sum, are to strengthen the capabilities, authority, and funding for communities and municipal governments on both sides of the border so that they can responsibly plan for economic growth and provide needed services.

THE RECOMMENDATIONS

Evaluate and Reform Institutional and Private Sector Roles and Responsibilities

1. Establish a Border Advisor in the Office of each President
   - to advise on and ensure that presidential policy and institutional frameworks foster regional sustainability along the border.

2. Establish and fund a bi-national presidential council (governors, mayors, tribal leaders, non governmental organizations, business and financial leaders) to:
   - define and oversee an action agenda for bi-national cooperation for regional sustainability (economic, social, environmental) with short, medium, and long-term objectives for all border areas, actors, and levels of governments,
   - evaluate relevant programs, agreements, and institutions and suggest reforms,
   - define and monitor progress towards sustainability, including shared goals for development,

- define indicators of sustainability as they relate to:
  - conserving ground and surface water supply and quality,
  - land use, urban expansion and densification of cities,
  - transportation management within cities and at border crossings including the rate of expansion of public vs. private transportation,
  - promoting accountability, and
  - rewarding environmentally superior behavior;
- identify and champion economic instruments in favor of the vision and goals of sustainability.

3. Hold public and stakeholder forums and use other mechanisms to inform the bi-national presidential council considerations in #2 above.

4. Appropriate necessary funding to existing border entities, including enforcement authorities, to
   - enforce the laws and regulations to protect public health and the environment, and
   - create a level and predictable playing field within which market incentives and pollution prevention can flourish.

5. Update the LaPaz Agreement and Border XXI workgroups to
   - include all stakeholders, and
   - incorporate and re-emphasize the vision of sustainability.

6. Implement market incentives to
   - motivate environmentally beneficial practices in business,
   - increase competitiveness,
   - improve public services, and
   - conserve natural resources.

7. Support private and other sector participation:
   - explore redefinition of roles and responsibilities;
   - identify levers for change including enforcement, fines, incentives, rewards;
   - explore regional solutions, including market mechanisms and

other tools, and develop a water conservation ethic to guide all decisions on water allocation and use;
- within a context of predictable effective regulation, work with the private sector to serve the risks of raising capital, asset operations, and technology development;
- develop/support public/private partnerships and public accountability with private sector solutions;
- set policy priorities designed to protect the environment;
- establish a regulatory framework that attracts private sector participation and encourages environmental and enterprise stewardship.

8. Establish accurate, fair and predictable polluter- pays and impact fees.

9. Link funding to
   - desirable local reform outcomes, and
   - building local capacity.

10. Increase transparency and public accountability of institutional decisionmaking.

11. Create a collaborative/transboundary regime to conduct environmental impact assessments including assessments of impacts on regional sustainability.

12. Provide market and other incentives that value the true costs of all activities in order to foster sustainable resource use.

13. Determine the carrying capacity of geographical/ ecological regions.

14. Develop indicators and strategies so that carrying capacities are a factor in regional growth management.

Strengthen Community Capacity and Border Municipal Authorities

15. Enhance the ability of municipal authorities to implement the vision and goals of sustainability.

16. Enhance local service deliveries:
   - train local leaders to improve their management skills,

- assure revenue to provide local services including land, taxes and levees, and impact fees,
- improve efficiencies and apply appropriate technologies.

17. Improve transparency of decisionmaking:
    - involve and account to the public,
    - empower community members to participate in planning and decisionmaking through ad hoc councils and provide tools to engage and communicate with all parties.
18. Build capacity to enforce and assure compliance with municipal codes and rules of law.
19. Use appropriate conditions on multi-lateral lending to strengthen municipal capacity.
20. Create independent improvement districts on the U.S. side to:
    - build and operate infrastructure facilities, and
    - work with Mexico sister cities and municipalities to improve service deliveries (transborder technical assistance).
21. Equitably re-distribute federal revenues back to state and local entities to help support necessary infrastructure.
22. Implement alternatives including training programs, to help municipal authorities and utility managers assure
    - continuity,
    - professionalism,
    - efficiency and
    - effectiveness.
23. In Mexico, promote the civil service sector to “career” status to assure continuity of professional public service.

Background

Mexico and the United States share a history of cooperation in addressing environmental issues along the Mexico-United States border. Opportunity exists now to build on this history and to use the institutional infrastructure, particularly consequent to the North American Free Trade Agreement (NAFTA), to create innovative environmental and economic alternatives to the negative effects of rapid growth along the border.

Mexico and the United States signed a bi-national border agreement in 1944, establishing in its present form the International Boundary and Water Commission with authority over border water allocation and quality, as well as wastewater treatment and sanitation.

Later, in 1983 the La Paz Agreement to protect and improve the border environment was signed, followed by the 1992 Integrated Environmental Plan for the border.

NAFTA and its side agreements of 1993, expanded the institutional structure for cooperatively managing the 2,000 mile border environment. Created by executive agreement between the presidents of Mexico and the United States to help win support for NAFTA, the Border Environment Cooperation Commission (BECC) and the North American Development Bank (NADBank), are intended as part of the side agreements to promote environmental infrastruc-

ture projects in the border region. In complement, the 1996 Framework Document for the Border XXI Program builds on this base and establishes five year objectives for protecting human health and the environment along the border.

The environment and the economy of the border are part of a broader economic context and political agenda that has to do with trade, technology and sustainable development. Population, mainly urban, is rising fast due to rapid industrialization and consequent urbanization of Mexico's northern frontier. The numbers are critical to the issues at hand. By 1995, almost 10.6 million persons lived adjacent to the border, approximately 4.8 million on the Mexican side and 5.8 million on the US side. Projections of future population along the border vary according to methodological assumptions, but conservative estimates which reduce 1995 migration rates to the border region to zero (a highly unlikely scenario), still produce a 50 percent increase by the year 2020—meaning the border population will grow by almost 5 million persons by 2020. About 3.1 million of this growth will occur on the Mexican side of the border. However, should migration patterns maintain themselves for another 25 years (a likely scenario), the border population increases by 120 percent to 24 million by 2020 (an increase of about 13 million in 25 years). This would result in a total of 13.5 million persons on the Mexican side of the border region.

Clearly, the border region is in a state of evolution, and steady environmental deterioration is one result. Industrial investment and output, energy consumption, transportation, and demands on resources, especially water, are rising at a rapid rate. Exacerbating the increases, the maquiladora (maquila) industry grew rapidly subsequent to the 1994-95 devaluation of the peso which lowered real wages significantly. In addition, while the US is facing a shortage of unskilled labor in both the service and agricultural sectors, Mexico's labor force is growing faster than employment opportunities in Mexico. The result is expected to be a continuing flow of migrants from Mexico to the US and especially to the border region.

It is along the border, therefore, that these developments come together and are most intense. And though we speak of the border as though it is an exact area, it is in fact not self-contained nor easily delimited. The defining border line stretches 2,000 miles from San Diego/Tijuana to Brownsville/Matamoros. The most commonly used designation of the border, however, includes the 200 km border region (100 km on each side of the defining border line). The border region encompasses both desert and arid land, and large urban populations, where nearly ninety percent of the population live. This includes the fourteen sister city-pairs. But even this designation is limited. In addition, relevant and important cities and agricultural areas lie outside the 100 km limits, for example Corpus Christi in the US, Monterrey and Saltillo in Mexico, the San José/Sacramento farm lands (and the Silicon Valley), and some of Mexico's choice irrigation districts. Future links between border activities and beyond are bound to grow.

There is also an essential asymmetry to consider. The vastly important industrial maquila sector—which employs close to one million people is in a large sense extraterritorial, an enclave in Mexican territory, for it is managed largely by parent businesses throughout the US, and other countries (in Europe and Asia). Maquila assembly operations are part of the global strategy of most of these businesses, so that the volume of this output is under the control of their headquarters—supply of its parts and services, technological improvements, and even maintenance operations. Purchase of local Mexican goods is limited and sale of finished products, whether semi-manufactured or final consumer goods, to the rest of the Mexican economy is small scale.

Maquilas are not the only source of waste generation and pollution at the border but contribute a good deal. Other companies and industrial plants, agricultural production, and many services also contribute, as do households because of rapid urban population increase. Urban infrastructure has been overwhelmed by this growth and has not developed fast enough on the Mexican side - Tijuana and Ciudad Juarez being the glaring examples- to deal with solid waste disposal, the disposal of chemicals into the sewage systems, air

pollution and the contamination of surface water and aquifers. Environmental deterioration all along the border has been extensively documented.

Most of the environmental progress made at the border has been concentrated on managing industrial and municipal pollution to maintain health and quality of life. However, natural resource protection and management, including natural reserve networks and watershed protection, are poorly understood and underfunded, and not considered a priority. This lack of attention and investment in conservation of ecosystems and their services along the border poses a mid to longterm threat to the economic viability of the region and the health and quality of life of border residents. Policy and management measures to prevent costly mitigation and restoration are needed.

While solutions and renewed progress may come from bi-national and local programs, the ultimate source of environmental deterioration lies far beyond the border in its present definition, and has linkages to the overall economies of the US and Mexico. Air pollution knows no territorial limits. Water, a scarce resource that decreases in quality, is a concern also beyond the 200-km border. Nevertheless, problems and trends at the border are important enough that federal and local authorities, and bilateral and other institutions should devote increasing resources to dealing with them.

It is with some urgency, therefore, that the Aspen Border Group issues this call to action to make the Mexico-US border region a model of binational cooperation for sustainability and offers a vision to frame its recommendations.

The following nine papers were written and circulated prior to the dialogue to provide common background to the participants and to highlight key issues. They are offered here as they were presented, according to the focus of the initial presentations, i.e. the environment, institutional infrastructure, and mobilizing the private sector. The preceding Call to Action and recommendations were based on these papers and the subsequent dialogue they engendered.

Dialogue Papers

An Overview on US-Mexico Border Environmental Challenges

Air Quality Issues–El Paso-Cd. Juarez

Octavio E. Chavez[1]

Nature has well defined balances among its different ecosystems; nothing is wasted and normally the ecosystems edges intertwine adequately. However, we have imposed on those ecosystems the political borders. The US-Mexico border, as we know now, is simply a 150 years old political boundary, and its last modification is as recent as the Chamizal Treaty of 1967.

The US-Mexico border is not only the international boundary between the two countries. It is also a region that for environmental purposes, has been defined as the 100 kilometers wide strip on each side along the international boundary. The border has the uniqueness of being a place where a significant number of agencies, from both countries, have mandates. However, the border is also a line that is nobody's land.

The two countries governments intervention in the region, with different approaches and resources, creates a significant congestion and confusion that many times produces poor results. The white map syndrome is a fact of life along the border. Although it has changed in recent years, government officials on one side of the border do not necessarily know in detail what is happening on the other side. Nevertheless, decisions are made that have environmental impact on the other side.

Population growth is generally blamed as the main factor contributing toward the region's environmental degradation. It is important to rec-

ognize that this growth has not been uniform throughout the border region. The most dramatic growth, outside the San Diego/Tijuana area, has been on the Mexican side. As a matter of fact, the Mexican communities have at least twice the population of their sister community across the border. On the Mexican side, only a few, 13 of the 39 border municipios, have experienced growth rate above the national average. Already the most populated municipios are part of the selected group of high growth rate: Tijuana, Nogales, Acuña, Juarez, Agua Prieta, Tecate, Reynosa and Matamoros. There are, however, border communities that have seen its population decrease like Ojinaga and Diaz Ordaz. The rest have had positive growth below the national average.

The urban Population creates a significant environmental impact. This effect is commonly addressed by seeking to minimize the impact through reducing the pollutants at the source or through infrastructure that treats the pollutants. These actions require resources that in poor areas of high growth, as in the case of most of the border communities are very scarce.

On the US-Mexico border, the border between the developed world and the developing world, the economic differences are obvious and notorious. And these differences are reflected in the environmental infrastructure. This fact alone creates a bias toward looking at the Mexican side when discussing the border environmental issues. Although the US has its own share of environmental issues as well, the majority of the issues are clearly present on the Mexican side.

The border binational environmental agenda seems to be influenced primarily by the perception of environmental impacts to the United States. For instance, over exploitation of the water supply is an issue in the Sonoita/Lukeville. The area aquifer supports agricultural activities, as well as supply water to Puerto Peñasco approximately 100 km away. However, the Hueco Bolson that supplies water to El Paso and Cd. Juarez appears to receive less attention than it should considering its importance. El Paso has already developed alternative sources for water; meanwhile Cd. Juarez depends today totally on the Hueco Bolson for its water supply.

On the issue of wastewater, there seems to be a greater concern for the cases of Tijuana, Mexicali and Nogales than Cd. Juarez. In the latter cases, wastewater flows from Mexico to the U.S., where in the case of Cd. Juarez, most of the wastewater is being used by Mexican farmers and only a small portion, if any, is sent to the Rio Grande River. Of these four cases, only Cd. Juarez does not treat its wastewater output. It is expected that Cd. Juarez will start the treatment of its wastewater by the end of year 2000.

Another case where there seem to be clear differences on how environmental issues are included in the binational environmental agenda, is air quality. Where Juarez/El Paso is a front runner in terms of binational attention, Tijuana and other communities are not getting the attention they may require. Cd Juarez' air quality has been for many years closely tied to the air quality of El Paso. In the case of Tijuana's air quality, it is estimated that Tijuana receives more pollutants from southern California than what that city contributes to the southern California air problems.

What gets included in the binational environmental agenda involves a complex negotiation process. It is certainly more than only what impacts the U.S. However, the perception could lead to that conclusion. The fact that the Mexican government has lacked a stronger proactive attitude regarding border issues, not only on environmental issues, does not help their image.

With the La Paz Agreement of 1983, both federal governments began to look at border environmental issues. However, it was not until a few years ago, with the development of the Border XXI Program and the creation of the border institutions (the Border Environmental Cooperation Commission and the North American Development Bank—out of the side agreements from the North America Free Trade Agreement process), that more specific and long term actions were to be fully implemented. These environmental border programs are currently trying to catch up to the demands of the region.

The infrastructure in place is inadequate for most communities, especially for those in rural U.S. and on the Mexican side. *However,*

However, there has been limited urban planning and inadequate infrastructure for the majority of growth of Mexican cities'. For instance, the border region faces a number of water quality and water supply issues. Although more than half of the border region belongs to the Rio Grande basin, water is scarce and of poor quality. The two countries have treaties that define how to share surface water and management of shared river basins. However, though most of the water supply for the border communities comes from aquifers, they do not have any formal agreement about how to manage shared aquifers.

There are communities in the US that do not have tap potable water, the so-called "Colonias". On the Mexican side the conditions are not better; even the urban infrastructure for water distribution is insufficient such that a significant number of the urban border residents do not have tap water service and sewage. Approximately 88% of the homes are connected to the water distribution network and 69% are connected to the sewage. Although in recent years there has been a clear trend to promote water conservation and reuse, the required infrastructure for such programs is still behind current needs. As previously indicated, water supply and quality are major issues as well, since not all the residents connected to the water distribution network can receive water 24 hours a day every day. Water supply shortages and considerable water losses are due to the poor conditions of the distribution network.

Wastewater is also a relevant problem throughout the border region primarily because the treatment infrastructure is years behind the demand. The issue is critical for those areas that receive their water supply from surface water that is used by upstream communities. That is the case of most of the eastern border region cities. The most common process for wastewater treatment is oxidation lagoons. However most of them are old and operate over their design capacity, reducing their efficiency.

As mentioned above, water shortages are common in many Mexican border communities as well as in the "colonias" on the US side. Poor management policies among many water utilities

favor political gains or business interests over the long term well being of the community. On the Mexican side, it is common that the water utilities have a significant number of outstanding customers with several years of back debts. Also, there are a very few utilities that can claim to have at least 80% of customers with metered service and billing based on real consumption. These facts certainly diminish the capability of any utility to provide adequate service in the long term. The basic water distribution networks reflect the poor maintenance and planning that has prevailed in the past. It is fair to point out that there are serious efforts to reverse this trend; however, there is need of financial resources to overcome the deficiencies. The sources for those financial resources are few considering that in Mexico, almost 99% of the tax revenues are collected by the federal system.[2] Additionally, the fiscal distribution of those revenues does not necessarily return a fair share to keep up with the high demand generated by economic and population growth.

In addition to water issues, there is the issue of hazardous waste disposal and what will happen within a few years when industrial waste from offshore operations can be disposed in Mexico. In 1996, about 86% of the maquilas operations along the border were identified as complying with their legal obligation regarding hazardous waste handling and disposal. The primary concern is that there is basically only one official disposal site for hazardous waste in Mexico today. Will the border continue to face the illegal dumping of hazardous waste? The border community needs to be alert and work with all the parties to make sure the proper treatment is given to hazardous waste. Again financial resources are part of the challenge. The current mechanism and infrastructure is not up to the level that is required. On the side of municipal solid waste, the conditions are not better. The sector is behind in terms of its limited infrastructure and poor practices. Illegal dumping happens practically in all the Mexican communities. Customs and inadequate infrastructure are part of the problem.

Many of the environmental challenges at the border could perhaps be confined or at least contained, with some degree of success.

However, air issues do not respect any political boundary. Air pollution travels through borders freely. On the US-Mexico border, air pollution is a serious issue. Two of the five annexes to the La Paz Agreement deal with air pollution on the border. These annexes show more than 10 years of binational negotiations between the two countries. The binational agenda on air quality issues go from visibility in a national park to urban air quality.

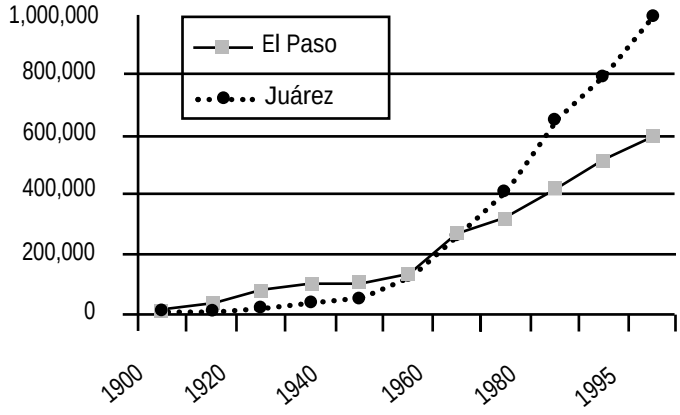
One case in the binational agenda is the Big Bend National Park, where there has been a decrease in the visibility within the park. The first reaction was to blame two coal based electric plants a few miles from the border in Piedras Negras. However, further studies have shown that the pollutants could be coming from far distances in Mexico and the U.S., therefore more studies are underway. This case is a clear example of how air pollution does not stop at the border, and the effects of urban and industrial sources can be traced several hundreds, and perhaps thousands of miles away.

One of the annexes of the La Paz Agreement, Annex 5, although written in language that applies to everything at the border, was prompted by the air quality conditions in the border region of El Paso, Sunland Park and Cd. Juarez. This region is commonly referred as Paso del Norte, an old Spaniard name for the region from the colony days.

In the Paso del Norte region, a particular situation developed as the community struggled to manage the air quality issues with overcrowded and sometimes conflicting government regulations that meet at the border, but can not stop influencing each other.

The population in the Paso del Norte region has grown several folds in the last decades. The faster growth has been on the Mexican side, in Cd. Juarez. It is relevant to point out that the population size has been reversed from what it was a century ago. In 1900, El Paso had 15,906 residents, when Cd. Juarez had 8,212. Now, it is the opposite situation.

Urban Population Growth in the Paso del Norte Region



As the population grows, so do the environmental challenges. In the region, air quality has been an issue for many years. The region's climate, vehicle emissions and industrial activities have been listed as the major factors contributing to the air problem. El Paso has been declared as a non-attainment area for Ozone and moderate non-attainment area for carbon monoxide and particulate matter by the U.S. Environment Protection Agency (EPA). On the Mexican side, there are not specific categories to describe if an area fails with the standards, however, reading from air quality monitoring stations in Cd. Juarez indicates that it fails to meet Mexican healthy limits for ozone, carbon monoxide and particular matter.

The dramatic differences between the two contiguous urban centers could be due to a number of factors, from type and number of sources and the location of the monitoring stations to differences in numerical standards. Regarding the former, Mexico has a more stringent standard for ozone than does the U.S. (110 parts per billion versus 120 ppb, respectively). Thus, a reading of 115 ppb would exceed the standard for Mexico but not for the U.S. Furthermore, in the U.S., a 10 percent cushion is provided before an exceedance is recorded. Thus, an ozone reading must exceed 132 ppb or 10% over the standard of 120 ppb before it is recorded as an exceedance. Despite these differences, stud-

ies of the air quality readings have concluded that there appears to be more severe ambient concentrations of pollutants in Cd. Juarez.

The sources of air pollution in the Paso del Norte region come from both human and natural sources. Vehicle emissions and area sources, such as unpaved roads, open burning, fireplaces and wood burning stoves, are high on the list of pollution sources while industrial activities are now lower on the list. Natural factors such as the region's arid climate and high elevation contribute to the pollution problem as well. Mountains surrounding the Paso del Norte region on three sides form a natural amphitheater that traps pollution.

Because human sources of air pollution can be associated with one side or the other, there are indications that both sides contribute to the problem. For instance, on vehicle emissions: with more than 60% of its vehicles being at least 10 years old, Cd. Juarez, old vehicle fleet contributes to over 87% of the pollutants being released to the atmosphere in the city. On the other hand, the vehicles in El Paso have higher mileage travel per day. Also there are practically no heavy air emissions from industrial operations in Cd. Juarez; where as in El Paso, there are petroleum and mineral refinery operations. Meanwhile, there are a number of brickmaking operations in Cd. Juarez that represent the open burning of several types of fuels, including solid fuels such as wood and plastic. In the winter time, people in Cd. Juarez' poor neighborhoods burn wood to warm their homes, and many El Paso residents turn down their natural gas furnace thermostats to light up their fireplaces. Only about 65,000 out of about 250,000 homes in Cd. Juarez have natural gas connection.

With the high population growth and deficient urban plans, the problems continue to aggravate, and the community seeks different and new approaches. One of those efforts is the Paso del Norte Air Quality Task Force. The Task Force is an example of innovative transboundary environmental cooperation effort. The Task Force is a grassroots binational group formed in 1993 with non-governmental, industrial, governmental, and academic representatives in addition to concerned citizens. The main focus of the

Task Force has been to find ways in which institutions and individuals on both sides of the border can cooperate and work together to improve the region's air quality. From the start, Task Force members defined air pollution as a regional problem requiring binational solutions. In 1993, it proposed the creation of an international air quality management district covering the entire airshed. The management district would foster greater cooperation and more effective air pollution policies without superceding existing government regulations. Although this objective has not been met yet, significant progress has been accomplished of having more local input into the policy and regulation making processes that apply to the region.

Border residents have long learned to cope with a congested and sometimes conflicting regulatory environment. However, they recognize that they must work together to solve the common air pollution problem in the region. The Task Force works within the legal framework of each country; nevertheless it seeks to depend less on decisions made from desks hundreds of miles away. The Task Force has been able to work with both federal governments to recognize the existence of a common air basin in which Cd. Juarez, El Paso and southern New Mexico's Dona Ana County are located. With official recognition of the Paso del Norte Air Basin in May 7, 1996, also came the creation of a binational advisory committee. The Paso del Norte Joint Advisory Committee (JAC) has been established primarily to provide recommendations to the Air Working Group of the Border XXI Program (also of the La Paz Agreement). The JAC has 20 members equally divided by country and government and non-government representatives. The federal representatives include one from the United States and three from Mexico (showing the still strong influence of the Mexican federal government in border local issues). The Task Force is seeking to use the JAC as a mechanism to influence policies to be implemented in the region. The JAC is the closest that the Task Force has come to its goal of having an international air quality management district.

In addition to working with government agencies, the Task Force members work toward the goal that targets pollution reduction

efforts where they can do the most good. Some of the Task Force members actions have involved activities like:

- Training mechanics in Cd. Juarez how to inspect and maintain automobiles to minimize pollution.
- Special events at the maquila plants where people can get their vehicles inspected, many times with the cost being picked up or at least financed by the company.
- Assisting paint shop owners on both sides and new ways to reduce volatile organic compounds (VOCs) through new paint gun sprayers and redesigned paint booths.
- Curtailing brick kiln emissions by encouraging brickmakers to adopt new technology and switch to cleaner fuels.
- Decreasing carbon monoxide emissions by requiring gas stations in the region to sell oxygenated gasoline during the winter months, and reducing VOCs by requiring them to sell low vapor pressure gasoline during the summer months.
- Developing a region-wide computerized map using geographic information systems (GIS) technologies to model, plan, and assess pollution reduction strategies and alternatives.
- Developing cross-border emission trading. Under this program, a company needing to reduce emissions could invest in a project located on either side of the border resulting in the greatest pollution reduction at the lowest cost.

In addition to the specific actions mentioned above, the Task Force is collaborating closely with the JAC to develop innovative schemes that will result in better air quality. One possibility is binational *Supplemental Environmental Projects,* or SEPs. A supplemental environmental project occurs when a company is fined for violating an environmental regulation. A violator can have the fine reduced by investing in an approved project resulting in pollution reduction. In April 1997, a pilot binational SEP was carried out when an El Paso company agreed to invest in a project in Cd. Juarez. By modernizing a soldering operation, this project will reduce air and water pollu-

tion as well as the generation of hazardous waste.

Another example of the payoff from cooperative efforts is the work by Task Force members to reduce traffic congestion and waiting times on international bridges. These members have helped obtain a commitment from various government agencies to designate a commuter lane on the Stanton Bridge (opened in late summer 1999), establish high occupancy vehicle lanes, and keep all inspection booths open during peak hours.

The advances made by the Task Force and its members could not have been possible without a number of federal agencies officials willing to try new approaches. The sovereignty shadow still paralyzes many officials dealing with border issues. The institutional call to preserve a mandate over finding new ways to solve problems, is perhaps the biggest obstacle.

Meanwhile state and local officials certainly have been instrumental in their support of many proposals. However, there are still technical deficiencies among their ranks. Most of those deficiencies are due to the limited resources allocated by elected officials to the environmental challenges. It is not until conditions reach critical stages that resources are allocated, and often those resources are too little too late.

A recent study case about the Task Force reported the following key success factors:

1. Several key factors which cannot be reduced to a single formula are responsible for the success of the Paso del Norte Task Force. However, those involved in the Task Force have identified a few key factors that might be useful to others interested in establishing a similar community-based organization:
2. Members held a common understanding of the problem. And right from the start, Task Force members shared a common objective: to make the air cleaner.
3. Getting the right people involved. Early in the process, government, business, and civic leaders were identified who could make things happen.

4. Focus on finding solutions rather than assessing blame. Task Force members adopted the philosophy that air pollution was a common problem requiring solutions.

5. Set goals and objectives early and have both short and long term objectives. Short term objectives are important so the group can have a sense of accomplishment. Long term goals and objectives also help keep the group focused because some problems can not be solved quickly.

6. Encourage members to stay involved. The Task Force is an inclusive organization, allowing anyone to join interested in finding solutions to air pollution. During initial meetings, brainstorming sessions were held to solicit input from members of the Task Force. As a result, members become stakeholders in the success of Task Force projects.

7. Focus on substance over procedure. The Task Force has maintained a sense of informality. Membership is open, no dues are collected, and anyone interested can attend meetings.

8. Good timing. As a result of NAFTA, the border received increased attention from both the U.S. and Mexican governments. Environmental concerns led to a commitment to reducing pollution in the border region.

9. Patience and humor are critical to establishing a new organization.

In the process of addressing the Paso del Norte air quality issues, different interests have arisen. Two proposals before the JAC exemplify the point. The basic idea of the proposals is that all the residents should be asked for equal conditions or "sacrifices", recognizing to the furthest extent possible social-economic differences. One proposal calls for all the gasoline being distributed in the region to comply to the same or similar standards. These standards are that during the summer time, the gasoline should have low vapor pressure and during the winter time be oxygenated. El Paso is already complying with these standards that reduces the presence of volatile organic components in the air, therefore reducing ozone formation in the summer; also the measure helps reduce the formation of Carbon Monoxide in

the winter as the oxygenated gasoline increases the combustion efficiency. In the case of Cd. Juarez, PEMEX, after strong assistance from federal environmental authorities in the lobbying efforts, agreed to distribute gasoline under the conditions described above. However, the environmental authorities in New Mexico cannot implement a similar program due to the lack of legal backing for the measure, at least, that is what they claim. What this means is that people will be able to travel a few miles west of El Paso to find cheaper gasoline that does not help the air quality programs.

One of the major obstacles in the case of PEMEX distributing Oxygenated gasoline in Cd. Juarez has to do with the additive to oxygenate the gasoline. El Paso is using ethanol that is subsidized. The main supplier of gasoline to Cd. Juarez, is the refinery in El Paso. However, PEMEX decided to use MTBE since it is its "national" policy; again everyone has to abide by the same central policy regarding the particular regional conditions. In addition the Mexican car manufacturers pressured to prevent the use of ethanol in the gasoline. The problem for the Mexican car manufacturers may be that ethanol seems to affect some of the materials they use in the vehicles sold in Mexico, even though, the vehicles come from the same assembly lines. Cheap materials for the Mexican market, higher quality products for the US market.

The other proposal deals also with the issue of vehicle emissions, clearly the major contributor to air pollution in the region. The two areas with the oldest fleets, southern New Mexico and Cd. Juarez, did not have until recently a vehicle Inspection and Maintenance (I&M) program. It has been only a few years that Juarez, established an I&M program. At the beginning it was voluntary, and since 1998 it is the state traffic law. On the other hand, New Mexico does not have an I&M program yet , claiming that the state government does not have the legal foundation to enforce it.

In Addition to the legal framework and willingness from the governments to promote adequate policies to reduce air pollution, there are real issues about the rest of the infrastructure to support such policies. Together with the conflicting legal mandates, social eco-

nomic conditions are often called out as a reason why a given policy is not viable. The poor infrastructure to support alternatives to the use of private vehicle and other production practices are particularly real challenges.

The solutions, as the Paso del Norte Air Quality Task Force has recognized since its foundation, require that everyone pitch in. The problems affect everyone, therefore the solutions should involve all of the actors in the community: governments, private sector, academics, social groups and the community at large. In addition, the solutions will cost, and there are not enough resources available for the problems to be solved by one sector alone. By joining forces therefore viable alternatives are more likely to be found.

Endnotes

1. International City/County Management Association and also Co-Director of the Border Information Institute (INFOMEXUS) in Cd. Juarez. The concepts expressed in the paper are the sole responsibility of the Author.

2. Environmental Performance Analysis, Mexico, Organization for Economic Cooperation and Development (OECD), 1998.

Panel on the Border Environment United at the Border

Ernesto C. Enkerlin-Hoeflich

Executive Summary

We should think and work in the border area as something that truly unites us and not as an imaginary and sometimes very real line of separation. How can we work closer and better? The “green” part of environmental issues, natural resources, biodiversity ad ecosystems, receive so far very little attention compared with other environmental issues which in turn do not receive enough attention yet in the border area and especially in the northeastern border with Texas. Current focus is more on social development and poverty alleviation, compensating fiscal deficits in the municipalities by dedicating “environmental” funds to conduct basic infrastructure and public works and finally to environmental/political crisis management. Citizen participation is increasing but still weak and especially so on the Mexican side. Empowerment and awareness campaigns are urgently needed to create a citizen-government synergy that proves to be positive and includes ample information and “right to know”. Given the perceived conflict in establishing toxic or nuclear waste facilities with a “safe environment” by the majority of the public on both sides, it is wise to declare the area free of any such plans for the future. This would also be politically a sound decision. It is imperative to link further infrastructure development to regional ecological planning including the establishment or reinforcement of natural protected areas that insure the viability of endangered species and

maintain ecosystem services. A cap needs to be set on development such that municipalities enter into competition for the best companies and not just for any company or development project. Binational cooperation both at the government and civil level is important and demonstrated in projects such as "Laguna Madre: a Binational initiative. This project will help establish a vision for the region through participatory processes and will be an example of increased awareness and long-term planning for this region. Specific development activities should be a needed follow-up. Nine concrete recommendations are advanced.

We seem to think that borders are supposed to separate. We are taught this and our culture reinforces it. We even build walls and fences to prove that it is supposed to separate us, but to me in the end we are always united at the border.

Instead maybe we should think of it more as the line that marks the meeting point of the hemispheres of an asymmetric body. Or the zipper that allows pieces of fabric to stay together instead of leaving us in a naked ridicule. We are bonded so closely that to know which side you are on we rely on the sun and the stars. It also unites us in many silly ways but more importantly in shared challenges like poverty, misunderstanding, asymmetries and the environment. Within the environment possibly the greatest challenge relates to natural resources as even when we finally pay attention to the environment we end up in an end-of-pipe approach, again drawing imaginary borders between human environmental needs and ecological environmental needs. Environmentally, the border definitely has a bias and it is not green but brown (gray).

The paper may be critical or even cynical at times but I recognize important advances due to NAFTA and other initiatives to advance the resolution of border problems. I will stay away from most statistics and figures because the real figures are in the land and the people of the border who at times do not even know what is good for them and their future. It is our responsibility to give them the awareness and the tools and possibilities to choose what is best for them. The spirit is one of critical optimism; otherwise, who wants to be involved?

We are finally waking up to uniting the border and now when we think of it, it is no longer a line but a stripe, two hundred miles wide, half on each side of an imaginary line. This is still a partial vision, a negation of natural boundaries, and an acknowledgement that we need to work together, all this has to start with and continue with permanent dialogue.

Natural resources: a forgotten agenda

The environment and the concept of sustainable development might have according to many a "green" stigma but in practice to date it has been just a way to camouflage development in the old style. True environmental concerns such as watershed protection and restoration, biodiversity conservation and economic recognition of ecological services are all left out of the discussion. The environment has been little more than paying attention to, and sometimes resolving, the most pressing issues of the moment that have an impact on human communities and can be resolved with "infrastructure." The orientation is coping with growth instead of managing, redirecting or even curbing growth based on the limited availability of natural resources and the potential to permanently reduce quality of life in the region.

The region of influence of our border from the Big Bend to the Gulf includes in part the Mexican State of Chihuahua and all the border of Coahuila, Nuevo Leon and Tamaulipas. These are all next door to the state of Texas, and all areas including five on the Texas side have one thing in common: they have benefited tremendously from NAFTA and will continue to do so for historical, economic and geographic reasons.

Benefits of economic growth have allowed maintenance and in some cases increased allocation of resources towards the environment, but an overwhelming majority of these have been diverted to issues of basic public service and social justice such as clean water, sewage and appropriate waste disposal, while true environmental investment or forward looking mechanisms have been underfunded or simply forgotten as municipal and state authorities find in environmentally

related funding mechanisms (such as NADBank and World Bank) an easy escape to many of their own fiscal constraints for public works. While most of these investments are clearly necessary and hopefully properly prioritized, it remains a fact that they area all short-term and emergency driven. Until a binding mechanism to allocation of a proportion of resources to true green issues (ecosystem-based and long-term) is devised we will see a constant decrease in quality of life and availability of natural resources and a constant increase in the cost and difficulty of mitigating the impacts in a zero or negative sum game that will benefit no one.

Citizen participation

Participation has been increasing in the border area but at a rate much too slow to cope with the pressures and decisions that occur on an almost daily basis. Non-governmental organizations (NGO's) or organizations of civil society (OCS's) including grassroots groups dealing with green issues are extremely few and under-funded on the Mexico side. Better organized, supported and respected on the Texas side. Despite differences between countries they are all sharing to a large extent apathy from most citizens who view these organizations as interested in nature and not human welfare. Some are generally regarded as fundamentalist and/or politically motivated. In general, although this is changing finally and rapidly, environmental groups are viewed as a minority subculture worried about the future when the present is already so complicated. In many cases interests counter to long-term sustainable development including misinformed politicians and government officials have also contributed to undermine the credibility and action of environmental groups. Needless to say in some instances, a minority, environmental groups themselves have acted in a less than responsible and well informed way on issues in the area.

Toxic waste in the border strip: a clear no-no.

Even political common sense should strongly signal that toxic (including nuclear) waste disposal should be prohibited on the bor-

der strip. If this area has been agreed and declared by both countries an area of special environmental concern it is really a big mistake, on either side, to propose toxic waste disposal within the "green" strip. If Sierra Blanca was a US initiative just imagine a Mexican initiative to locate such a facility less than 100 miles from the US border. Would US public be condescending? I doubt it.

Solid waste disposal is different and can be dealt with differently. Currently there is a very strong need to improve facilities especially in Mexico. Areas that are unable to provide reasonable service should be banned from establishing additional plants.

Natural protected areas: more than a difference in strategy and context.

Over 95% of land in Mexico is privately owned, the northeast is much the same and much like Texas. The difference in Mexico is that about half of that private land (about one third in the arid north) is comprised of "ejidos" or social property that was until 1992 owned by government. Ejido land can now be sold but it is not as easy as one might think. Many ejidos are currently held on "lease" by prospective buyers with the idea of eventually becoming strictly private.

As in Texas, and most of the world, private ownership has a very strong sense of independence. In many ways and on both sides of the border property lines also mean a change in order. The order of each individual landowner. This is a fact for conservation and natural resource management and one that we need to work with. Only in the measure that we can find common ground with private landowners will we have significant impact in conservation beyond the meager land that can be "protected" in the traditional sense.

Mexico is moving forward with establishing incentives for conservation on private lands much like what has been possible in the US for a long time. The "land-trust" concept and movement in the US is beginning to have an echo in Mexico. Organizations like Pronatura

are currently exploring possibilities to establish such. Many landowners in Mexico, especially those with other sources of income, are looking into conservation of their properties as a way to leave a "footprint" with or without incentives. The potential, especially in the north, to have significant (millions of hectares) land devoted wholly or in part to conservation is there to be used creatively. The Mexican government is promoting the establishment of UMA's (Units for wildlife use and conservation) as an alternative mechanism for protection. Some have been successful but much abuse is still present in individuals who have used the concept to legitimize unsustainable schemes of wildlife use. Much remains to be done to make this interesting tool (UMA) of value to conservation, make all UMA's like the few good ones.

Perhaps nowhere is the disparity of resource allocation for the environment between the US and Mexico more evident than in natural conservation areas and associated green issues. Just as in the border area this may be as different as 100:1 and at best about 1:30, US:Mexico investment in wildlife and ecosystem conservation and management. Even factoring in the differences in strategy and in our respective economies this is an unacceptable difference. Furthermore the US is unwilling to use any significant US fiscal resources to "invest" in conservation on the Mexican side despite the clear logic and high benefit:cost ratio of doing so. It is necessary to achieve joint commitments to both increase Mexican appropriations and to allow use of US funds on the Mexican side for establishment, management, enhancement, promotion and restoration of natural areas and ecosystem function.

Binational work in progress: the case of Laguna Madre[1]

The project's geographical region consists of Cameron and Willacy counties in Texas and the municipal areas of Matamoros and Valle Hermoso and associated coastal villages in Tamaulipas. The three major objectives for the first phase of this project have been: 1) to assess the current economic and environmental state of the region by developing and measuring a set of community "indicators"; 2) to

build support among community leaders for responsible decision-making which promotes development that is based on conservation of local natural resources; and 3) to produce a state of the region assessment which will publish the results of the indicators research, highlight the Laguna Madre's unique habitat and promote strategies for the region that enhance both economic value and conservation of the Laguna Madre.

One of the strengths of the project, and also one of the most delicate and demanding tasks, has been to work with a binational advisory committee that has met several times over the last 10 months (prior to July 1999). These meetings have served to establish some issues of common concern, allow the members to get to know one another, and discuss the objectives and initial research conducted for the project. Several project components are now underway or have been completed. They are: 1) Conservation and development attitudes survey of 400 local registered voters 2) Four Brownsville Leaders' Forums 3) Community "diagnostico" for the fishing village of Mezquital 4) Bilingual "Laguna Madre highlights" power point presentation These are discussed in more detail below.

The community attitudes survey (please also see attached survey report) found that a surprising number of people both recognize the economic value of natural resources and believe that they should be protected. In fact, 80 to 90% of those surveyed answered positively to the statement "natural resources like the Laguna Madre are important to our economy". Interestingly, respondents felt trash dumping was the biggest environmental problem in the region, and apathy the leading cause of environmental problems. The responses indicated that people wanted cleaner communities, more trees, and protection of water resources, but also felt that local government could do more to attract different businesses to the region. On April 29th and 30th, TCPS conducted small-group Leaders' Forums involving 35 Cameron, Willacy and Hidalgo County community leaders in a dialogue on environmental and economic balance in the area. Participating leaders included city planners, economic development council representatives, private businesspeople, navigation district directors, real estate developers, irrigators, wildlife biologists,

tourism officials, grassroots organizers, educational personnel, extension agents, shrimpers and activists. Most participants felt that community growth is economically desirable, but expressed concern that perhaps growth was happening "too quickly", that cities could not keep up and nature was often overlooked in the rush to bring in industry. The exchange proved there is a profound need to both educate local leaders about how development might be better managed to improve conservation, and in enlisting their support to promote those alternatives. TCPS contracted a local University of Texas—Brownsville professor to write a report which we will distribute to community leaders and interested citizens throughout the region.

In addition, Pronatura staff and Terra Nostra, a non-profit organization based in Ciudad Victoria, conducted a community "diagnostico" (diagnostic analysis) in the coastal village of Mezquital, an extremely poor fishing village south of Matamoros. The village has immense poverty and solid waste disposal problems, compounded by a growing population which impacts increasingly on the Laguna Madre fisheries, colonial nesting birds and islands. The Tamaulipas state agency in charge of fisheries (SEMARNAP) has already taken an interest in collaborating with us and attended a recent meeting of our project advisory committee to discuss steps to alleviate pressures on the resource and improve living conditions for the villagers. Pronatura and Terra Nostra held a very successful community-wide forum on June 26th in Mezquital, involving a large representation of the community and SEMARNAP officials and members of our binational advisory committee.

TCPS and Pronatura are currently developing a bilingual power point presentation that will include the results of the community exchanges and share the initial indicators analyses with groups on both sides of the border. The presentation will focus on four areas where we have begun our initial research: agriculture, biodiversity, fisheries and tourism. The presentation will be shared with the Advisory Committee for their input before it is presented to the public. The idea is to visually link the relationship between environment, economy and community, using measurements people can understand, so that conservation eventually becomes a key factor in

decision-making. We are gathering important information for the indicators research, and will be concentrating most of our time in the next few months on evaluating and interpreting this information. The indicators research is the backbone of the Final Assessment and will be key to galvanizing the support of the communities along the Lower Laguna Madre. Pronatura has hired an intern to assist with data collection in Mexico.

In collaboration with the Center for Strategic Studies of Monterrey Tech, a neutral third party with great trust and visibility, we will conduct a visioning process for the Mexican component of the project. This process "Visión 2025: Matamoros, Valle Hermoso y Laguna Madre" will allow the community to be more involved in the decision making process and to charter a course that can be projected to investors interested in the region.

Recommendations

1. Planning in a broad, proactive and holistic sense as opposed to short-term, urban defined, crisis driven and "end of pipe" focus.
2. Mandated balanced allocation of resources between short, mid- and long-term problems, green-brown issues and prevention-mitigation-remediation.
3. Adequate policy infrastructure to support a change towards sustainability.
4. Establish a financial mechanism to derive resources for environmental protection, especially maintenance of ecological services such as water and clean air, in the same proportion as economic activity increases.
5. Increase environmental education and awareness at all levels and make it relevant to our region of focus.
6. Try to increase migration of factories, twin-plants, etc. further into Mexico. Establish a certification process for municipalities linked to a quota. I.e. allow only municipalities that comply to

receive investments in new infrastructure and factories but put a cap based on current infrastructure and natural resources availability.

7. Consolidate and support a State/Federal Systems of reserves that insures viability of biodiversity in the region.
8. Conduct a region wide ecological planning or "Ordenamiento Ecologico" that is democratic and balanced mandating a long-term zoning for the region including restoration areas.
9. Reach commitments by US and Mexican authorities to increase resource allocation for wildlife and ecosystem protection and conservation.

Endnotes

1. From a progress report to Ford Foundation by K. Chapman, M.A. Cruz, E. Enkerlin-Hoeflich and M. Kelly.

Water On the Border! Status and Trends

Felicia Marcus

Introduction

The United States—Mexico border is a unique place where two sovereign nations, two economies, two languages, and two cultures meet. The geographic landscape, bisected by the international political boundary, encompasses a common ecosystem—the desert regions of the Mojave, Sonoran and Chihuahua provinces. A rich biodiversity exists in these arid climates, but with a critical dependency on water. The political jurisdictions of nations, states, and local governments have been superimposed on the landscape without reference to the watersheds and aquifers that span the border. Settlements (i.e., sister cities) have grown up around border crossings, but without reference to reliable water supplies.

In the border region, water is found in surface watercourses—both perennial and ephemeral—and in groundwater aquifers. It is applied to support ecological needs (wetlands, riparian zones, fisheries, etc.); agricultural needs (food, fiber, forage and livestock); urban needs (municipal water supplies); and industrial needs (maquiladoras, national companies). Water is vitally important to life in the Border region, and to a robust industrial and agricultural economy. Water has a quantity component and a quality component, each is important in an arid region. Management of water supply and wastewater treatment and reuse become major policy objectives.

This paper explores the myriad dimensions of water in the border region, and poses several issues in the context of sustainable development for discussion and dialogue.

Watershed Orientation

Watersheds traverse the landscape without reference to political boundaries. Groundwater basins underlie the border. Many of the surface streams have been controlled by engineered works (dams, canals), while many of the naturally dry washes have become continuously flowing watercourses fed by wastewater flows. There is an intimate interdependency between surface water and groundwater; for example, pumping groundwater may affect surface base flows or "underflows" in the gravels of streambeds, and lining of canals may preclude water replenishment and recharge to the groundwater. In a desert region apparently without water the hydrology is quite complex.

Some rivers flow **south** into Mexico. The Colorado River (subject to complete engineered control and interstate compacts, international treaties, and sovereign Indian rights) flows across the border to Morelos Dam where it is almost fully diverted for uses in Mexico. The lower Colorado River Delta region has lost most of its waters, except for agricultural drains and infrequent flood flows, with a consequent loss of ecological values.

Rivers also flow **north** into the United States. The Tijuana River, New River, Alamo River, Santa Cruz River and San Pedro River all convey waters north. The natural surface flows would normally have been ephemeral following the rains, with year-round "underflow" in the river gravels. Today these north-bound streams are perennial water courses fed by continuous flows of wastewater and agricultural drainwater. Despite the impaired quality, these rivers now harbor unique aquatic ecosystems, sometimes with endangered species at risk.

The Rio Grande River forms the natural border of the U.S. and Mexico. The Rio Grande is truly a **shared** waterbody, giving life and economic vitality to both countries adjoining it.

Demand For Water(Present and Projected)

Water in the arid border region must ideally be allocated to the highest and best uses. However, no formal system of prioritization nor allocation exists. Therefore, the demand for water becomes subject to competition among ecological, agricultural, industrial and municipal needs, as set forth below.

In the desert, animals and plants have adapted to a boom-or-bust water supply. The unique aquatic ecosystems that exist along the U.S.-Mexico border depend on intermittent, seasonal, and flood waters to refresh and enliven in-stream, riparian, and wetland habitats, as well as to recharge underground sources of seeps and springs. The very specific strategies employed by aquatic and terrestrial plants and animals in this bioregion allows them to survive years of drought as well as periodic inundations. As a result of the modifications that human use of desert water hydrology has engendered, most of these ecological systems now suffer chronic water deficits. At the same time, they have had to cope with water quality changes, such as lower temperatures, increasing salinity, and the presence of anthropogenic contaminants.

Industrial water needs have increased, in large part due to the growth of maquiladoras. Maquiladoras are assembly plants located in border cities such as Tijuana, Mexicali, Nogales and Ciudad Juárez, where parts of products manufactured elsewhere are put together by a local workforce; the end products, which may not be sold in Mexico, are sent out of the country, mostly north of the border. They are owned by foreign parent companies, predominantly from the United States.

The maquiladora program began in the 1960s and was typified by relatively low-technology assembly plants. The workforce was made up in large part by displaced farm workers. In the 1990s, however, the magnitude of this sector of the Mexican economy greatly increased, and today includes the assembly of more advanced finished products and services. As this industrial sector has matured, the workers are more experienced in this type of work than was the

previous generation. In general, although the maquiladoras do use hazardous materials and generate hazardous waste, they do not require large amounts of water for industrial processes. Of course, they must provide sanitary facilities for their employees and may also operate food services, such as cafeterias, that use water.

Attracting workers to the maquiladora factories has brought the pressures of rapid urbanization, such as inadequate housing, infrastructure, sanitation, and other public services to border cities. The Mexican Comisión Nacional del Agua has been playing catch-up, trying to supply all the neighborhoods springing up around the border cities with adequate potable water. Next on the list is adequate wastewater collection, and then wastewater treatment. But the movement of workers and their families to the border does not wait for sufficient infrastructure, and, as a result, the border cities face chronic shortages of water supplies and sanitary services. This domestic sewage flow combines with commercial and non-maquiladora local industrial flow to create the perennial wastewater streams, where only intermittent flows were found before. As Mexico progresses towards providing all households with potable water, per capita use demand will most certainly increase, further exacerbating competition for water for other resources.

Although maquiladoras and urban growth represent more recent demands for water, agriculture was the first major user of available water, primarily in the Colorado River riparian zones and the great Mexicali-Imperial Valley in Baja California and California. Diversions of Colorado River water, through aqueducts and canals, were put in place by the end of the last century. By the middle of this century, dams to hold water in huge reservoirs were in place throughout the system, taming the wild Colorado to provide water for hugely successful agricultural efforts and burgeoning desert cities in Arizona, California and Mexico. Agriculture uses the majority of the available water, returning a portion as drain water back to the river, where it is re-used by downstream users until the last dam, Morelos, in Mexico. Users in Mexico and Arizona return some flow to the vast delta of the Lower Colorado River through meandering sloughs, recreating some of the wetlands that once were the dominant feature of the region.

The Problems of Pollution and Degraded Water Quality

The most obvious pollution to surface water comes from untreated and uncontrolled point sources: black to gray murky water, strongly smelling of biological decomposition, perhaps containing unsightly floatables, spewing out of a pipe into a larger body of water, like a stream, river or the ocean. This pollution, which can include pathogenic organisms, nutrients, industrial chemicals containing heavy metals and organic compounds, causes changes to the physical properties of the water into which it flows, making it unsuitable for use by humans and other organisms. Point source pollution exists in cities and communities along the border, in the Tijuana Estuary, the Pacific Ocean, in the New River in Mexicali as well as the Santa Cruz in Nogales. But this type of pollution can be controlled and reduced with appropriate collection and treatment systems, and with pollution prevention and industrial pretreatment programs.

Agricultural drainage, a non-point source of pollution, in fact adds the most pollution to surface water throughout the border. Nutrients, organic chemicals (pesticides and herbicides) and silt are the pollutants common to agricultural drainage systems. But in the desert, the irrigation water picks up salts from the soil and carries them to the receiving water body. Without the benefit of dilution from rain, especially during the dry season, salts are concentrated as drain water makes up an increasing percent of the flow, and downstream users may not be able to use the salty water without harming their crops and soils. In the 1970s, Mexico and the U.S. entered into agreements to limit the increased salinity of the 1.5 million acre-feet of Colorado River water allocated to Mexico by a treaty signed in 1944.

Pollution to ground water is not so obvious. Dissolved substances can move quickly through sandy soils or into an unprotected well down to an aquifer, despoiling that source of precious water for years to come, if not forever. The widespread use of toxic compounds in daily household and business activities under such conditions can compromise a water source for all who share the groundwater aquifer. On-site septic systems can also be sources of nutrient contamination of ground water in the desert.

Problem of Over-Appropriation

The Colorado River, draining some 244,000 square miles, flows through seven western U.S. states, including the Upper Basin States (Wyoming, Colorado, New Mexico and Utah) and the Lower Basin States (Nevada, Arizona, California), and two Mexican states (Sonora and Baja California). The Colorado is, in the words of author Philip Fradkin, "the most used...the most highly litigated and politicized river in the country." The river's water was apportioned out to the Upper and Lower Basin states in the 1922 Colorado River Compact based on estimates of an average flow of 16.8 million acre-feet. More recent estimates put the average at anywhere from 13.5 to 15 million acre-feet. This disparity has not been a problem as long as the Upper Basin States have not taken their full allocations. But California's practice of taking more than its allocated 4.4 million acre-feet is bringing the specter of chronic water shortage in the West ever closer, as Nevada and Arizona begin to use their full allotments to meet the demands of dramatically increasing populations in those states. In addition, Colorado River Indian Tribes' rights to Arizona's allocation have recently been established by the courts, and the Tribes will now be included in all discussions of river water uses. The only surface water source for this entire area, then, is historically over-allocated, certainly insufficient to meet the demands of increasing human populations and industrial and agricultural activity north and south of the border.

The complicated hydrology of ground water aquifers makes estimating the available water resource more difficult. The pumping of wells drawing from the aquifer lowers the water table and causes land subsidence. The effects of overuse of this resource, however, may be even more far reaching. The drawing down of aquifer that feeds the San Pedro River, flowing from Sonora to Arizona, has reduced the base flow, threatening to dry up the riparian habitat that is used by birds and other wildlife in the San Pedro River Natural Resources Conservation Area (NRCA).

In the ironic turnabout that happens so often when a resource is scarce, the much-applauded effort of the Imperial Irrigation District in California to reduce its water use by lining the All-American

Canal that brings Colorado River water to the Imperial Valley is now seen as a potential problem for farmers in the contiguous Mexicali Valley, who depend on the seepage from the Canal to replenish their wells.

Wastewater Treatment (Works-In-Progress)

In 1983, Presidents Reagan and De La Madrid signed "The Agreement Between the United States and Mexico for the Protection and Improvement of the Environment in the Border Area," known as the La Paz Agreement. This recognition of the degraded environmental conditions along the border made possible the development of binationally funded projects. The first of these was planning and construction of the International Wastewater Treatment Plant in the Tijuana-San Diego area. The U.S.-Mexico International Boundary and Water Commission (IBWC), working with EPA, planned and built the IWTP and Ocean Outfall, as a first step in meeting Tijuana's pressing need for wastewater treatment. The IWTP is now complete and operating, bringing great relief to both U.S. and Mexican interests. The project is planning for an expanded second phase. Other wastewater collection and treatment system projects for Tijuana are also being contemplated for the near future.

The environmental side agreements of the North American Free Trade Agreement (NAFTA) set forth the need for infrastructure improvement in cities along the border and created institutions and other funding mechanisms through which such projects might be planned, reviewed and constructed. Both existing and new border institutions have been involved in the several stages of project development in Mexicali. One component of the Mexicali project is the construction of a new wastewater treatment plant south of the city. Although at this stage, there are no plans for re-use of the treated water other than to send it into the New River north to the Imperial Valley, Mexico has stated its interest in re-claiming the water at a future date, either for re-use in agriculture or to send it south to the Rio Hardy wetlands, a remnant of the Lower Colorado River Delta.

A project in Ambos Nogales is in the planning stage. Numerous elements, including the geography of the area, the need for groundwater recharge, and unaccommodating watershed features make this a most challenging project.

The fourteen Indian Tribes living within the border region have also received support for wastewater projects, including $22 million of the border infrastructure appropriation set aside in 1997. By the end of fiscal year 1999, more than $12 million dollars in funding will have been committed to 11 wastewater projects and 23 water supply projects on Tribal lands.

Small communities along the Sonora-Arizona and Baja California-California border are taking advantage of available infrastructure and Institutional Development Program (IDP) funds to evaluate all aspects of their systems, from conducting rate studies, updating user bases, and developing management systems, performing water line and sewer surveys to engineering studies. To date, 17 such projects have been certified.

Water Supply (Works-In-Progress)

Ground water is the preferred source of water for individual home use, and aquifers throughout the border region are being tapped to supply this need. The aquifers are not generally overly abundant, and recharge potential from adjacent water bodies has been diminishing as modifications have been made to those systems. With the increased rate of population growth at the border, and the higher rate of household connections to potable water, however, demand has begun to exceed supply. For example, the city of Tijuana, having overdrawn its small aquifer, must now import 95 per cent of its water from the Colorado River, a more costly supply of lower quality. Other areas with concerns about ground water supply include the Mexicali Valley and the San Pedro River watershed.

Where there is sufficient water, at least to meet the present level of demand, there may not be adequate infrastructure to bring that

water to potential users. The cities of Mexicali, Tecate, and Nogales, as well as and smaller communities on both sides of the border, are developing projects to improve treatment and supply systems. In the case of Mexicali, the government is working with private investors from Japan to develop a financial package that includes giving credits for wastewater system improvements. In other words, planning for the system is integrating the entire water delivery-use-treatment process, rather than considering the components in isolation.

In addition to wastewater projects, the Tribes have received support for 23 water supply projects.

Potential For Water Reclamation

It would seem that reclamation of wastewater for re-use should be at the top of any desert area water manager's list of priorities. In the United States, however, reclamation has been slow to catch on, hampered by the added cost of tertiary treatment, the perception that such water is still somehow tainted, and, ironically, by the fact that there is still enough relatively cheap "unused" water. Even on the Mexican side of the border, where pilot reclamation projects have been developed and a Border Environment Cooperation Commission (BECC)-supported wetlands project is in the development phase in the Mexicali region, the move to re-use water is not yet widespread. Indications that this may be changing come from the results of a successful wastewater wetlands farming project in Naco, Sonora, and from the support for a proposal, known as the Bajagua project, in the Tijuana Valley to treat and re-use IWTP water.

A note of caution must be added here, however. Where unreclaimed wastewater had historically been returned to its source, such as the Colorado or other public water body, it provided some environmental benefits to the in-stream flow and associated riparian and wetland habitats. With reclamation projects using water several times instead of returning it, water quality and quantity problems may be exacerbated for downstream users and reduce the environ-

mental benefits. In particular, areas within the former Lower Colorado River delta wetlands have come back to life because they receive unreclaimed agricultural drain water. The Ciénaga de Santa Clara receives drainwater from the Yuma, Arizona area through the Wellton-Mohawk Canal, and this same type of water from Mexicali farms replenishes the Rio Hardy wetlands. In the case of the Ciénaga, potential reclamation projects would decrease the amount of such water sent to this now flourishing wetland area.

Water and Sustainable Development—Living Within a Tight Water Budget

The idea that there are limits to the resources we can use to improve our lot, is now widely accepted. For those who live on the border, in the hottest driest region of the U.S. and Mexico, the limits must be faced every day. A long, hot summer, seasonally changing wind patterns, summer storms that bring flash floods, astonishing and unstable geographical formations and finally, the composition of the soil define this fascinating and rugged area.

The long growing season and deep alluvium has been used to good benefit by the farmers in the Imperial-Mexicali Valley and along the Colorado and Gila River riparian zones. Until recently, California desert agriculture and cities have been able to use more than their allotment of Colorado River water, thus, the availability of water in the desert has not been a problem on the U.S. side.

Other human endeavors, on the other hand, have flourished in spite of the physical difficulties, supported instead by human political, economic and social structures. The maquiladoras came to the border in response to a policy decision by the Mexican government. Their continued success has come in the midst of facts of life for border residents such as a lower quality water supply, lower per capita availability and use of water, and chronic shortfalls in public services. But reports extolling the economic boom in the free trade milieu keeps companies coming to the border.

It would be inspiring if some changes in the ways in which growth is being accommodated at the border could be brought about before the resource limits of the region are reached. What would those changes be? In the following pages, we review the uses of water and suggest ways in which the economic sector might become more efficient and the social environment improved, while leaving resources sufficient to rehabilitate the natural environment.

Industry

Although maquiladoras, particularly those in the dominant industries, i.e., electronics, textiles and automotive equipment, may not use much water in their processes, there are still uses associated with any facility that brings many people together for hours at a time. Efficient, water-conserving sanitary installations should be standard, and the plant itself should be designed and built of materials to reduce inefficient use of public utilities, such as electricity and telecommunications. The local climate should be factored into all plant management plans, so that maximum production time does not coincide with the hottest seasons or the hottest times of the day. Environmental Management System principles should be adopted as the industries' standards. Mexico has initiated an "Industria Limpia" (Clean Industry) program, inviting manufacturers to comply voluntarily with environmental regulations. Integration of the International Standard Organization's (ISO) 14000 environmental management standards could also be introduced into this program.

At the same time, the cost of living in a healthy condition is much higher at the border. Some effort should be made to narrow the gap between the prevailing wages and what it takes to have a good quality of life on the border. Financially stressed workers do not form a stable workforce, and their use of inadequate infrastructure may actually increase the rate at which natural resources are used.

Any directive to incorporate Environmental Management System principles into the maquiladora industries' design and operation should apply equally to local businesses. Local manufacturers and commercial establishments need to examine their use of the

resource as well. They should incorporate pre-treatment components into their processes, and work to reduce or eliminate the direct discharge of untreated wastewater into open drains in border cities. The benefits accrued from an increased output/input ratio, lower costs in dealing with manufacturing waste, and overall lower operation costs should compensate for the time and money spent reviewing, planning and implementing these improvements.

Public Services

For municipalities facing the formidable task of meeting infrastructure needs at the border, daily operation is constantly in crisis mode. With both nations committed to underwriting infrastructure projects, managers can afford to develop long-term plans, allowing for more rational use of scarce resources. When projects are brought to the BECC for certification, they must incorporate principles of sustainable development. That translates into assurances that public utilities are financially able to support not only basic operation and maintenance of their water and wastewater systems but also the new infrastructure. This will ensure that the project will function as designed. Other elements that indicate a sustainable project is one that uses appropriate technology, includes on-going training for staff, incorporates pre-treatment programs, and encourages building for longevity.

In the case of increasing urban populations, there is little need to debate whether to upgrade water delivery and wastewater collection systems. In areas where populations are dispersed, however, it may make more sense to review an application for incorporation into a larger system. The cost of building permanent infrastructure in such places may never be affordable, and modern mobile water delivery coupled with on-site treatment may address public health needs more efficiently and more quickly.

Urban planning

For all users of water in urban and suburban border communities, the principle of living within the limits of the local supply should guide all development. All building should be required to employ all reasonable water conservation measures. Water pricing should favor

low users, native xeriphytic landscaping should be encouraged, and gray water re-use should be built in wherever possible.

Plans for new construction, especially where multiple dwellings are contemplated, should also be required to incorporate principles of sustainability. Buildings should be designed to be insulated against heat, using non-electrical interior cooling features wherever possible. Energy- and heat-efficient appliances should be readily available. Developers should be encouraged to fill in urban areas, rather than building where resources and services are scarce or non-existent.

With its abundance of solar and geothermal energy, the border region seems to be a natural place to develop alternative, low-impact electrical power sources. A large geothermal plant is now operating in the Mexicali Valley; other installations in the Imperial Valley face closure when U.S. program subsidies expire within the next few years. Tapping these resources for power offers the region alternatives to hydroelectric power that now comes from Colorado River dams. In addition, power sales to coastal cities would broaden the border's economic base.

Agriculture

Agriculture has been the economic mainstay in large areas of the border for almost a century. The importance of this sector has been underscored by national policies to support farming in this region by providing subsidized water and postponing the development of programs to reduce impacts of agricultural drainage on public water quality. When there were few people living along the border, the cumulative degradation of the unique public water bodies did not generate consistent public attention. The maquiladora industry in Mexico, bringing many people to the area, has highlighted regional water quality and quantity issues. The historic priority water use that agriculture has enjoyed is coming under scrutiny as other users demand more access to the resource.

Local irrigation districts are being encouraged to conserve water, but desert agriculture must always have enough to remove salt from the

root zone of the crops. The log-term issue of increasing salinity of agricultural drain water returned to the Colorado has been, and continues to be, a subject of discussion between Mexico and the U.S. and internally, within and between the Lower Basin states. As cities have grown, however, urban sources of water pollution have become an issue along the border.

The fact remains, however, that the overwhelming source of water pollution in the Imperial-Mexicali Valley agricultural-urban interface is agriculture. Nutrients, herbicides and pesticides, and sediment are the major contaminants. Can the problem of agricultural non-point source contamination be addressed by employing principles of sustainability?

Incorporation of source reduction and pollution prevention measures can be as effective for farm non-point source management as they have been for industrial point sources. For example, integrated pest management, using natural predators to control pest species, has been shown to reduce those populations more effectively than pesticides. The delivery of nutrients to each plant with drip irrigation systems can reduce the amount of chemicals needed to enhance growth. To reduce the volume of irrigation water, which carries sediment, an obvious strategy is to plant crops that require less water. Catchment basins are being put in at the end of fields, and created wetlands may also work to capture sediment loads. An economic evaluation of the marketability of salt-tolerant crops would be valuable, as it might help to reduce the need for water to flush fields of salt. Another source of interesting ideas for alternative agricultural management might be found in the work of Bill Mollison and other permaculture farming researchers.

Natural Resources

Finally, there are the natural resources of the region: local endemic species, as well as migratory species, of humans, plants and animals so critical to the integrity of the unique bioregion that is the border, and whose need for water of good quality must be also accommodated. There is a common misperception that this arid region is a "wasteland," and that modern agricultural methods have made it productive. In fact, this region supports life at all levels, creatures

from all the biological phyla, that were -- and are -- adapted to the natural processes and cycles characteristic of the region. With the large-scale hydrologic changes made during the 20th century, habitats have shrunk, invasive species have become dominant, and resident and migratory species are less able to complete their life cycles successfully.

Can we make the case for the support of these esoteric border resources within the context of sustainability? The ecosystem of the border, now living on a sharply reduced water budget, manages to survive. From desert pupfish in the shallows of the Salton Sea to the few Cocopah Indians living traditionally in the Lower Colorado River Delta, to the vaquita, a small dolphin which inhabits the Gulf of California, the area continues to display its potential to support biodiversity. In a region used to making the most of a relatively meager natural allotment of resources, it may not require much water to take the ecosystem out of the danger-of-extinction zone. That research needs to be done, but we have hints as to the region's resilience in the Ciénaga of Santa Clara, an agricultural drainwater-fed wetlands in the Lower Colorado River delta. Wetland plants thrive, invertebrates and fish are numerous, and biologists and ecotourists regularly visit to study and enjoy the restored habitat.

We must evaluate the economics of supporting the ecosystem by returning to it some volume of precious water. Increasing wetlands and riparian habitat would be found by migratory birds, now squeezed into small, usually contaminated, resting places along the much-reduced Pacific Flyway. Birds bring bird watchers, and bird watching is one of American's fastest growing recreational pastimes. Other types of low-impact recreational opportunities, such as non-motor water travel (i.e., kayaking), camping, fishing and hunting could be developed.

Environmental restoration or rehabilitation is an unexplored area of economic opportunity. The tremendous task of removing invasive stands of tamarisk trees along riparian zones could be tackled using volunteers, including concerned citizens and students at all levels. But people could also be paid to do this work, which could be suc-

cessful if sufficient person power were brought to bear. The need for agricultural workers is highly variable; the Imperial Valley, for example, suffers high unemployment during a substantial portion of the year. These workers would learn valuable, translatable skills working with researchers on large-scale, long-term restoration projects. Other educational opportunities could be coupled with these projects.

Conclusion

By definition, a desert is an area with little or scarce water. The U.S.-Mexico border is a desert region, but development in the area during the 20th century has proceeded as if this were not the case. While U.S. agriculture has been able to flourish with substantial support, the desert ecosystem has been greatly diminished and degraded by hydrologic modifications that have brought water to farm fields. With the growth of urban centers in Mexico, municipal water requirements have increased exponentially. Unable to keep up with the demand for infrastructure, public health is threatened by inadequate water supplies and untreated or partially treated wastewater. Agriculture and growing urban centers will not be able to flourish at the border unless an effort is made to review all uses. The development and implementation of a long-term sustainable regional plan must include the ecosystem's need for water. Finally, it should promote projects that are specific and appropriate to the region.

The U.S.-Mexico Border Region: Population Trends and Projections

James Peach and James Williams[1]

Rapid population growth in the large urban areas along the U.S.-Mexico border affects and exacerbates all of the issues being addressed at this conference. This is particularly the case with environmental and economic development issues, but it is not much of an exaggeration to suggest that there would be little interest in the U.S.-Mexico border area if the region's population was declining rapidly rather than growing rapidly. The purpose of this paper is to present a brief summary of border region demographic trends and projections.

The National Context:

Between 1900 and 1995 the U.S. population grew from about 75 million to about 260 million persons or by roughly three and a half times. At the same time, Mexico's population increased six-fold from about 15 million to 91 million persons.[2] With little inflow of migrants, it is obvious that birth rates have been much higher in Mexico during this century than they have been in the U.S. While not widely known in the U.S., demographers have keenly followed rapid reductions in Mexican birth rates after 1970, and while still higher than U.S. birth rates the differential has narrowed remarkably.

The highest U.S. population growth rates in the 20th Century occurred during the pre-depression era and the baby boom era. In

contrast, Mexican population growth rates increased each decade from the 1920s to the 1970s, following the staggering absolute loss of population which Mexico experienced during the revolution (1910 to 1920).

The Border States:

The four U.S. border states (California, Arizona, New Mexico, and Texas) had a combined population in 1995 of 56.2 million persons, which was nearly four times larger than the 15.2 million persons in the six Mexican border states (Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon and Tamaulipas). Border state population growth rates for both the U.S. and Mexican sides of the border have varied considerably from state to state and from decade to decade, but have generally been higher than national growth rates, especially since WWII.

In 1900 only one U.S. resident in 18 lived in a border state. By 1995 about one in five U.S. residents lived in border states, and that figure may reach one in four early in the next century. The figures are similar, though somewhat less dramatic for Mexico, with one Mexican in ten living in a border state in 1900 and one in six by 1995. The presence of the border has less to do with these changes for the U.S. than for Mexico. In the U.S. much of the growth in border states in the past few decades has been associated with "sunbelt" growth both in terms of population and employment. Much of the U.S. border state population lives in cities well away from the border. In Mexico, on the other hand, the border has been the reason for much of the growth as Mexican policies have encouraged, for various reasons over the years, development of population and employment along the northern "frontier."

Border Counties and Municipios

There is no consensus on a definition of the geographic area to be called "the border" region. We concentrate on 25 U.S. counties and

38 Mexican municipios (roughly county equivalents) that are geographically adjacent to the U.S.-Mexico border (see Tables 1 and 2).

Tables 1 and 2 provide totals and percent changes in population of the border counties and municipios for 1980, 1990 and 1995. By 1995, almost 10.6 million persons lived adjacent to the U.S.-Mexico border with about 5.8 million on the U.S. side and slightly less than 4.8 million on the Mexican side. In 1980 there were about 7 million persons adjacent to the border and 4 million of these were on the U.S. side. San Diego County dominates the population total for the U.S. side of the border with 2.6 million persons and combined with Imperial County, California contains almost half of the U.S. border population. Juárez, adjacent to El Paso, Texas, continues to be the largest Mexican municipio along the border, although by 1995 Tijuana (with just less than a million persons) was only barely smaller than Juárez (with slighter over a million persons) according to the Mexican mid-decade census.

On the Mexican side there has been a pronounced acceleration in population growth since the 1980s: border municipios overall went from 3.1 percent average annual growth in the 1980s to 4.5 percent average annual growth in the 1990s, and the acceleration is apparent in every Mexican state. But, there is considerable variation across municipios.

On the U.S. side of the border a somewhat different picture emerges. Population growth slowed overall from 3 percent annually in the 1980s to about 2.4 percent in the 1990s. But, as on the Mexican side of the border, the variability of growth rates along the border is remarkable. In California, for example, migration slowed dramatically to San Diego County, reflecting difficult economic times for the city. Conversely, Imperial County, adjacent to San Diego, showed dramatic acceleration in population growth. Arizona and New Mexico growth rates were relatively stable while population growth in Texas border counties accelerated during this time.

The Importance of Age Structure

The age structure of a population at least partially determines future population growth potential, the size of the labor force, per capita income patterns, the demand for educational facilities, medical services and much more. In both the United States counties and in the Mexican municipios along the border, the most rapid increases in population in the early 1990s were for birth to 4 years of age. In general, the border areas showed substantial births and probably notable inmigration of young children. At labor force ages, 15 to 64, there was a striking contrast between the U.S. and Mexican sides of the border. In Mexico the percentage change in labor force age population was more than double the U.S. figure.

The contrasting age distributions displayed in Figure 1 reveal that the municipios have considerably more demographic momentum than the U.S. counties. Demographic momentum is a phrase meaning capacity for future growth even if fertility rates and migration were at low levels. Examining Figure 1, it is apparent that there is a younger age distribution in Mexico than in the U.S. Today's young people will be tomorrow's parents of additional children. Put another way, the supply of "mothers" for the next few years has already been born and it is a simple matter to age them into the childbearing years. If the numbers of potential mothers increases at childbearing years, then births would increase in the future even if fertility rates were constant.

Historically, the municipios have shown strong natural increase, the excess of births over deaths, and levels of natural increase have traditionally been greater on the Mexican side than the U.S. side of the border. But, levels of natural increase on the U.S. side along the border, while generally lower than the Mexican side, have been higher than U.S. average. To this strong natural increase historically is added the fact of an age distribution, especially on the Mexican side of the border, which favors future natural increase.

Finally there is the migration factor. The border municipios have attracted migrants from elsewhere in Mexico adding to the overall

growth rate. On the U.S. side of the border the trends have been a bit different. U.S. border counties have in fact grown from migration, but that migration growth tends to be the result of immigration, not migration from elsewhere in the U.S. For example, 20,176 individuals migrated to San Diego from abroad in 1997, but 4,196 San Diegans on balance left the area and moved elsewhere in the United States. Similarly, El Paso gained 11,632 net immigrants in 1997, but lost almost 8,000 persons, net, to other U.S. destinations. This pattern is widespread on the U.S. side of the border. So, the U.S. border grows from natural increase and immigration, with immigration sufficient to more than offset the tendency for the border counties to lose population to other areas of the United States. Should the flow of immigration stop, growth rates would drop dramatically although natural increase would go on for some time. On the other hand, should a border area become a domestic migration magnet, like Las Vegas, Nevada, for example, growth rates would accelerate remarkably.

Projecting the Future Population on the Border

The projections that follow (Tables 3 and 4) are based on the "cohort-component method" and conditions in the 1990 to 1995 period. The method makes independent calculations for 36 age-sex groupings (five-year age-sex cohorts) for each county and municipio, and projects births, deaths, and migration (components) separately for each cohort. The projection periods available are at five year intervals. We have applied the same projection methodology on both sides of the border. This makes our projections unusual since many population projections could be found but we know of none applying consistent methods along both sides of the border.

We have prepared three alternative sets of projections. The sets share the same assumptions about natural increase components. Birth rates are held constant at 1990 to 1995 levels. Deaths rates trend downward slowly, consistent with available national forecasts. The sets differ in their migration assumptions. In the set which we call "HIGH" the migration rates that were experienced in the 1990 to 1995 period are allowed to continue in the future. Our "LOW" set is

in marked contrast to the high series as we wanted to document the growth potential of natural increase in the absence of any migration. Thus, the LOW series sets net migration to zero in all areas beginning immediately after 1995. Finally, we produced an intermediate result which is labeled "MEDIUM" and in which we reduce migration rates to 75 percent of the early 1990s levels for the 1995 to 2000 projection, and then we again reduce migration to 50 percent of the early 1990s rates for all projection cycles after the year 2000.

The HIGH projections imply a continuation of demographic patterns of the early 1990s, trends not unusual in the history of most of the border region, suggest tremendous population growth in the next 25 years. The border population would grow from about 10.6 million in 1995 to more than 24 million persons by 2020. On the Mexican side of the border the population would grow from 4.8 million to almost 13.5 million, with today's metropolitan areas becoming very large cities. On the U.S. side of the border, the HIGH projections imply significant population growth, but as a whole, the U.S. border counties would not even double in size. However, many of the Texas border counties would more than double in size by 2020 under this scenario.

Can this happen? One approach to this question is to consider the demographic issues. Migration patterns are truly a key concern. A slowdown in migration to border areas has two impacts. First, of course, the direct effect of migration is reduced. But, with a lot of migration to the border that includes women of childbearing ages and children, the migration patterns of the past have contributed to future births. So if migration declined there would be two impacts that would reduce growth rates. But, how might migration patterns change? On the Mexican side of the border, so long as the northern frontier is a major source of jobs and remains relatively wealthy in the eyes of Mexicans elsewhere in the country, then migration would likely continue.

We should note that Mexican national projections show slower population growth in the next century reflecting the late 20th century fertility decline. Some of the current migration from Mexico to its border with the U.S. is certainly a stepping stone for migration to the United States, legal or undocumented. On the one hand, should the United

States further control immigration, either legal or undocumented or both, then immigration levels would be reduced and immigration contributes substantially to U.S. border population growth. On the other hand, recall that border areas show outmigration to other areas of the U.S. We do not know if these are immigrants traveling on after a few years or longer term residents leaving. If these outmigrants to other parts of the country are indeed recent immigrants, then reduced immigration to the U.S. would probably reduce the outflow to other parts of the U.S. from border counties, dampening the impact of lessened immigration on the balance of growth.

Medium Series: Migration Trended in Half

Reducing migration rates by half diminishes projected population growth along the border through 2020 by about 4.5 million persons, with a new total along the border of about 19.5 million persons, up from 10.6 million in 1995. So, even a sweeping and substantial reduction in migration would not eliminate the growth prospects for the future as the border population would almost double in the next 25 years after 1995.

Low Series: Zero Migration from 1995 Onward

Under this draconian scenario all growth is produced from the balance of births and deaths yet the total border population would still grow by almost 5 million persons or about 50 percent by the year 2020. About 3.1 million of this growth will occur on the Mexican side of the border, reflecting its relatively greater demographic momentum. Along the entire border, only tiny Jeff Davis County in Texas would be projected to experience population decline from 2,067 persons to 2,021 persons between 1995 and 2020.

Summary and Implications

Evaluation of demographic and economic information on the U.S.-Mexico border is a matter of perspective. From the U.S. national

view, the U.S. side of the border, excepting San Diego especially, is a third world region with high unemployment, low wages, low educational levels, and relatively rapid population growth fueled by both birth rates and migration from across the border. From the perspective of U.S. border residents gazing across to the Mexican side, the view is of uncontrolled and unconstrained population growth and a host of serious infrastructure problems including water, sewer, roads, schools, hospitals, and environmental concerns. But, were one to look at the Mexican side of the border from the perspective of much of Mexico, it is a place of opportunity with booming employment growth and rapid urbanization, and adjacent to U.S. shopping and entertainment. No wonder Mexicans continue to move to the border, joining a population already growing thanks to relatively high birth rates. It is no wonder that some come to the U.S. as that is just a step forward in the chain of migration patterns, joining a culturally and ethnically similar land one political boundary away. This pattern might be stopped supposing the border could truly be closed, but the fact for planning is that these patterns have a long history now and there is no reason to expect some sudden change.

Projecting population is not all that difficult as a mathematical exercise, and evaluation of our projections is a matter of evaluating the assumptions. The border will grow in population even in the absence of migration, and certainly the resources and the environment will be strained further. Population growth of 50 percent along the border by 2020 is, short of war or natural disaster or some incredible unforseen change in patterns of birth and death, a certainty. Death rates are modern and birth rates are simply higher than the very low rates in the general U.S. population. Mexican birth rates have already dropped considerably, but scepticism about major further reductions is appropriate. The figure of 50 percent minimum additional persons requires one to imagine no further migration to the region, and certainly the post-1995 data available say that is not happening.

Should migration patterns maintain themselves for another 25 years, the impacts are nothing short of astounding. Imagine El

Paso (Texas) Ciudad Juárez (Chihuahua) and Las Cruces (New Mexico) as a single metropolitan center of almost 5 million persons. Local officials who have seen these projections respond simply that "there is not enough water," a problem that is of concern along many miles of the U.S. border with Mexico. But, shutting off the flow of people is not an easy task and most often local governments scramble to meet already unmet demand for services so it would seem prudent to plan for substantial population growth on the border, and attendant growing pains.

Even the LOW series projections raise a number of troubling questions. Where will the employment growth come from and will it continue to be at marginal wage levels? Where will water, sewer treatment, and much more come from, and particularly what will be the source of capital for major additions in the future? It remains to be seen whether these problems will be noted at the respective federal levels or left to states or local governments, with attendant expectations about their capacities to cope.

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Figure 1

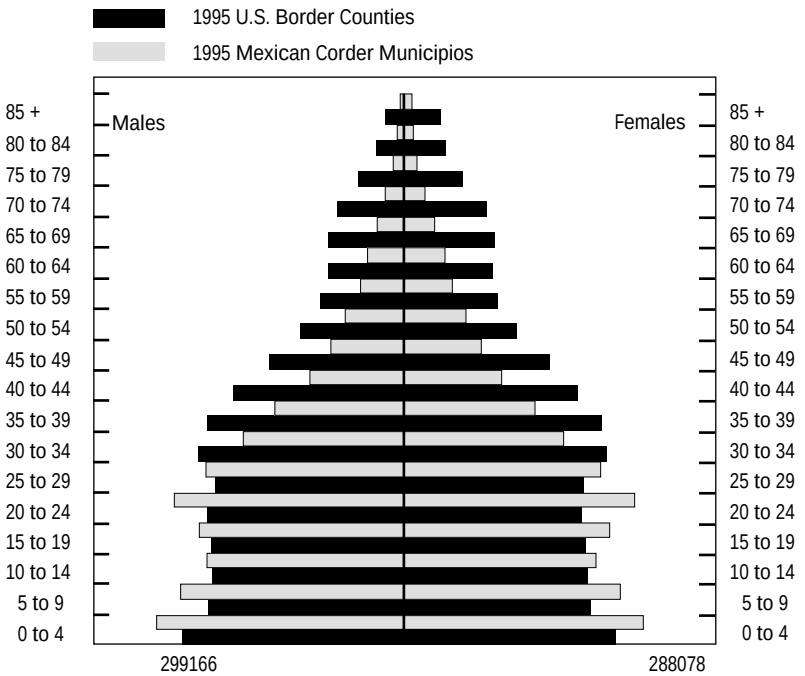

Table 1
U.S. Border Region Total Population

AREA	(Thousands of persons) 1980	1990	1995	Percent Change 1980-90	1990-2000*
San Diego	1,861.9	2,498.0	2,626.7	34.2	10.3
Imperial	92.1	109.3	141.1	18.7	58.1
California (Sub-total)	1,954.0	2,607.3	2,767.8	33.4	12.3
Yuma	90.6	120.7	136.1	33.3	25.4
Pima	531.4	666.9	755.3	25.5	26.5
Santa Cruz	20.5	29.7	36.4	45.1	45.1
Cochise	85.7	97.6	110.4	13.9	26.2
Arizona (Sub-total)	728.1	914.9	1,038.2	25.7	26.9
Hidalgo	6.1	6.0	6.3	-1.5	10.2
Luna	15.6	18.1	22.6	16.2	49.3
Dona Ana	96.3	135.5	160.0	40.7	36.1
New Mexico (Sub-total)	118.0	159.6	188.9	35.3	36.7
El Paso	479.9	591.6	678.6	23.3	29.4
Culberson	3.3	3.4	3.2	2.8	-10.3
Hudspeth	2.7	2.9	3.3	6.9	15.6
Jeff Davis	1.6	1.9	2.1	18.2	12.4
Presidio	5.2	6.6	7.8	27.9	35.2
Brewster	7.6	8.7	9.1	14.6	9.1
Terrell	1.6	1.4	1.3	-11.6	-13.6
Val Verde	35.9	38.7	42.5	7.8	19.4
Kinney	2.3	3.1	3.4	36.9	16.2
Maverick	31.4	36.4	45.2	15.9	48.6
Dimmitt	11.4	10.4	10.5	-8.2	1.3
Webb	99.3	133.2	172.4	34.2	58.8
Zapata	6.6	9.3	10.9	40.0	34.4
Starr	27.3	40.5	52.2	48.6	57.7
Hidalgo	283.2	383.5	482.5	35.4	51.6
Cameron	209.7	260.1	307.9	24.0	36.7
Texas (Sub-total)	1,209.0	1,532.0	1,832.7	26.7	39.3
Border Region Totals	4,009.1	5,213.8	5,827.4	30.0	23.5

Source: U.S. Department of Commerce, Bureau of the Census. 1983, 1993, and 1998.

*As implied by 1990 to 1995 percent change. In other words, this figure is simply twice the 1990 to 1995 percent change.

Table 2
Total Population in the Mexican Border Region

AREA	(Thousands of persons) 1980	1990	1995	Percent Change 1980-90	1990-2000*
Tijuana	461.3	747.4	991.6	62.0	65.4
Tecate	30.5	51.6	62.5	68.8	42.6
Mexicali	510.7	601.9	696.0	17.9	31.3
Baja California (Sub-Total)	1,002.5	1,400.9	1,750.2	39.7	49.9
San Luis Rio Colorado	92.8	110.5	133.1	19.1	40.9
Puerto Penasco-Pl. Calles	26.8	36.4	37.5	35.9	6.3
Caborca	50.5	59.2	64.5	17.3	18.1
Altar	6.0	6.5	7.1	7.1	20.5
Saric	2.2	2.1	2.3	-6.3	14.8
Nogales	68.1	107.9	133.5	58.6	47.3
Santa Cruz	1.6	1.5	1.4	-7.2	-9.9
Cananea	25.3	26.9	29.3	6.4	17.3
Naco	4.4	4.6	4.9	4.5	11.1
Agua Prieta	34.4	39.1	56.2	13.8	87.5
Sonora (SubTotal)	312.1	394.7	469.8	26.5	38.0
Janos	8.9	10.9	10.8	22.4	-9.4
Asension	12.0	16.4	19.6	36.5	40.2
Juarez	567.4	798.5	1,011.8	40.7	53.4
Guadalupe	7.8	8.4	8.9	8.6	11.9
Praxedis G Guerrero	8.9	9.1	9.6	2.0	11.6
Ojinaga	26.4	23.9	23.5	-9.5	-3.3
Manuel Benavides	4.2	2.8	2.3	-32.9	-33.6
Chihuahua (Sub-Total)	635.5	870.0	1,086.6	36.9	49.8
Ocampo	9.0	7.9	7.5	-12.7	-9.4
Acuna	41.9	56.3	81.5	34.3	89.4
Jimenez	8.6	8.3	9.3	-4.4	24.9
Piedras Negras	80.3	98.2	116.1	22.3	36.6
Nava	8.7	16.9	20.4	94.8	41.7
Guerrero	2.3	2.4	2.1	2.5	-20.1
Hidalgo	0.8	1.2	1.3	62.5	8.0
Coahuila (Sub-Total)	151.6	191.1	238.3	26.1	49.3
Anahuac	16.5	17.3	18.3	5.1	11.1
Nuevo Leon (Sub-Total)	16.5	17.3	18.3	5.1	11.1
Nuevo Laredo	203.3	219.5	275.1	8.0	50.7
Guerrero	4.2	4.5	4.0	7.6	-23.9
Mier	6.4	6.2	6.2	-2.2	-0.1

Miguel Aleman	19.6	21.3	22.4	8.8	9.8
Camargo	16.0	15.0	15.3	-6.1	3.0
Gustavo Diaz Ordaz	17.8	17.7	15.6	-0.7	-23.4
Reynosa	211.4	282.7	337.1	33.7	38.5
Rio Bravo	83.5	94.0	100.4	12.6	13.5
Valle Hermoso	48.3	51.3	55.3	6.1	15.5
Matamoros	238.8	303.3	363.5	27.0	39.7
Tamaulipas (Sub-total)	849.4	1,015.5	1,194.7	19.6	35.3
Border Region Total	2,967.5	3,889.5	4,757.8	31.1	44.6

Source: INEGI 1998. * Same as Table 1.

Table 3

Population Projections: U.S. Border Region

AREA	Estimate 1995	LOW 2020	MEDIUM 2020	HIGH 2020
San Diego	2,626.7	3,191.2	3,294.8	3,397.2
Imperial	141.1	193.3	327.8	491.8
Calif. (Subtotal)	2,767.8	3,384.5	3,622.6	3,398.0
Yuma-La Paz	136.1	167.9	208.3	248.9
Pima	755.3	842.7	1,100.4	1,354.6
Santa Cruz	36.4	48.7	71.8	96.3
Cochise	110.4	126.5	162.4	198.1
Arizona (Subtotal)	1,038.2	1,185.9	1,542.9	1,897.9
Hidalgo, NM	6.3	7.7	7.6	7.5
Luna	22.6	24.9	43.0	66.6
Dona Ana	160.0	203.0	277.7	351.7
New Mex (Subtotal)	188.9	235.6	328.3	425.8
El Paso	678.6	906.3	1,103.1	1,287.2
Culberson	3.2	4.4	3.1	2.3
Hudspeth	3.3	4.1	4.4	4.6
Jeff Davis	2.1	2.0	2.4	2.7
Presidio	7.8	9.6	13.1	16.7
Brewster	9.1	9.8	10.7	11.0
Terrell	1.3	1.5	1.2	0.9
Val Verde	42.5	56.9	61.2	65.0
Kinney	3.4	3.6	4.4	5.2
Maverick	45.2	64.7	94.5	126.0
Dimmit	10.5	14.1	11.9	10.3
Webb	172.4	253.5	407.1	583.7
Zapata	10.9	15.2	19.2	23.5

Starr	52.2	78.0	122.7	173.3
Hidalgo, TX	482.5	684.0	1,050.2	1,457.5
Cameron	307.9	420.1	554.3	688.8
Texas (Subtotal)	1,832.7	2,527.8	3,463.3	4,458.7
Border Totals	5,827.4	7,333.8	8,957.1	10,671.3

Source: U.S. Department of Commerce, Bureau of the Census (1993 and 1998) and author calculations.

Note: Components may not add to totals due to rounding.

Table 4

Low Case Population Projections: Mexican Border

Area	Census 1995	LOW 2020	MEDIUM 2020	HIGH 2020
Tijuana	991.6	1,671,328	2,676.7	3,822.1
Tecate	62.5	107,606	134.3	159.5
Mexicali	696.0	1,088,659	1,233.0	1,362.0
Baja Ca. (Subtotal)	1,750.2	2,867,593	4,044.0	5,343.6
San Luis Rio Colo	133.1	220,955	272.4	321.7
Puerto Penasco-Pl C.	37.5	60,790	49.9	42.4
Caborca	64.5	104,417	100.8	98.1
Altar	7.1	11,673	11.5	11.4
Saric	2.3	3,954	3.6	3.3
Nogales	133.5	235,480	299.6	362.2
Santa Cruz	1.4	2,462	1.6	1.2
Cananea	29.3	45,029	44.0	43.1
Naco	4.9	8,648	7.1	6.1
Agua Prieta	56.2	100,042	198.4	328.0
Sonora (Subtotal)	469.8	793,450	988.9	1,217.5
Janos	10.8	20,529	14.1	10.4
Ascension	19.6	35,004	42.3	49.1
Juarez	1,011.8	1,676,142	2,395.0	3,166.1
P. G. Guerrero	8.9	14,649	12.9	11.8
Guadalupe	9.6	16,055	14.0	12.5
Ojinaga	23.5	35,336	27.3	22.2
Manuel Benavides	2.3	3,497	1.7	0.9
Chihuahua (Subtotal)	1,086.6	1,801,212	2,507.3	3,272.9
Ocampo	7.5	14,184	9.4	6.5
Acuna	81.5	146,798	294.6	492.5
Jimenez	9.3	15,439	16.1	16.7
Piedras Negras	116.1	197,117	231.6	263.0
Nava	20.4	38,489	45.7	52.4

Guerrero (Coah)	2.1	3,107	2.0	1.3
Hidalgo	1.3	2,102	1.9	1.8
Coahuila (Subtotal)	238.3	417,236	601.2	834.1
Anahuac	18.3	29,328	26.6	24.6
Nuevo Leon (Subtotal)	18.3	29,328	26.6	24.6
Nuevo Laredo	275.1	450,103	633.8	828.2
Guerrero (Tam)	4.0	6,338	4.2	3.1
Mier	6.2	9,170	7.9	7.0
Miguel Aleman	22.4	35,976	31.5	28.2
Camargo	15.3	22,781	18.9	16.3
Gustavo Diaz Ordaz	15.6	22,602	13.3	8.3
Reynosa	337.1	535,293	658.4	774.1
Rio Bravo	100.4	162,750	147.2	135.9
Valle Hermoso	55.3	87,952	83.2	79.7
Matamoros	363.5	610,587	736.9	854.2
Tamaulipas(Subtotal)	1,194.7	1,943,552	2,335.3	2,735.0
Border Region Totals	4,757.8	7,852,368	10,503.2	13,427.8

Source: INEGI (1998) and author calculations.
Note: Components may not add to totals due to rounding.

Endnotes

1. James Peach is Professor of Economics and International Business at New Mexico State University. James Williams is Professor of Sociology at New Mexico State University. This paper is a condensed and revised version of a paper titled: "Population and Economic Dynamics on the U.S.-Mexico Border: Past, Present and Future" delivered to the U.S. EPA/SCERP Conference ("Roadmap to the Year 2000") in Rio Rico, Arizona in December 1998.

2. Historical population data are from census counts with the exception of 1995 U.S. figures that are from estimates produced by the Census Bureau. Sources are listed in the references section of the paper as either U.S. Department of Commerce, Bureau of the Census or the Instituto Nacional Estadística, Geografía y Informática (INEGI).

Land Use Planning

Luis Felipe Siqueiros

Ciudad Juárez keenly exemplifies cross-border migration and the tremendous growth of multinational private investment resulting in high job creation, the establishment of the maquiladora industries, and trade flows and traffic, mainly of freight.

Immigration accounts for 70% of population growth in the municipality of Ciudad Juárez, which has the third highest growth rate nationally, after Tijuana and Zapopan, and the fourth highest in absolute terms, trailing only Tijuana, Ecatepec, and Zapopan.

Ciudad Juárez houses and offers job opportunities to more than 30,000 people who come each year, constituting a socio-culturally diverse mosaic of immigrants from various parts of Mexico. Some 65.8% of the population is made up of persons under 30 years of age.

Another phenomenon typical of the border is the high percentage of GDP accounted for by Ciudad Juárez in relation to its population. Ciudad Juárez accounts for over 50% of the GDP and 32% of the population of the state of Chihuahua, and nationally 1.64% of GDP and 1.1% of the population. Over the years investment in the maquiladora industries has come to include 350 operating plants, which account for 15% of all plants in the country, and 28% of all jobs in these industries.

Dynamic job creation has held steady in the border region. The last quarter saw open unemployment of 0.6%, one of the lowest rates in the country.

The other extreme of this development entails the costs imposed by development, immigration, and the public sector's inability to respond to citizen demands for services and infrastructure. The following data reflect the serious imbalances between economic development and quality of life, and the serious social and environmental situation:

Ciudad Juárez is a city where:

- only 50% of the streets are paved;
- the sanitary drainage system is beset by serious shortcomings;
- population growth has been very high, with the population doubling every 20 years in the last 40 years;
- area occupied increased ten-fold from 1960 to 1980, and doubled again from 1980 to 1999, from 1,894 ha in 1960 to 10,514 ha in 1980, and then to 19,500 ha in 1999;
- 76% of the area has been set aside for growth, and 24% of the occupied area is constituted by unexploited idle lots;
- there is a deficit of 50,000 new housing units, and improvements are needed to attain the minimal conditions in terms of service and space in 50,000 already-existing units.

Ciudad Juárez is also a city that has:

- A deficit of over 80% of lands set aside as green areas, based on United Nations guidelines;
- 26.3 students per teacher, while the state average is 17.3, and the average for the city of Chihuahua is 18.2;
- a marked deficit in pre-college secondary schools (*preparatorias*) and unequal distribution of school facilities equipment;
- serious road congestion;
- one of the country's most chaotic and deficient transportation systems;
- a considerable lack of spaces for sports activities and healthy recreation;
- 10,000 families living in high-risk and unsuitable areas;

- current water sources that are depleted or drawn down considerably, in urgent need of alternatives to guarantee its development;
- serious air, water, and soil pollution problems;
- an infrastructure that lags several years behind many other cities;
- high levels of violence and insecurity.

Immigration and industrial investment have been the driving forces of the process of urbanization and occupation of the territory of Ciudad Juárez over the last 25 years. The city has grown extensively, and especially through squatter settlements; moreover, industry generates large poles of employment, which are not always appropriate or accompanied by urban planning. These two factors together make for an explosive demand for infrastructure and public services, which has outstripped the capacity of the local governments.

In this context of growth in private investment and employment, the fundamental problems are not being solved either by addressing unmet needs or by preparing ourselves for the future. Indeed, this scheme of development will lead us to a crisis situation in coming years if we don't change course.

a) Of special note is the economy's dependence on a single sector. 69% of formal-sector employment, according to Seguro Social records, is directly in the maquiladora industries. The services sector has accounted for a diminishing share of jobs over the years, making Ciudad Juárez a city focused on the secondary sector.

b) In addition, the city's competitive position is based mainly on the cost of labor in the international market. The value of the currency clearly reflects investment trends over the years. The graphs reflect the increases in investment in the maquiladoras, and in job creation in the wake of the devaluations, as well as the declining incomes, in real terms, as incomes increase in other countries.

c) The third element that stands out is the local content of the products in the maquiladora industries. It is estimated that only 2% of the value of the goods produced is accounted for by local components, which reflects a major shortcoming in human and technological resources.

d) Finally, we should note the turnover in employment. Low unemployment has led to a contraction in the labor supply, sparking intense turnover in employment, which is a major concern of the companies. Some consider the border region saturated, with constraints on labor supply, leading lower value-added industries to seek more competitive locations. The following table shows the location of the maquiladora industry in Mexico from 1966 to 1995, indicating a gradual decrease in the share of the border municipalities, in terms of labor and establishments, as a percentage of the entire maquiladora industry in Mexico. A recent study by the Universidad de Juárez shows the flip side of the turnover: it has achieved a level of skills formation that is an asset for attracting new industries. The constant factor since 1995, in the wake of the devaluation in Mexico, is that the border region has been highly dynamic, marking a change in the trends observed from 1966 to 1995.

e) The last element we highlight has to do with the productive structure of Ciudad Juárez, the linkages of suppliers, and the related services (advertising and sales, industrial developers and builders, legal procedures for export and import operations, warehouses, etc.). These aspects, together with the skilled labor and of course geographic location, make for a very rich industrial base, which ranges from the first coupon factories to 6T inputs and the new design centers.

Natural Resources

All along the Mexico-United States border we share natural resources. For example, the surface waters of the Rio Grande and the groundwater supplies, such as the Mesilla and Conejo/Médanos aquifers, and the El Hueco basin, which supply Ciudad Juárez and

El Paso. An example of overexploitation and irrational use, El Hueco already has a drawdown of 50 m, which is growing by 1.5 m each year. Both El Paso and Ciudad Juárez have overconsumption. El Paso consumes 656 liters inhabitant daily, while Juárez consumes 330 liters/inhabitant daily. The recent workshop on sustainable development in Ciudad Juárez indicates that current operations would be sufficient to supply Juárez for 10 more years if we had more rational levels of consumption (280 liters/inhabitant), even taking into account population increase. A water crisis is expected in the next 10 years if consumption is not reduced and if alternative sources of supply are not tapped.

In flat cities such as Ciudad Juárez, the lack of rainwater drainage systems or the impermeability of the existing ones further complicates the collection of water for the aquifers, and adequate surface channeling. Rainwater accumulates in the streets, causing floods, damaging the pavement, and adding to chaos on the roads. Occasionally, flooding also causes human and material losses, as it washes away housing situated in riverbeds and gullies.

In addition, the air quality of Ciudad Juárez-El Paso has been worsening year after year. El Paso is not in compliance with its environmental certification requirements due to excess suspended solids and carbon monoxide; Ciudad Juárez exceeded the environmental standard on 31 days in 1998. The innumerable registered and unregistered vehicles are the leading source of air pollution. Of the registered vehicles, 87% are more than 10 years old.

Environmental degradation is also visibly expressed in the Rio Grande; instead of constituting an element of integration, as in most cities worldwide, it is synonymous with division and hostility. When the Rio Grande was established as the border in 1847, as a result of the war between Mexico and the United States, what had always been an element of integration and productive development, along its north and south banks, became a barrier.

The same situation prevails with the ditches and channels that constitute the irrigation systems of the Rio Grande valley: the represent

degradation, filth, and waste, which is the opposite of the role water has traditionally played in the structure of cities.

Regional Mobility

Regional mobility is one of the crucial issues for the border. In the El Paso-Ciudad Juárez region the cross-border traffic of private commercial vehicles has grown 80% in the last 10 years, while the traffic of commercial vehicles increased by 300% in the same period. In 1998, approximately 16 million vehicles and 50 million people crossed the border south-to-north.

From the standpoint of sustainable development, the data is worrisome: pedestrian crossings diminish year by year (8.5 million in 1989, and 4.5 million in 1998), and mass transit services between the cities have gradually worsened. Today, there is only one tourism service, with a small number of passengers; there had been a streetcar service from the early years of the century and busses, which stopped running in the 1980s.

In general, the cross-border movement shows a significant increase in freight traffic, a moderate increase in crossings of non-commercial private vehicles, and a marked decrease in pedestrian crossings and the use of public transit services. The moderate increase in the crossings of private vehicles has to do with waiting time at the crossings, which has tended to impede the movement of persons across the border. It is thought that congestion on the bridges is the main obstacle to the international exchange of goods and people.

Railroad facilities also need to be modernized, and should run through less conflictive areas than is the case today in the Juárez-El Paso region, where it runs through the centers of both cities.

Land Use and Soil Uses

From the standpoint of land use, the helter-skelter nature of the growth is apparent. This applies to border cities on both sides.

Real estate pressures have provoked unnecessary growth of speculative lands, contributing to the horizontal expansion of the city, and consequently to mounting difficulties when it comes to providing services. Paradoxically, this has not helped drive down land costs, but has inflated the costs of large tracts of land in the wake of a minimal investment (e.g., building a new street or avenue).

The problem of urban sprawl is glaring in El Paso, not only due to the pattern of growth based on suburbs, but also due to the rise of subdivisions with no services and "neighborhoods" outside of the consolidated areas.

In Ciudad Juárez, since the late 1960s land invasions have been a much-used means of obtaining housing, making it necessary to engage in costly procedures to issue title, solving the need for housing only precariously, and responding to the needs for services to a limited extent, or very slowly, while benefiting the leaders or promoters, who engage in such practices for personal, political, or economic purposes. It is estimated that approximately 40% of the city has been occupied without title, by these processes, or through illegal subdivisions. Fortunately, a series of measures have reversed or halted this pernicious process, including patrolling the peripheral neighborhoods so as to prevent invasions of lots, and providing real alternatives for the residents through the direct participation of the municipality in the supply of lands to be inhabited (expropriation of Tierra Nueva). Nonetheless, the inertia of the clandestine practices persists: several dwellings continue to occupy land without title or and land tenure, dangerously tapping into the electrical grid, and without any water supply or piped drainage.

A city can improve its environment to the extent that it limits its size and makes its transportation arteries efficient. Along the border, long-standing practices maintain the divorce between urban planning and transportation planning. Indeed, many Mexican municipalities are not yet involved in regulating public urban transportation, which is under the state authorities, and continues to be disorderly and chaotic, shaped more by a political control strategy than by considerations of efficiency and entrepreneurial vision.

For the citizens and users, border transportation represents: low reliability, irregular service, low levels of comfort, scant security, high cost considering the service offered, high number of transfers, pollution, congested roads, potential for accidents, and a sense of chaos and deterioration.

The system is not good for most of the persons involved, and fails to meet the minimum requirements in all respects: planning, supervision, operation and maintenance, which is not financially balanced (expensive for the user and for the city, insufficient for the transportation operator), and it cannot be sustained in the medium term.

It has been shown that expenditures for improving public transit have an enormous impact in terms of cutting the social costs (man-hours, stress, etc.) and the environmental costs of urban development. Nonetheless, the investment outlays are only indirectly geared to public transportation (by building streets). There is no formal operation of integrated transportation systems.

Fundamental issues for the border region

The problems mentioned encompass the fundamental issues of the border region:

- Border economy
- Natural resources
- Regional mobility
- Land use and soil uses (growth patterns).

Directing urban development and land use (growth patterns, complementary facilities…)

- Social participation
- Information and coordination

The border will continue to attract migrants and offer opportunities that should some day bring its inhabitants economic prosperity, environmental protection, and community education and participation, with the cultural advantages and services of two countries.

The possible reorientation of the **border economy** in the coming years should enable us to adjust to the global changes and to maintain our competitiveness and growth, but somehow more local products and more skilled human resources need to be integrated into the economy. In addition, schemes for diversification should be sought.

The various levels of government in Mexico, mainly the federal and state governments, should further the process of decentralization, and subsidiary processes. In addition, a new fiscal order is needed in Mexico:

- Devise new models for collecting and distributing fiscal resources
- Strengthen local capacities to invest, finance, and offer fiscal incentives
- Review the federal, state, and municipal relationships
- Encourage formalization of economic activities
- Stimulate productivity
- Stimulate savings

As regards natural resources, there is an urgent need to develop systems for the collection, channeling, and recovery of rainwater drainage; to maintain cooperation for the treatment of waste waters, and step up the construction of such facilities; to resolve the water problems from a regional perspective; to restore the environment of the Rio Grande and all of its derivations (irrigation ditches and channels); and to implement a series of actions to improve the environment in connection with many issues of common interest in the border region: refuse, hazardous waste, tires, junk yards, oils, etc.

The assault on natural spaces—the mountains, valley, and desert—also needs to be addressed.

Giving impetus to mass transit systems, paving the streets, and controlling air emissions would help curtail degradation of the ozone layer, but attention is also needed for the shared problem involving the greatest road congestion, i.e. the border crossings.

Regional mobility requires a series of strategies marked by sustainability. It is essential to reverse the trend towards increased reliance on the automobile, which entails the social and environmental costs noted, and to promote in its place quality and attractive pedestrian routes, electric transportation systems, and urban bicycle routes. New border bridges should already be under analysis on both sides, along with intermodal freight stations and intermodal passenger stations. International mass transit systems should be developed and integrated in the short term. Expeditious service at the border crossings will continue to be key for cross-border relations.

From the standpoint of **urban development**, urgent strategies to be considered include the following:

- Rational and balanced growth of the region
- Sustainable development, the long-term vision, and linkages among the actions
- Avoid urban sprawl
- Re-direct growth patterns: build up, not out (seek urban densification)
- Urban quality of life, healthy environments, green spaces
- Schemes that allow us to solve the problems of services, infrastructure, housing, and public equipment

If we start from the finding that the current models of urban development have profound shortcomings that require structural changes, we need to propose a change or evolution of development in terms of sustainability for the use of the scarce natural, human, economic, and technological resources. We need future-oriented decisions.

Some sociologists propose dividing the infrastructure of a city or region into three types:

- **Physical Infrastructure,** which supports communication and transportation
- **Social Infrastructure,** i.e. organizations, institutions, laws
- **Ideational Cultural/Ideological Infrastructure,** i.e. of beliefs, values, cultural practices.

The last of these may be the dynamic force for constituting the other two. In few places does one feel so intensely the absence of social cohesion as in the border region. The constant arrival of new people whose community relations were left behind, the construction of housing which is often provisional, the overcrowding and difficult economic conditions all make for a society without a strong identity in which violence reaches alarming levels. The sense of rootedness and community may generate fundamental changes that become part of the very diversity so characteristic of the border, with the potential for strengthening community values or the urban culture. It is fundamental, for example, for the community to gain awareness of its dramatic situation, and of the costs and efforts required for a healthy and prosperous future. It is equally important to recognize and strengthen the identity of the border region.

Paternalistic and populist programs have not only failed to solve the problems of physical infrastructure, but have contributed to dismantling the infrastructure of ideas.

Citizen participation is essential, including on a binational basis. Efforts are already under way by institutions, groups, and associations that have displayed their commitment and achieved concrete results. It is important to keep the emphasis on local proposals and to expand joint cultural and educational work.

We need private participation and synergies: for growth and investment, and for business opportunities.

Finally, as regards border relations, we can work in the short term on coordination and information mechanisms. For example, we can generate joint information via the Internet, including promotion materials, statistics, and maps. In addition, the mechanisms of cooperation can be expanded and enhanced.

A Synthesis of Institutional Activities and Practices

Mark J. Spalding[1]

Abstract

There is a rich context and history to border environmental institutional activities and practices. This paper attempts to provide a synthesis of those institutions' activities and practices with a special focus on the new NAFTA environmental institutions. In addition to such a synthesis description, the paper provides some modest suggestions for institutional reforms related to the role these institutions might play in improving growth management in the border. The paper concludes with a broad discussion outline of the obstacles and opportunities that face border environmental institutions.

The environment, as Mexico's Ambassador Rosario Green recently said, is a "non-traditional issue in US-Mexico relations" and until the GATT Tuna/Dolphin case, the environment was certainly a non-traditional issue in trade relations more generally. To highlight this starting point that lead to the infusion of the environment into the NAFTA debate please realize that the US public started this new era with TV video images of dolphin struggling and drowning in tuna fishers' purse seine nets. Meanwhile, Mexico led off with the image of an imperialist, unilateral action by the US to protect a species of animal that was not yet endangered by demanding the alteration of a fishery that was outside its territorial jurisdiction.

There are many environmental problems to be addressed in US-Mexico Border zone: air, water, and land-based pollution; overconsumption of water and other natural resources; deforestation; loss of biodiversity; and the increasing trade and exploitation of endemic species. While some problems are localized, many are transboundary in nature. The main causes are interlinked with the growth of urban populations as well as the constant development of new industry and associated activities. For example, with the expansion of the maquiladora industry, there has been an increase in industrial waste as well as an increase in human waste from population growth in the area. Unfortunately, the border region has not yet focused on the proper management of its growth. The region needs integrated, rational land use planning coupled with incentives that will improve quality of life without resorting to the constant chase of absolute growth.

One answer was the NAFTA environmental institutions, or the institutionalization of these "non-traditional" relations. I will attempt to answer the following questions: What are these new institutions? What is the perception of their impact? What has been their influence toward change? And what does the future look like? However, before this discussion the paper provides a review of the context in which all the border environmental efforts take place.

Context and History of Border Environmental Institutional Efforts[2]

International Boundary and Water Commission (IBWC)

With antecedents in the 1889 International Boundary Commission, which was given some responsibilities regarding water in the 1930s, the IBWC (know as the Comisión Internacional de Limites y Aguas (CILA) in Mexico) was established by the 1944 Water Treaty. It is the principle binational agency with authority over territorial limits, water allocation, wastewater treatment, sanitation, and water quality. Its chief activity involves the planning, construction, and operation of several wastewater treatment plants on both sides of the border.

The institutional arrangement just described has been questioned by many border scholars and activists who criticize the IBWC for its inability to act as an independent border institution, and for the lack of transparency in its decision-making processes. The IBWC is infamous for being an old fashioned engineering driven institution that focuses on large, capital-intensive brick and mortar projects. The IBWC has also been criticized for being too slow, too bureaucratic and a top down, non-public oriented institution. To make matters worse, the IBWC's many proposals for border projects have frequently not been given funding in Washington or Mexico City. For example, despite the pressures on existing wastewater treatment systems from growing populations, the IBWC only added 15 or 16 new wastewater treatment facilities in the past 53 years (depending on how you count its Rio Grande management projects).

With regard to border environmental infrastructure, the IBWC has completed a number of projects in its over 50 year history. An examination of the total list of IBWC projects, however, reveals that only a few constitute real environmental infrastructure. If one eliminates from the list items such as bridges and the various flood control projects, there are not many truly environmental infrastructure projects. Obviously, IBWC cannot be blamed for this. It has other duties in its portfolio and has not always had its recommendations for infrastructure followed by the US or Mexican Congresses. In addition to water quality, and sewerage/sanitation, the IBWC portfolio includes non-environmental tasks such as boundary settlement and maintenance; water gauging, monitoring and apportionment; as well as water storage and flood control. Obviously some of these tasks may relate to the environment in direct and indirect ways.

Fortunately, the slow movement of the IBWC and its lack of focus on environmental infrastructure are changing. To show this, we list in the table below the two projects of the "quick fixes" program (Minute No. 294) worth $14 million. In addition, Minute No. 294 contemplates an additional five projects through the year 2001.

Table
IBWC/CILA Quick Fix Project Examples

Location	Project Type	Comment
Mexicali, Baja California	Water quality improvement for the New River	Completed December 1998 for $12.80 million
Nogales, Arizona and Nogales, Sonora	Water quality improvement for the Nogales Arroyo	Completed in early 1999 for $2.10 million

In the future, the IBWC/CILA will either take the lead, exercising its unused authority to lead; or it will move into a strong support role. Its support role might make use of its best qualities and resources, which include its engineering capabilities and role in crafting its form of binational agreements known as minutes. We can expect the IBWC/CILA to take a more active role in water resource management including regional water planning for surface and ground water. This might include leadership in promoting the negotiation of a ground water treaty.

In order to advance in addressing border environmental needs, there must be a greater clarification of the IBWC/CILA role in relation to the BECC/NADBank institutions. The IBWC/CILA must adopt its own policies related to sustainable development and public participation that are consistent with those of the BECC. In this way we will increase sustainability of border environmental infrastructure projects regardless of who builds them. To help accomplish this, the IBWC/CILA need to hire new engineers who are well grounded in alternative technologies and cost reduction methodologies such as value engineering. The IBWC/CILA need to become more binational in their operations. One of the dramatic steps taken with the BECC/NADBank institutions was to make them wholly binational with bilingual, bicultural staffs.

The 1983 La Paz Agreement

The Agreement Between the United States and Mexico for the Protection and Improvement of the Environment in the Border Area, signed by Presidents Ronald Reagan and Miguel de la Madrid in 1983, established a framework for cooperation on specific environmental pollution problems. The US EPA and Mexico's SEMARNAP act as the national coordinators of efforts to find and implement solutions to border environmental problems, in particular to prevent, reduce and eliminate sources of air, water, and land pollution. Formal workgroups, comprised of federally appointed governmental and academic experts, target their policy recommendations toward water, air, contingency planning and emergency response, hazardous waste, enforcement cooperation, and pollution prevention.[3] These workgroups have had varying degrees of success. For the most part, they are not sufficiently transparent, participatory, intermedia or interdisciplinary in focus. Because the La Paz Agreement lacks any formal avenue into national policies, critics see it as more symbolic than practical. Despite its informal nature, the La Paz Agreement is regarded as the basis for binational cooperation on a variety of regional environmental issues.

Integrated Border Environment Program (IBEP) 1992-1994

The IBEP was the first binational federal initiative created under the assumption that increased trade liberalization would create additional stress for the environment and human health along the border. The plan was released in February 1992, amid the environmental politics of the NAFTA negotiations. It proposed strengthening enforcement of environmental laws, increased cooperative planning, completion of expansion of wastewater treatment facilities, and the development of a computer tracking system on the transboundary movement of hazardous wastes. But because the IBEP lacked any implementation plan or resource commitment, it was widely criticized as nothing more than a plan to plan. It was also considered too "top down." Despite these criticisms, a study of the IBEP efforts indi-

cates many of its programs and activities have proceeded and proved useful for the border communities.

Good Neighbor Environment Board

The Good Neighbor Environmental Board was created by the Enterprise for the American Initiative Act of 1992 to advise the President and the Congress concerning environmental and infrastructure issues and needs within the States contiguous to Mexico.

The Act requires that Board membership include representatives from appropriate US Government agencies; from the governments of Arizona, California, New Mexico, and Texas; and from private organizations, including community development, academic, health, environmental, and other nongovernmental entities with expertise on environmental and infrastructure problems along the southwest border. At present, there is also one tribal representative on the Board. A Presidential Executive Order delegates implementation authority to the US Environmental Protection Agency. The Board has a goal to meet three times annually at locations along the U.S.-Mexico border. The Board has met eleven times at various border locations since its inception.

The Board has submitted three annual reports since its inception. And, while the Border XXI workgroups and other border institutions have implemented many of the Board's recommendations, it is not well know within the federal legislature. To be more successful, this board needs to assert its role as an advisor to the executive and legislative branches and urge them each to take a more holistic approach to border environmental issues, and an approach that is targeted to the most long-term solutions possible.

NAFTA

It is probably too early to tell what will be the NAFTA's impact on border environmental infrastructure, or border infrastructure in general.[4] However, it is clearly going to have a significant impact in

pollution from manufacturing, energy, and transportation sectors. The NAFTA is the first trade agreement which contains provisions to deal with environmental issues which arise in the context of trade relations and disputes:

> The text of the agreement includes explicit references to environmental and health standards and goals. The preamble contains a commitment to sustainable development and to the preservation and protection of the environment, and specific provisions appear in four chapters: sanitary and phytosanitary measures (Chapter 7b), measures related to standards (Chapter 9), investments (Chapter 11), and settlement of disputes (Chapter 20). In brief, the purpose of these provisions is to ensure (a) the integrity of the signatories' internal systems of environmental regulations, (b) the implementation of efforts tending to improve standards, (c) the ecologically sensitive settlement of disputes related to environmental measures, (d) the protection of the trade provisions of international agreements, and (e) the avoidance of external investments that could allow the creation of pollution havens.[5]

Border XXI

The Border XXI Program (Border XXI or Program) is an innovative binational effort which brings together the diverse US and Mexican federal entities responsible for the shared border environment to work cooperatively toward sustainable development through protection of human health and the environment and proper management of natural resources in both countries. It is the follow-on to the IBEP.

Regardless of where they originate, border environmental problems significantly impact communities and ecosystems on both sides of the border. Border XXI respects the sovereign rights of the US and Mexico to manage their own resources according to their own poli-

cies, ensuring that such activities do not cause damage to the environment of the neighboring country.

The principal goal of Border XXI is to promote sustainable development in the border region by seeking a balance among social and economic factors and the protection of the environment in border communities and natural areas. The central strategy of Border XXI consists of three components: public involvement, decentralization of environmental management through state and local capacity building, and improved communication and cooperation among federal, state, tribal and local government agencies. Given this goal and the central strategy, Border XXI, a product of significant public input, defines five-year objectives for the border environment and describes mechanisms for fulfilling those objectives. The success of Border XXI is contingent upon broad-based binational participation by federal, state, and local governments, Indian tribes, international institutions, academic, nongovernmental organizations, the private sector and border citizens and communities.

Nine binational Border XXI workgroups implement the Program by integrating the efforts of participating entities and defining specific projects to meet Border XXI objectives. Each workgroup operates under the guidance of a US and a Mexican Co-chairperson. The workgroups ensure effective coordination of bilateral efforts by bringing together federal agencies from both countries with interests in a given issue. There are a number of projects being carried out under the umbrellas of each of the nine workgroups (The projects are listed in the 1998 Implementation Plans).

Because Border XXI builds on the La Paz Agreement, it is likely that Border XXI or a similar successor will continue to exist in some form to serve as a coordinating mechanism for the two countries. As Border XXI continues to emphasize transparency to the public as well as to tribal, state and local governments, there will be more participation by those governments and from NGOs and the private sector in the workgroup process. This most likely will also mean a lengthier decision-making process. If decentralization continues in Mexico, so that the Mexican state and local governments have

greater decision-making capability, there will be more state-to-state collaboration on local regional projects. The federal governments will need to learn to play a different role in this decision-making paradigm.

To make Border XXI function well there must be a commitment to greater resources from all sectors of government: federal, tribal, state, and local, as well as greater coordination between all these levels of government. All concerned need to work toward the increased participation by the private sector. Those involved in Border XXI should do more to plan ahead and become proactive (i.e. less reactive). Unlike BECC/NADBank or IBWC which build infrastructure, the Border XXI workgroups can provide some long-term vision for the border. In this way, we may achieve greater incorporation of sustainable development policies in planning and implementing border region projects.

What are the new NAFTA institutions?

CEC

The Commission for Environmental Cooperation (CEC) with headquarters in Montreal Quebec, Canada was formed as part of the NAFTA package which sought to liberalize trade in North America while simultaneously providing some minimal protections for labor and the environment. The CEC is thus an international organization whose members are Canada, Mexico and the United States. Specifically, the CEC was created in 1994 under the North American Agreement for Environmental Cooperation (NAAEC) to address regional environmental concerns, help prevent potential trade and environmental conflicts and to promote the effective enforcement of environmental law. The Agreement complements the environmental provisions established in the NAFTA, and the work of the CEC can be divided into five main areas:

- Protecting human health and the environment.
- Enforcement cooperation and law.
- Environmental conservation.
- Environment, trade and economy.
- Information and public outreach.

BECC

The Border Environmental Cooperation Commission (BECC) with headquarters in Ciudad Juarez, Chihuahua, Mexico, was created to assist local communities and other sponsors in developing and implementing environmental infrastructure projects, and to certify projects for financing consideration by the North American Development Bank or other sources. BECC certifications are based on a set of environmental, health, technical, financial, community participation and sustainable development criteria, through a process that requires extensive public and local input. BECC is augmented by grant funds from EPA for its Technical Assistance Program. To date, $13.2 million has been provided to 70 communities for use in project development.

NADBank

The North American Development Bank (NADBank) with headquarters in San Antonio, Texas, is capitalized in equal shares by the United States and Mexico to provide $3 billion in new financing to supplement existing sources of funds and leverage the expanded participation of private capital.[6] The NADBank was augmented in 1997 by the creation of the Border Environmental Infrastructure Fund (BEIF) which can provide grants for water and wastewater projects. The BEIF started with approximately $170 million available, much of which has now been allocated to projects. The NADBank has also established an Institutional Development Program (IDP) primarily for utility capacity building.[7] IDP has $4 million available to give as grants. NADBank made its first BEIF grant recommendations in March 1998, and IDP is currently active in 93 projects in 70 communities.

The BECC/NADBank institutions are limited to three types of environmental infrastructure development: water supply and treatment, waste water treatment and disposal, and solid municipal waste [and related matters].

What is the perception of their impact?

During the NAFTA debates, many predictions were made regarding environmental concerns related to Mexico and in particular to the

border region. One reason for this is that the US and Canada already had decent environmental protections and enforcement. Mexico's general environmental law (of 1988) was well written, however there were serious questions about its enforcement. Another reason for this focus on Mexico was the ample horror stories regarding environmental harm and its affect on human health in the border free trade/maquiladora zones.

To counter the dire predictions, the advocates of NAFTA made overly generous promises on behalf of NAFTA's environmental institutions. These promises have now come to roost. The NAFTA environmental institutions look like failures in comparison to the claims made about what they would do. They are pale reflections of the all-powerful institutions they were promised to be.

Anti-NAFTA advocates in both the environmental community and what I will diplomatically call the far right make great use of these "broken promises."[8] Thus the NAFTA environmental institutions suffer, in the view of the current majority in Congress, for carrying the double-curse of being both "environmental" and related to "NAFTA."

Many in Mexico viewed and still view these institutions more as blackmail than benefit. They were a cost of entering into the NAFTA. Now, and especially after the peso devaluation, they are just plain too costly. How can Mexico justify spending so much on these institutions?

Worse yet, some analysts have suggested that Mexico is unfortunately not getting its fair share of benefit, given its fifty- percent support of the BECC/NADBank institutions.

Many argue that the CEC has become a think-tank, that is not helping Mexico's development or its environment. Further, its dispute resolution system creates an unneeded tax on the environmental ministry's budget that Mexico can ill afford.

There is a lack of congruence between perception and reality. A very few perceive these institutions for what they are—limited first steps toward broad North American cooperation on environmental

issues—institutions which are working toward that lofty goal in a slow but sure fashion (although truly with some rocks in the path). Although we sit here looking at NAFTA plus 5, for these institutions we are really limited to examining about 3 years or less (it took a while to get them started, they did not magically appear fully formed on 1 January 1994).

What has been their influence toward change?

CEC

To quote from a recent independent review of the CEC,[9] it has been:

- Developing regional action plans for the reduction and elimination of widespread and persistent pollutants, including DDT, PCBs, chlordane and mercury, to protect public health and the environment. [MJS – a demonstration of the ability to innovate and find solutions and ultimately improve environmental indicators.]
- Providing the public with important regional environmental information. This includes pollutant emissions data shown on a regional basis in the CEC's annual Taking Stock report, and an on-line comprehensive summary of the environmental law of the three NAFTA partners. [MJS – an increase in the knowledge base]
- The sharing of scientific information on biodiversity among the three Parties. [MJS – an increase in the knowledge base]
- Identifying the cause of waterfowl mortality in the Silva Reservoir in the State of Guanajuato, Mexico, and providing capacity building and planning activities that have assisted the state and federal government in rehabilitation of this important wildlife area. [MJS – some improvement of environmental indicators]
- Establishing an elaborate process of public participation through the JPAC and national advisory committees, as well as public meetings at the Council sessions, and with working groups. [MJS – institutionalization of cooperation]

- Working with the three governments to help develop an open and transparent means of conducting transboundary environmental impact assessments for government projects that may adversely affect the environment of a neighboring NAFTA country. [MJS – an increase in predictability, or at least the elimination of surprises]
- Promoting cooperation among the environmental enforcement agencies of the three countries by exchanging information on current policies and practices, and by conducting several capacity building and training exercises. [MJS – an increase in the knowledge base]
- Implementing the innovative public submission procedure empowering citizens to allege that a party to the NAFTA is failing to effectively enforce its environmental laws. [MJS – engaging the public]

BECC/NADBank

- As of July 1999, 27 projects have been certified with a combined estimated cost of over $800 million dollars. Fifteen are US and 12 are Mexican projects. The NADBank has authorized loans, guarantees and/or grants totaling $105 million and leveraging over $400 million in total financing for 14 projects. Fourteen of the 27 projects are under construction, and one has been completed. When complete, the projects will provide at least some benefit to an estimated seven million border residents—approximately sixty-percent of the border's population.
- Public participation [MJS - engaging the public]
- Transparency and access to information [MJS - no surprises]
- Bottom up decision-making [MJS - not top down business as usual]
- BECC Certification Criteria [MJS - clear predictable rules]
- Creation of a faster process which ensures more infrastruc-

ture is built [MJS - some improvement of environmental indicators]

The future

Obstacles

- Some will continue to label border environmental institutions as failures and claim they are not doing anything constructive.
- Increasing fragmentation or compartmentalization of US-Mexico relations may limit leverage in linking environmental protection to trade liberalization.
- As the result of the recent replacement of its general director, the CEC has been in a management transition. Significant changes are under consideration to fix management problems. It would be most advisable for the CEC to work toward a structure that increases its independence and thus its credibility. In this way, it can improve its relevance. The CEC should augment its otherwise excellent studies with more applied actions in communities. This might be accomplished by an increase in funding for NAFEC, which supports grass-roots activity.
- The CEC can also be said to suffer from a pattern of neglect or at least indifference by the US and an interestingly large role by SECOFI in Mexico's participation in the Commission.
- The BECC and the NADBank need to do more to plan ahead. They can use their entry into communities to promote planning, reduce perverse resource subsidies and to stimulate more involvement by the private sector. The BECC and the NADBank need to work to eliminate the unproductive competition with the states for money, without compromising project criteria standards.
- The ultimate barrier to the success of the border environmental institutions is financial. For example, reasonable estimates for border environmental infrastructure in the three areas of the BECC/NADBank mandate are between $8 and $10 billion.

At best the NADBank can only leverage $1 to $2 billion. More grant funds for project design, capacity building, planning, etc. are crucial.

Opportunities

- Unilateralism will decrease. We can expect better outcomes from a more interactive, reciprocal relationship on environmental issues between the US and Mexico.
- But the golden rule still applies—the nation with the most gold rules. In other words, "who decides" and "who pays" are inextricably linked. This said, there is plenty of room for better management of the status quo.
- Slow upward harmonization of environmental standards.
- There is an opportunity to do more to consolidate and expand joint work on issues of environmental protection and conservation on which there is consensus.
- Slow opening and democratization of Mexico's political system.
- Slow improvement of environmental conditions/indicators.
- The NGO community is taking a greater lead in innovation and in finding workable solutions.[10]

Endnotes

1. Mark Spalding is a visiting member of the faculty at the Graduate School of International Relations and Pacific Studies (University of California, San Diego) where he teaches international environmental policy and law courses. He is the Executive Editor of the school's *Journal of Environment and Development.* Mark is the Chair of the California State Bar Association's Environmental Law Section. And, he is currently serving as a member of the Good Neighbor Environmental Board which advises the US Congress and President on US-Mexico border region environmental issues. He may be contacted for more information at mspalding@ucsd.edu or 619-259-7879.

2. This section drawn from Spalding, Mark "Addressing Border Environmental Problems Now and in the Future: Border XXI and Related Efforts." To be published as an essay in the SCERP Monograph Series (SDSU Press, forthcoming).

3. The workgroups produced five annexes of cooperation on the following areas of environmental pollution: 1) sanitation problems in the San Diego/Tijuana area, 2) hazardous materials spills, 3) transboundary shipments of hazardous substances, 4) air pollution by copper smelters on the Arizona/Sonora border, and 5) air pollution in urban centers on the border.

4. It is equally hard to isolate NAFTA's economic impacts – there are many factors that have impacted the North American economy in the last 5 years. For example: the December 1994 Peso devaluation and its related exchange rate and labor cost impacts; economic growth in the US due to restructuring during the last recession; and the world-wide economic crisis which creates some opportunities and limits some markets. The majority of studies suggest that the economic effects of NAFTA are broadly positive or neutral on major indicators such as trade growth, GDP, income, and employment. There are of course sectors or firms for which this is not true—we are talking about net impacts. Many of these studies do, however, show overall negative effects on income equality or income distribution.

5. MacDonald, Gordon J. Daniel Nielson, and Marc A. Stern (eds.) *Latin American Environmental Policy in International Perspective* WestviewPress (1997) at p. 122.

6. Mexico and the US will each contribute half of the $450 million in paid-in capital and half of the $2.55 billion in callable capital. It has been estimated that leveraging these moneys could produce $10 to $20 billion for environmental and social adjustment projects.

7. In a parallel move, the EPA has also provided $17 million in direct grants to tribes for this same purpose.

8. See for example, Public Citizen, *NAFTA's Broken Promises: The Border Betrayed.* (Washington, DC: Public Citizen Publications, 1996).

9. An Independent Review Committee appointed in 1997 by the three environment ministers presented its report on the operations and effectiveness of the North American Agreement on Environmental Cooperation at the Fifth Regular Session of Council, Merida, Mexico, 26 June 1998. My comments are in brackets.

10. For example, the Ford Foundation has now sponsored two "Annual Meetings on the Border Environment" which have included the participation of over 400 environmental NGOs from the border region alone. The campaigns to stop the construction of a low level nuclear waste facility in Sierra Blanca, Texas and a solar salt evaporation facility in Laguna San Ignacio, Baja California Sur also indicate a maturation of the North America network of environmental NGOs into effective binational coalitions.

Harnessing the Power of the Private Sector to Improve Environmental Quality on the U.S.—Mexico Border

Ramón Álvarez

> "*[M]anagers must start to recognize environmental improvement as an economic and competitive opportunity, not as an annoying cost or an inevitable threat.*"
>
> —Michael E. Porter and Claas van der Linde, in "Green and Competitive: Ending the Stalemate," Harvard Business Review, Sept-Oct 1995

Summary

Manufacturing facilities on the US-Mexico border have been the focus of intense scrutiny due to concerns about their impacts on public health and the environment. A number of agencies and organizations have tried to address these concerns by engaging the manufacturing sector in projects designed to reduce the environmental impacts of their activities. These projects have consistently demonstrated that pollution prevention, energy efficiency, water conservation and recycling initiatives (collectively "eco-efficiency") can improve environmental performance while also improving business performance. However, industry's adoption of such "eco-efficient" practices is not universal, or even widespread. Most observers agree that there are many such "win-win" opportunities that have yet to be identified at other industrial facilities on the border. This paper discusses the challenges of reaching all of these facilities and recom-

mends strategies and policies to promote increased adoption of eco-efficiency measures by industry in the border region.

Definitions

As used in this paper, eco-efficiency is a catch-all term that incorporates a number of desirable environmental management practices, including pollution prevention, energy efficiency, water conservation, and recycling. Eco-efficiency also encompasses the commonly used concept of "resource productivity," which gets at the notion of producing more with less.

Pollution prevention is any practice that reduces the amount of any contaminant or waste stream during the production process prior to recycling, treatment or disposal. By seeking to prevent the generation of waste at the source, pollution prevention is the opposite of pollution control which is an end-of-pipe approach. Pollution prevention includes equipment modifications, process changes, product reformulation or redesign, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

If the creation of a waste stream can not be prevented, then recycling should be pursued as a management approach before treatment. Disposal should be viewed as the environmental management strategy of last resort.

This paper focuses exclusively on eco-efficiency as it relates to opportunities to eliminate or minimize the environmental impacts of a company's manufacturing practices. It does not address other environmental issues related to a company's operations, including other stages of a product's life cycle, packaging, or transportation.

The business case for eco-efficiency

An entire field of research has formed in the last 10 years which aims to evaluate the interconnections between a firm's environmental performance and economic performance. This section is meant to be illustrative and not comprehensive.

A survey of facilities filing pollution prevention plans to the New Jersey Department of Environmental Protection found that projected savings were more than seven times the investment. Reducing or eliminating waste streams offers direct cost savings to the firm for raw materials, labor, compliance, waste disposal and transportation. Pollution prevention also offers a number of indirect and less tangible benefits that are more difficult quantify, including reduced insurance expenses, enhanced worker health and safety and improved public image and community relations (NEWMOA).

Reduced energy and water consumption also reduce the direct costs of production. Recycling is a potential avenue for recovering some value for waste streams or by-products from the production process.

A 1998 analysis of 70 research studies concluded that companies that outperform their peers environmentally also outperform them on the stock market (Deutsch).

A number of demonstration projects on the US-Mexico border have shown that good environmental management is also good for the bottom line. For example:

- Since 1994, the Texas Natural Resource Conservation Commission has conducted 19 site assistance visits at large maquiladoras, resulting in $7.8 million in estimated cost savings from pollution prevention and recycling projects.
- The Environmental Defense Fund worked with two companies in Matamoros, Tamaulipas to identify significant reductions in air emissions, hazardous and solid waste while reducing costs by more than $300,000 a year.
- The Border Waste Wi$e Partnership helped improve the environmental performance of 27 companies in Tijuana including Hasbro, which saves $230,000 per year by reusing or selling waste plastics; and Sony VTM, whose recycling program netted over $500,000 in combined revenue and cost avoidance in 1995.

If eco-efficiency is such a great thing, then why isn't everybody doing it?

Information barriers. Managers may not realize the benefits that eco-efficient practices would bring to their own firms (EPA). This usually results from the firm's failure to use accounting systems that fully reflect all relevant costs (Frosch). While typical accounting practices attribute to a production line the "traditional" costs like labor, fuel, raw materials, capital and O&M expenses, they overlook the costs of wasted raw materials, waste treatment or disposal, liability, and regulatory compliance (manifesting, reporting, recordkeeping, etc.) (INFORM). These environmental costs are generally hidden in overhead and therefore out of sight of production managers. Once the true costs associated with inefficient production processes are identified, a firm is generally motivated to seek alternatives. For example, the Alcoa Technical Center in Pittsburgh began charging each division for its contribution to the waste stream. A manager reported that "when people saw how waste inflated their own budgets, they found new and creative ways to eliminate it." Over a four-year period the facility was able to reduce by 66% the quantity of waste shipped off-site and by 73% the associated waste management costs (Clean Air News).

Management and technical barriers. Even if a company knew the true costs associated with their inefficient production processes, it may not be a priority for its staff to identify and implement eco-efficient improvements or alternatives. Alternatively, the firm may not even have staff with the necessary technical expertise to identify and evaluate options.

Economic barriers. Many eco-efficiency measures require little or no capital investment. On the other hand, many require modest or significant up-front capital investment. Some companies elect not to implement such measures because the project fails to meet an internal hurdle rate of return or because of limited capital budgets. However, it is believed that relatively few companies have reached the point where only capital intensive measures are available (EPA).

Recommendations

1. Help border industry overcome barriers to implementing eco-efficiency measures

Traditional technical assistance programs. Technical assistance programs are a common approach used around the world, as well as the border region, to promote the adoption of eco-efficiency measures. The programs are designed to break down the barriers that prevent companies from realizing the benefits of eco-efficiency. Technical assistance providers enter a facility with a fresh pair of eyes and ask questions designed to gauge the magnitude of costs associated with inefficient processes or practices. A typical technical assistance program consists of a no-cost site assistance visit followed by written recommendations that describe available opportunities. The programs provide a valuable service and have provided on-the-ground proof that cost-saving opportunities exist on the border.

On the other hand, reaching all of the border manufacturers who would benefit from technical assistance presents a real challenge because the programs are not designed to be sustainable over the long term. The central problem with most technical assistance programs stems from the way they are funded and staffed. First, these programs generally depend on annual grants from the government or private foundations. These funds are finite and unreliable, and therefore only a small fraction of companies will ever receive needed services. And second, the programs typically cease to exist altogether once the funding expires because they do not rely on Mexican experts or build the local capacity necessary to independently promote eco-efficiency measures. In addition, the programs are vulnerable to criticisms that they represent subsidies to corporations, who receive significant benefits without paying for services received.

The limitations of traditional technical assistance programs are compounded by the lack of a well-established environmental consulting sector in Mexico, which could in principle complement the work of technical assistance programs. Broadly defined, "environmental consulting" is not a service that is easily accessible to Mexican industry, especially on the northern border. Partly due to a limited

pool of trained experts (that are quickly hired by industry, government, and academia) and partly due to the uncertainty of employment in a non-traditional sector, environmental consulting firms have not developed a significant presence in Mexico. In their absence, US firms are regularly awarded contracts to work with Mexican government officials and industry leaders on environmental matters. To fill the gap, Mexico's leading universities have recently incorporated pollution prevention and other proactive environmental management strategies into their curricula. However, it will be many years before suitable numbers of technical experts trained in pollution prevention are available in Mexico. Moreover, it is unlikely that these experts will be able to sustain independent consulting firms until business models appropriate to the unique Mexican circumstances are developed and shown to be viable.

Building sustainability into border technical assistance programs. A surefire strategy for "home-grown" environmental consulting firms to establish a presence in Mexico is to offer value-added to their clients, while identifying a revenue stream to pay for their services. The business model employed by energy services companies (ESCOs, an industry with annual sales in excess of $1 billion) does both of these things. ESCOs generate cost savings for clients by identifying and implementing energy saving opportunities at a facilities in return for an agreed-upon portion of the savings. The client pays nothing if a minimum level of savings is not achieved. This business model could be extended to include other types of eco-efficiency measures focussed on improving overall manufacturing efficiency.

EDF's proposed approach. The Environmental Defense Fund's experience in the region suggested that there was a way to provide economic growth through eco-efficiency while simultaneously training a new generation of environmental professionals, and thereby expand the number of people in the field who provide technical assistance and other environmental services. EDF has developed an industry outreach approach that attempts to correct the flaws in current technical assistance programs in the hope of creating a mechanism for sustained implementation of eco-efficiency measures by industry on the US-Mexico border. The key differences

are: 1) funding—firms that receive services will be asked to pay for services received, 2) staffing—the program relies on Mexican experts, and 3) capacity building—by partnering with Mexican universities, the students who will become environmental professionals receive hands-on training in eco-efficiency. The EDF approach extends the business model developed by energy service companies to encompass any eco-efficiency improvement, not just energy efficiency.

Specifically, EDF is working to establish teams of eco-efficiency specialists in conjunction with Mexican universities to work with manufacturing firms to identify and implement cost saving eco-efficiency opportunities. We seek to finance these efforts through a revolving fund established with a combination of government and private support. This fund will be replenished with part of the savings manufacturers realize by implementing eco-efficiency measures. As discussed above, there is ample evidence that significant financial benefits accrue from implementing eco-efficiency measures. That led us to believe that a portion of the financial benefits could be harnessed as a secure stream of revenue to maintain an industry assistance program to promote eco-efficiency. Mexican universities can use a portion of the dedicated funding stream to prepare Mexican students for environmental careers that will benefit them and their communities.

2. Policy recommendations to promote eco-efficiency

The following policy recommendations are intended to establish an acceptable, minimum level of environmental performance and to spur innovation by making in the best interest of border industry to do so.

Encourage strict, balanced enforcement of laws and regulations. Studies show that a key motivator for firms to adopt eco-efficiency measures is a stringent regulation or enforcement action (EPA). The threat of enforcement fulfills an important role in creating "outside pressure in overcoming organizational inertia and creative thinking" (Porter and van der Linde).

Give industry the right incentives and price signals. The greater the financial down side to pollution or over-consumption of resources, the greater the incentive for industry to make improvements. Policies that promote an eco-efficiency and conservation ethic include:

- assessing fees for environmental releases and hazardous waste disposal. Revenues from these fees could be used to supplement funding for enforcement as well as industry assistance programs.
- removing subsidies for electricity and other utilities.
- establishing a deposit-refund system, under which the user acquiring a hazardous substance leaves a deposit with the environmental authorities and is granted a refund after properly using and disposing of the substance. Such a system creates a financial incentive for sound "cradle-to-grave" management of hazardous materials, including the reuse and proper disposal of chemicals. A deposit-refund system could also improve the ability of authorities to track the existence and movement of hazardous chemicals.

Require public disclosure of environmental release and chemical use data. The so-called "right-to-know" program in the U.S. has empowered local citizens and moved corporate management. The public spotlight on firms responsible for excessive environmental releases is credited for a large proportion of the 53% reduction in air releases of chemicals reported to the Toxics Release Inventory between 1988 and 1997. On the other hand, less progress has been made in reducing production related waste and volumes of materials transferred off-site have actually increased. The standard environmental release and transfer data should be expanded to include chemical use data information about the quantities of toxic chemicals that facilities use. With this more complete information, community residents would know the amounts of chemicals transported to nearby facilities, workers would know the amounts of chemicals used in plants, and consumers would know the chemicals that remain in products. This information would provide an incentive for companies to reduce the quantities of chemicals used in their

operations and in their products, just as publicly-available information from TRI has motivated reductions in chemical releases.

Chemical use data would also provide a check on the accuracy of data that facilities report to the TRI (because inputs must equal outputs plus the amount in products). Employing a process called "materials accounting," facility staff would use purchase orders and other data to determine chemical use inputs, and measurements and best estimates to determine chemical outputs and the amounts in products. New Jersey and Massachusetts right-to-know laws now require such reporting of chemical use data.

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Attracting Private Sector Participation in the Mexico-US Border Region

Amanda K. Martin

Good morning and thank you for the opportunity to participate in today's dialogue on growth management of the Mexico-US Border and the role of privatization in that effort.

Here in Aspen, water contributes to an economy that thrives on fresh snowfall and endless rounds of chilled Perrier. Aspen water isn't necessarily cheap … but it is safe, abundant and available upon request. Those of us who travel here on holiday don't spend much time thinking about our water … and rarely do we find the service lacking or disappointing.

Contrast that with the focus of today's dialogue, however, and the reality of the situation is another world away …

… across a politically sensitive border that has yet to embrace a cohesive vision for the management of water resources;

… over a notoriously prohibitive river, which serves as the region's primary water source yet is ravaged by raw sewage and other untreated waste that is dumped into its system;

… within the rapidly expanding communities, where limited municipal water and wastewater systems, and unmanaged, abandoned or unsafe solid and waste sites are contributing to high rates of disease, especially waterborne diseases;

… among the businesses and maquiladoras, which are growing so quickly that the capacity of border waste disposal facilities and hazardous waste sites is insufficient;

… and along the well-traveled NAFTA highways, which have enhanced economic growth but overwhelmed existing infrastructure.

As we look at each of these issues, we cannot help but conclude that traditional solutions for growth management have failed the Mexico/US border. The best intentions of government and non-government agencies and grass-roots organizations have fallen short of preventing untreated sewage from being dumped into the Rio Grande or washed up on California beaches … have failed to stop the spread of bacteria and virus … and have won few victories in addressing hepatitis A and the high rates of birth defects that persist in border communities.

Clearly it's time to consider a new approach … to put the dialogues and politics aside and take action.

The private sector is interested in bringing very different and creative solutions to the infrastructure needs of the Mexico/US border. But an approach such as privatization is not an easy sell. It comes wrapped in misconceptions about high costs, loss of control, unfamiliar change and fear of failure.

It's our job to change the paradigm. Economic forces are proving that the time is right for privatization, as evidenced by the private sector's ownership and operation of new and improved water and wastewater systems in Argentina, Brazil, Chile, Mexico and many other parts of the world.

Let's begin by looking at the issues that are driving today's dialogue—specifically, where are the problems, what are the problems, why do they exist and how do we solve them? And then, let's consider what it will take to start the process of meaningful change.

Identifying the problems

The 2,000-mile Mexico/US border region runs along the borders of the US's driest states—Texas, New Mexico, Arizona and California. The Rio Grande River, which begins as an alpine stream in the San Juan Mountains of southern Colorado and ends 2,000 miles later at the Gulf of Mexico, is the main water source for most Texas border cities. In addition, the sister cities of San Diego-Tijuana import virtually all of their water and the Colorado River is a major source of supply.

While the entire border is facing shortages of groundwater and surface water and water pollution, many sister cities are grappling with extreme situations because their infrastructure has been overwhelmed by high growth and rapid economic development. These problems are similar to those of many growing U.S. cities, but the stress of the border's infrastructure has resulted in very significant health problems. Various studies by agencies on both sides of the border have shown high potential for toxic chemical impacts near El Paso/Ciudad Juarez and Laredo/Nuevo Laredo, overpumping and infiltration of contaminants in the Mesillo-Hueco Boslon Aquifers and high levels of fecal coliform in segments of the Rio Grande/Rio Bravo river system.

Sister cities El Paso and Ciudad Juarez both pump water from the Hueco Bolson aquifer. An increasing population in these cities—which already have about 1.8 million residents —is placing a higher demand on the limited freshwater supply in the area. Although water conservation measures were implemented in the 1980s, the cities are pumping more water from the groundwater aquifer than is being replenished, and estimates are that the usable portion of the Hueco Bolson aquifer will be gone by 2025.

Mexico and the U.S. have no international agreements on sharing groundwater, although efforts to better solidify the management of cross-border groundwater are in the works. Further to that point, there is no open access to a water market and no wheeling of water. The border region needs new water resources—and these resources

exist. But existing laws and other barriers that prevent the movement of water across international borders restrict market access to these supplies.

In addition to these highly concentrated sister cities, almost 400,000 Texans live in unincorporated communities known as colonias, which have been around for decades. Colonias typically lack safe drinking water, wastewater collection and treatment systems and adequate solid waste disposal facilities. Human health threats from inadequate infrastructure and unsafe drinking water makes diseases such as cholera, hepatitis A and giardiasis a continuing problem in the colonias. Again, this situation is not vastly different from other unincorporated parts of the U.S., which lack municipal service systems, but is further intensified by a dense and growing border population.

Another phenomenon that has taxed the border's infrastructure is the maquiladora program. Initially attracted by relatively low wages and a market proximity that benefits from low shipping costs and an inexpensive distribution system, multinationals have flocked to the maquiladoras, especially since NAFTA. As of September 1998, more than half a million people were employed in just over 1,100 maquiladoras in the Mexican states bordering Texas, representing about 46 percent of all maquiladora plants in Mexico. Trends now reflect maquiladora movement away from the border to help ease the overwhelmed infrastructure system.

Further west along the Mexico/California border, the San Diego-Tijuana region's population boom (from 3.7 million people today to a high projection of 7.22 million by 2020) and maquiladora growth, combined with the heavy levels of pesticide used in California's Imperial Valley, will stress regional water supplies beyond the breaking point without new sources of water. The area's high population generates high wastewater outputs, overloading the capacities of the local treatment facilities and spilling over into storm drains and area watercourses (as they have for 15-20 years). Beach closures throughout San Diego County are a frequent occurrence because of contamination reaching coastal waters through storm drain runoff.

Why do these problems exist?

Unchecked and unmanaged growth in the narrow border corridor, combined with a population that is projected to more than double to 24 million people by 2020, will continue to stress the existing infrastructure (not just water, but other basic services, too). In this environment, the issue of who is responsible for solving the border's infrastructure problems and who should pay for the solutions has become a primary issue for both sides of the border.

As witnessed in other developing economies, new and creative market solutions can be particularly effective in these regions, but they are also tremendously expensive. And no one from the private sector will be willing to commit substantial capital to border projects in Mexico until the federal and state governments demonstrate that they have made infrastructure investment a priority and have created an investment environment that is attractive to private sector participation.

A number of government and non-government organizations, and even industries, have tried to resolve the water quality problems facing the border region. Organizations such as the EPA, the North American Development Bank, the BECC and the IBWC are committed to facilitating border development and bring different types of expertise to the process.

But without the right market mechanisms, the infrastructure sectors financed by these organizations present the highest risks, lowest returns, and greatest challenges for structuring viable sustainable projects on both sides of the border.

- The projects are expensive and local communities lack the resources to build, maintain and operate them;
- There's no single vision for a comprehensive infrastructure plan among local, state and federal governments;
- The local agencies that are responsible for providing water, sewage and sanitation services often lack the necessary adminis-

trative, commercial, financial and operating infrastructure to do so;

- The private sector has shown little interest and achieved limited success in developing water and wastewater infrastructure under the present conditions (which haven't changed in 50 years);
- And even though the Comision Nacional del Agua is working hard with local congresses to make improvements, the legal framework does not yet provide the elements necessary to give the private investor enough confidence to pursue these projects.

The real solution is much more global in scale

In the border region, we've reached the point where water pollution is leading to deadly disease. The way to fight disease is to make a significant financial investment in the local water infrastructure … and to operate and maintain these systems at certain standards of acceptability to ensure consistently clean water supply. Under the current system, the money isn't there. Customers aren't paying enough to improve and maintain their water infrastructure. Political appointees aren't willing to push tariff increases through to their constituencies, and instead, push them off on their political successors. Constituents have little enthusiasm for paying higher rates to sustain the operation and maintenance of new wastewater treatment facilities when their own tap water isn't safe to drink.

So the disease continues … and the chain is never broken.

The private sector can break the chain

Private sector participants can help governments overcome their budgetary restraints by aggressively raising capital and through innovative financing mechanisms. For example, in the U.S. market, governments enter into public/private partnerships in which private parties make equity investments in local water and wastewater companies or provide lower-cost outside capital sources to fund infrastructure requirements and growth opportunities.

The private sector also offers state-of–the-art technical and operational skills in the most efficient and cost effective basis. These benefits, and the private sector's ability to fund capital requirements, have improved the service and quality in the water sector in The United Kingdom, Argentina, and Chile, just to site a few examples that literally exist around the world.

But in order to attract the private sector, certain elements must be present:

The first step is to encourage the development of water as a commodity and to assure open and transparent water markets. Through the deregulation of gas, electricity and the airline industries we learned that a regulatory framework that promotes free markets improves productivity, quality and service while decreasing cost. It is time to bring this market influence to water, which will continue to be squandered and polluted unless it is economically valued.

The second is to leave the risk taking in water and wastewater resource allocation to the private sector. State and federal governments must work with the private sector to apply its strong capital raising and operational skills and technical expertise along the border. With this proven expertise and a commitment from the private sector to protect the environment and ensure the highest quality water standards, the free market will flourish. With the right legal and regulatory framework in place to allow the commodity and the revenue to be shipped back and forth across the border, government can leave the business of creating the market to the private sector … because the private sector is very good at figuring out how to get paid.

Finally, the multinationals, the Mexican government, U.S. border cities and multilateral agencies must recognize that each has a role to play. Multinationals must be held financially responsible if their operations have damaged the environment or the communities' drinking water. The Mexican government clearly has a vested interest since nearly one-half of its GDP comes from these border cities. If Mexico wants to continue to have this region become the driver of

the nation's growth, then it must invest in its future. On the other hand, the U.S. border cities bear a large portion of the current and future costs of not fixing this problem and therefore should be willing to invest in its solution. Lastly, multilateral agencies should coordinate their efforts, work with the municipalities, listen to their needs and help them identify infrastructure solutions such as Build-Own Transfer facilities that can be put out to bid.

Such an environment would allow a whole host of innovative ideas to evolve …

- U.S. cities, backed and supported by private enterprise, could participate in international concessions. Sister cities such as El Paso/Ciudad Juarez and San Diego/ Tijuana could transport water across their borders. Water resources on either side of the border could be wisely developed and deployed through the technical and financial resources of the private sector.
- Suppose there is a large reservoir on the Mexico side of the border that would cost $100 million to develop. A U.S. company would be willing to take that risk and obtain NADBank financing to develop the reservoir if the company could then transport the water across the border and use it as part of a regional market approach to providing water solutions.
- Cross-border agreements between sister cities could focus on implementing desalination projects that would result in new water sources.
- Capital could be applied to effectively decrease water usage in industry and agriculture. Farmers could receive financing to use more efficient irrigation technology and sell their unused water to others.
- More exhaustive exploration and production (E&P) work could be conducted in the border area, with more E&P focus on exploring aquifers at lower depths. Some border cities believe they have additional underground water resources that haven't been developed.

- And new upstream solutions that would provide new water resources at the headwaters of the Rio Grande and Colorado rivers could be explored.

Conclusion

The Mexico/US border's infrastructure problems are not supply problems. They are allocation problems. The water exists, but it is not developed. The communities that need water do not have it.

Private sector companies possess operating, management and technical expertise that can successfully integrate cross-border water flows, water management projects and other innovative solutions to help both sides of the border achieve a sense of cooperation and realize a greater productivity that is long overdue. But the private sector cannot initiate these programs until they can feel confident that they will receive a reasonable return on their investments.

It's time to put an end to the border's problems. To alleviate the barriers. Change laws. Redirect cultural mindsets. Open markets and recognize the valuable dynamics that come into play when nations and states begin to share resources.

Until those changes take place, many people will never know the benefits of healthy communities, clean rivers and safe drinking water … the very things that they should be able to enjoy all the time … for a lifetime.

Consciousness of Social Responsibility under the NAFTA

Alberto Bustani

Abstract:
Much of the controversy surrounding the NAFTA has been centered on issues that seem not to be directly related with trade itself, such as its impact on the environment, labor, worker health and safety, and immigration. This paper discusses the importance to accomplish social benefits apart from economic gains in the Mexico-U.S. Border Region. Several examples are presented of the importance to accomplish social benefits apart from good economic performance; the problems that migration of people from agricultural areas to the border are creating; the current situation in relation to pollution prevention and enforcement of environmental laws and regulations; the concerns over the use and protection of fresh water supplies; the condition of workers; human rights; and finally some recommendations for actions.

The Mexico–U.S. Border Region under the NAFTA.

Everyone is entitled to a social and international order in which the rights and freedoms set forth in the Universal Declaration of Human Rights can be fully realized.

The North American Free Trade Agreement (NAFTA) entered into force on the first day of January, 1994 with the intent of eliminating tariffs among Canada, Mexico and the United States over a period of ten years. Since then, trade between Mexico and the U.S. has grown at an average rate of 17%, reaching a record in 1998 of around U.S.$190 billion.

The NAFTA has been an economic success, even though it has benefited from one of the longest economic expansions of the U.S. in the last century.

But the development of the NAFTA was not an easy task, it required strong political support both in Mexico and the U.S. in order to be successfully implemented and sustained. In fact, the rapid turn toward free trade was politically surprising in Mexico after more than 50 years of protectionism.

According to the NAFTA, by 2004 North America should be a free trade region or at least many would expect a region with tariffs similar to the developed countries. In the 1940´s the trade tariffs among the developed countries were of the order of 40%, by 2000 that average will be less than 4%. This significant reduction of tariffs took around 60 years to complete while in the NAFTA this will be achieved in only 10 years. This is a remarkable accomplishment.

One peculiarity of the NAFTA is that it takes into account aspects of social responsibility. In fact, much of the controversy surrounding NAFTA has been centered on issues that seem not to be directly associated with trade itself, such as its impact on the environment, labor, worker health and safety, and immigration. These are complex issues that we still do not fully understand and that would be extremely difficult to fulfill by 2004.

Many people still believe that undeveloped countries can grow economically by expanding their manufacturing and other industrial plants at the expense of natural capital. These countries or regions cannot continue to do this indefinitely and some may be already limited by their inherent environmental factors; for example, water or energy may already be a limited resource.

The Mexico-U.S. Border Region is undergoing precisely this type of economic expansion. The number of people living along the Mexican Border has increased by four times in less than twenty years (from 3.5 million in 1980 to more than 12 million in 1999). Around 4,100 Maquiladora factories[2] are now established and employ around two million workers at the country level, from which around 63% are located in the Border Region.

Since 1985, the number of Maquiladora plants has increased on average 20% per year contributing now with more than U.S.$7 billion dollars to the local economy. The total production of the Maquiladora plants accounts now for nearly 15% of Mexico's gross domestic product.

The Maquiladoras provide employment and economic stability for Mexican workers and also create many related opportunities for Mexican and U.S. suppliers and service providers. In just over 30 years of existence Mexico's Maquiladora industry has gone from a simple assembly plant business to an important source of foreign investment, it has created jobs on both sides of the border, and has expanded exports.

Maquiladoras continue to grow faster than domestic manufacturing and the same is happening with the human population on the Border Region that is growing faster than other regions located further south in Mexico. This rapid growth, together with the increase in the amount of resources used, are altering the Border Region in unprecedented ways. Transforming the land through land clearing, forestry, pasturing, urbanization, mining; as well as altering the major bio-geo-chemical cycles of carbon, nitrogen, water; and altering the habitat and the subsistence of biodiversity.

We still do not know exactly how much of the land surface has been and will be transformed? How much of all accessible surface fresh water has been put to use? And how much is still available? How many of the bird species have been driven to extinction? We are impacting the environment at faster rates than before the NAFTA. Environmental problems resulting from the new human settlements

and industrial activity have begun to threaten the sustainability of the Border Region's life support system. We still do not know what will be the future implications of these changes on the communities on both sides of the border?

In general, little attention has been paid to our natural ecological system, the Border Region's life support system. It is important to increase awareness in relation to air and water pollution; floods and droughts; industrial and municipal wastes; soil contamination; translocation of nutrients; loss of biodiversity; loss of the diversity in human cultures. Border communities need feedback mechanisms and the involvement and participation of individuals, business leaders, border groups, and other institutions, to avoid or reduce the deterioration of the Border Region ecological systems. Human health, national security, and social justice are also strongly linked to environmental issues because each of them depends on the structure, capacity, and adaptability of our ecological systems.

Among the most critical challenges facing these persons, organizations and Institutions are the conservation, restoration and wise management of the Border region resources. Therefore, it is important to meditate about the role of the private sector, non-governmental organizations (NGO's), state and municipal participation, community groups, and others, in meeting the challenges of the border.

Social responsibility actions and economic performance

The Mexico–U.S. Border Region is changing in many ways. Inequity among communities on both sides of the border has increased. There are now more democratic municipal and state governments in Mexico. Technology, communication, and information systems have undergone revolutionary changes. Multinational corporations are merging. Non-governmental organizations are flourishing. The rate of transport of people, goods, drugs, and organisms is increasing very rapidly.

Today, more than ever, it is important for businesses to accomplish social benefits apart from the economic gains, which they seek. Businesses and society are interwoven rather than distinct entities and society expects appropriate business behavior. Therefore, efforts should be made to understand the social dimensions of free trade, including issues related to the environment, education, human rights, ethical issues, and alternative forms of integration and development.

What is the link between social responsibility actions and economic performance? Which are the conditions necessary for social responsibility to manifest? Are social responsibility actions unproductive resource expenditures for the organization? What levels are relevant to the concept and practice of social responsibility? At the National, State or Municipal Government levels? Is this the responsibility of community groups and/or Non-governmental organizations? Or is this only the obligation of corporations? Or is it the responsibility of the maquiladora industry as a whole? Or is it the obligation of companies or Individuals?

In general the more developed a region is the more prominent social responsibility awareness and actions should be.

At the federal level there are many initiatives that can be push forward, primarily through the political process. Examples of these are the promotion of civil rights and democratic structures, the legal recognition to give to state and municipal governments greater responsibility in regard to policy-making and law enforcement; and the inclusion of local community needs in the development of national economic policy.

It is difficult to conceive the Maquiladora Industry, as a whole, acting as an intermediary to promote social responsibility. The Maquiladora industry is composed of aggregations of firms with strong differences in their competitive structures, public visibility, government scrutiny, geographical location, environmental concerns, infrastructure, workers education and training, technology, communication and information systems; availability of local resources, among others.

There are, however, many individual companies in the Border Region that seem to be acting in a socially responsible way with the younger firms tending to be the more socially responsible.

Older firms would normally show a lower performance as their management teams were formed and are used to work in the business environment predominant in Mexico before the NAFTA, or before environmental regulations were established, and in general with lower public scrutiny. A problem facing many of these firms is that the Mexican government is forcing compliance with, for example, environmental regulations where there is not enough environmental infrastructure to treat or dispose of wastes or adequate financial mechanisms to implement pollution prevention programs.

Many would expect small- and medium-size companies to be more socially responsible the bigger firms. They normally treat their workers as a capital resource encouraging their participation in the decision making process. They usually have only one or two hierarchical level within the organization. Many times the owners of these small companies are also employees or workers. As companies get bigger the more bureaucratized they usually become. Larger firms or their subsidiaries normally have the obligation to act in the interests of their shareholders which most of the times are located in places far away from the plant location. The decision making process is normally done through a several layer hierarchical structure not encouraging employee participation.

This, however, is not what is happening in Mexico. We know, for example, that most of the companies that have established in Mexico pollution-prevention programs are big companies, mainly subsidiaries of international corporations, and have based their programs in principles and administrative practices of their corporations. These large companies are investing to modernize their facilities, improving at the same time their environmental performance.

However many small and medium-sized enterprises (SME´s) have practically not yet established pollution-prevention programs and are in general more concerned with pollution control and compli-

ance of environmental regulations than with pollution prevention. Even waste disposal has become too expensive for these small companies which fail to comply with the regulations. In general, SME´s do not have the resources or the expertise to implement environmental programs and they also seem to perceive that pollution prevention is costly. A challenging task for Border Institutions would be to develop awareness programs to convince the owners and managers of these small companies that a healthy economic performance is strongly linked to social responsibility.

The proper disposal of municipal and industrial solid wastes is becoming one of the most important environmental issues in the Border Region. The lack of adequate disposal is inducing the proliferation of disease, the contamination of water, and the pollution of the air. The amount of waste in the Border Region continue to grow but there are very few facilities that can presently receive, treat, and dispose of wastes properly, and, there has been very little investment in environmental infrastructure compared to border's needs.

Financing pollution prevention efforts can also pose a problem for small and medium-sized manufacturers. Lenders generally associate pollution prevention with environmental management practices, which are usually costly, and prefer instead to lend money to more traditional activities such as plant expansion and installations of capital equipment. It is important to work with lenders to make pollution prevention programs more evident to them in terms of their financial returns. It is necessary to have more financial aid packages and fiscal incentives available to promote pollution prevention for SME's.

It is also necessary to improve the federal tax structure. More of the taxes should remain at the municipal level and be dedicated to finance the much-needed environmental infrastructure and other needs.

Within companies, managers and other employees that work in areas that have naturally more contact with the community were more inclined to value social responsibility. For example, purchas-

ing, sales, public relations, legal, environmental, and marketing departments will manifest attitudes that are more socially-responsible than areas or departments that have little contact with the community, such as production, maintenance, accounting, etc.

In the case of individuals, there are basically two opposite situations, they either have or not an orientation to social responsibility. People tend to believe in social responsibility but quite often their decisions do not reflect their belief. Appropriate decisions are more likely to happen when social responsibility is part of their value system. Therefore, education and training, as well as dissemination of information, are the kinds of measures that can be directed at people to change their orientation to social responsibility.

In general, social responsibility comprises the economic, legal, and ethical expectations that society has of organizations, institutions, and individuals at a given point in time. There are social costs that society at large must bear when a company moves into or out of a border community. The question is "Who pays these social costs?" The answer depends upon the company's social concerns, the local communities' resources, and the support of the federal, state and municipal governments. What every border community would like to have is a minimum level of education, health care, and housing, a healthy environment and food for every person.

Migration to the border.

> *The family is the natural and fundamental group unit of society and is entitled to protection by society and the State.*
>
> *Everyone has the right to freedom of movement and residence within borders of each State.*

A larger population in the Mexico-U.S. border is becoming a problem, as more is necessary to spend on basic necessities-food, housing, clothing, education, etc. Small communities normally have better standards of living. This rapid population growth in the border

could turn into a national security issue as the migrations of people from the rest of the country could foster the proliferation of disease, social disruption, political fragmentation, competition for scarce resources, etc.

Many of these people migrate from poor rural areas south of the border, where they had left behind their communities, and their families, to look for better opportunities in the Mexican border or even across the border into the U.S. This situation worsen last year when a generalized drought and forest fires caused major losses in the agriculture, cattle and fishing industries in the whole country.

This migration from rural areas to the northern border is also related to the poor performance that Mexican agriculture has had under the NAFTA. Mexican farmers could not compete with U.S. farmers in large part because most agricultural products in Mexico, such as corn, are grown on tiny parcels of land and farmed by hand and also because the NAFTA opened the doors to cheap corn from the United States and Canada. In this case, free trade has increased dependency of Mexico on imported grains. The NAFTA also has not permitted sufficient levels of Mexican products to enter the U.S. market.

Despite this, Mexico is still the most important exporter of fresh fruits and vegetables to the U.S. market, providing around 75 percent, or around U.S.$7.5 billion dollars of these products. While this amount may seem insignificant compared to manufactured goods exports to the U.S., it is much more significant in terms of the number of people involved.

The two countries need to work together to develop policies and programs focused on overcoming the technological disadvantage of Mexican farmers and on securing this important source of agricultural products for both Mexico and the U.S. Economic development and prosperity depend also on preserving a reasonable flow of the vital services provided by natural ecosystems. Therefore, it is important to develop and implement a sustainable development management framework that makes possible the creation of profit with care of the environment and in general with social responsibility.

Non Governmental Organizations (NGO's).

No one may be compelled to belong to an association.

The participation of NGO's in this effort is extremely important, either as policy advocates or by providing technical assistance, education and training, as well as disseminating information. NGO's active participation ranges from the efforts of national advocacy organizations targeting industry sectors, to local initiatives targeting specific communities, particular businesses, or specific issues such as the environment, human health, human rights, water supply, etc.

The NGO's, particularly along the U.S./Mexico border, may also play a role in making enforcement practices tougher. Many groups have been working actively to establish community "right-to-know" programs and other means of monitoring illegal environmental practices.

Pollution Prevention.

Everyone has duties to the community in which alone the free and full development of his personality is possible.

Most of the environmental efforts in Mexico, and in general in the NAFTA region, over the last 30 to 40 years have been oriented towards environmental regulation and using control and command mechanisms. The pollution prevention approach began to gain acceptance more recently. Nevertheless, pollution prevention remains a slow process in the NAFTA region and public and private spending on this field is still low.

In fact, pollution control initiatives compete with the conditions for pollution prevention at that moment of establishing priorities and budgets. They also have influenced the regulatory programs in the NAFTA countries. Environmental issues also compete for public attention and priority with other social, political and economic issues. This situation is perhaps more evident and critical in Mexico than in the U.S.

In general, there is little experience in the whole NAFTA region in relation to the application of economic instruments to pollution prevention. However, some economic instruments have been used such as: Deposit/refund schemes, as for example for beverage containers; Product charges as for example in used-tires; Legal liability to deter potential polluters; Direct regulation such as the bans on the use of specified substances and requirements to use the best available technologies; and Subsidies such as, accelerated depreciation, tax credits or other fiscal benefits. Little has been done, however, to put in place instruments for environmental protection such as emission charges, and tradable permits.

In addition to developing tax incentives to help stimulate investment in pollution prevention programs and in pollution control equipment. It is important for border communities to enact laws to restrict the use of land in order to balance economic development, environmental management, and natural resources conservation and protection.

Inadequate solid and hazardous waste management practices now rivals deforestation and air pollution as Mexico's main environmental problems. Hazardous waste disposal companies have suffered innumerable setbacks. While hazardous waste is the jurisdiction of the federal government, land use laws might be federal, state or municipal, thus giving rise to possible conflicts of power between state, federal and municipal authorities, local community groups and environmental advocates.

Enforcement of environmental laws and regulations.

The Mexican environmental policy and regulations has focused more on enforcement and sanctions than in promotion of pollution prevention activities and measures. But even enforcement is a complex task in Mexico, mainly because there is a lack of a consistent and uniform system of enforcement standards, lack of useful information and long-term planning, as well as the problem of corruption. Law enforcement in Mexico is administrative in nature, with the predominance of non-judi-

cial forms of law enforcement. Administrative agencies, rather than courts, have considerable authority for determining whether laws are violated and, if so, the remedies that should be imposed.

The trend current trend in Mexico is to give state and local governments greater responsibility in regard to environmental policy-making and enforcement. Currently, the 31 states have environmental legislation and statutes but the bulk of policy-making is still carried out at the federal level.

The environmental policies and actions are conducted under a strategy of decentralization for environmental and natural resources management. The objective is the strengthening of the local management capacity, especially at the municipal level, and the broadening of social participation. A key component of the decentralization programs is the induction of regional planning for the exploitation of resources, oriented through the local knowledge and recognition of the specific characteristics of such resources.

In addition to the present state environmental duties, each federal entity and each specific environmentally critical zone is invited to establish an ecological zoning of its territory with the legal capacity to enforce the environmental laws.

It is the responsibility of both the state government and the municipality to carry out the required actions for pollution prevention and control, including the installation of control equipment for generators. Both the state and the municipalities are also responsible for carrying out inventories

Concerns over the use and protection of fresh water supplies.

Mexico's economy grew strongly after the 1994 crisis, and should see record GDP growth in 1999, and maybe also in 2000, even considering the forthcoming presidential elections.

However, private participation in the water and wastewater sector in the Border Region is still in an early stage. Most systems are still

operated by local governments and require significant subsidies. Mexico is slowly developing a market for integrated municipal concessions in larger municipalities.

Still, there is a greater concern, the use and protection of the fresh water supplies in the border Region.

Nearly all of the border areas between the Baja California region and east to the Sierra Madre Oriental receives less than 250 millimeters of rainfall per year (10 inches of rainfall yearly). Only the mountainous areas receive enough rain to support agriculture without irrigation. The majority of the border area in the Gulf of Mexico Coastal Plain Region receives between 300 and 500 millimeters (12 to 20 inches) precipitation yearly, with the eastern coastal area receiving up to 1000 millimeters (39 inches) annually.

It has not been established yet to what degree it may be feasible to increase the usage of the available water supply of the border region; indeed, under the current status, the limit may have already been exceeded. The ecosystems of Mexico's border region are more precarious and more subject to irreversible damage than the more robust ecosystems of the U.S., which has significantly greater water resources than Mexico.

Therefore, in view of the limited water supplies, a bi-national effort is required to guarantee the water supplies in the border region. The U.S., for example, enacted, a few years ago, a Water Desalination Act, focused primarily on its southern states. It is necessary to emulate this on the Mexican side. This would require strong political support to be successfully implemented and sustained but this is an enormous challenge for border communities nowadays.

Local communities will have to find out the types of industries and technologies that are most compatible to their long-range sustainable development. It would seem that this issue has, so far, not been well addressed.

Water may be more of a constraint to future food production in Mexico than land, a situation which is similar to other agricultural

regions such as northern China, India, the western part of the United States, and most of the Middle East.

The condition of workers.

> *Everyone, without any discrimination, has the right to equal pay for equal work.*
>
> *Everyone who works has the right to just and favourable remuneration ensuring for himself and his family an existence worthy of human dignity, and supplemented, if necessary, by other means of social protection.*
>
> *Everyone has the right to rest and leisure, including reasonable limitation of working hours and periodic holidays with pay.*
>
> *Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.*

Open unemployment in Mexico in May 1999 was 2.7% but the purchasing power of workers is low. Workers in Mexico have lost at least 50% of their purchasing power during the last two decades, thus not being able to guarantee the basic sustenance of their families.

Workers quit their job very often. Indeed, they may quit one company today and be hired tomorrow by a nearby company. This will take place even if they do not get higher wages out of the move.

Around sixty percent of the Mexican labor force now lives in poverty up from 34 percent in the pre-NAFTA decade. Wages have been falling for nearly two decades. Only from 1993 to 1999 wages have decreased 16.8% while consumer prices have increased almost 200%.

Mexico has the lowest compensation of major industrialized nations. Average hourly compensation for workers in Mexico in 1998 was U.S.$1.51 per hour compared with the U.S.$17.20 in the United States (or Germany U.S.$31.88, Japan U.S.$23.66, and Korea U.S.$7.40). It is difficult to cover with such a low income of U.S.$1.51 per hour the basic needs of a family, including food, housing, utilities, transportation, health care, clothing, child care, and personal care, not considering at this moment that they also need extra money for other expenses and emergencies.

In the U.S. a person would have to work full time at U.S.$13 dollars per hour in order to cover these basic needs but workers actually earn on average U.S.$17.20. This leaves U.S.$4.2 per hour for savings, recreation, or medical or other emergencies.

In Mexico workers can barely buy the necessities of life with U.S.$1.51 per hour. The situation is even worse when we consider that this compensation is actually nearly 4 times the minimum wage in the border area of U.S.$0.40 per hour.

Even with these low wages, the Maquiladora industry is the number two source for jobs in all of Mexico and the number of jobs it provides has increased around 12 % per year over the last ten years. It provides employment and some sort of economic stability for the Mexican workers. However, young people generally leave their work after a few months or a year because the salary is so low.

It is clear that a huge problem of the border region is how to integrate the high-wage economy of the United States (today the stronger and perhaps healthier economy in the world) with the low-wage emerging economy of Mexico, with a large percentage of its labor force living in poverty. It is difficult to promote social responsibility with these types of inequalities. Therefore, It is necessary to bring investment but with social consciousness. It is important to give incentives to employment but also to improve wages.

The Mexican government has the opportunity to include some strategies for improvement of wages now that is working to extend the existing tariff structure for imports along the border, to the year

2002. The reason for considering more intensive and extensive changes is that the current Maquiladora program will come to an end in the year 2001.

Maquiladoras that are not members of the NAFTA (e.g. operating with Asian or European capital) will be given four more years to increase their local product content to the NAFTA levels. In 2001, Maquiladoras will be allowed to sell 100 percent of their output in the Mexican market if they wish to but will have to pay tariffs on inputs and machinery imported from outside the NAFTA region. Today, only 75% of output can be sold locally.

The future of the Maquiladora program is currently unclear. However some people thing that under the NAFTA it will require only minor changes or adjustments in order to leave the basic incentives for the industry or it will be extended under a different name.

Others believe that the Maquiladora industry must transform itself into a global center of knowledge about its products or processes. However, this new type of organizational structure, will need not only higher wages but also better training and education of their employees to make sure they have the right aptitudes, competencies and attitudes.

The question is how to avoid the situation where capital moves from high wage to low wage countries leaving behind an unbalanced economy and probably also financial collapse as it did happen with many Asian economies recently.

Human rights.

> *Everyone has the right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment.*

The international Bill of Human Rights recognizes civil and political rights but also social and economic rights. Even though there is more dissemination of information in relation to civil and political

human rights (e.g. Kosovo), social and economic human rights are also very important (e.g. Chiapas). People require minimum levels of food, housing, medical care and education.

The international Bill of Human Rights recognizes, among others, the following social and economic human-rights: Own property; Social security; Work, under favorable condition; Rest and leisure; Food, clothing and housing; Health care and social services; Education; Participation in cultural life; Protection of minority culture; Freedom of thought, conscience and religion; Equal pay for equal work.

Work, under favorable conditions.

Many workers, particularly women, are exposed to toxic chemicals, or are subject to difficult working postures and repetitive movements during their work hours with machinery and tools, or are subjected to high noise levels. Because of these conditions, many people suffer rashes, headaches, depression, nervousness and other disorders. Many of these workers receive little or non-training on protective measures. Many of them have been working through community groups in order to pressure industry to improve plant safety, and to get better living standards by investing in roads, housing and childcare centers. NGO's have established local teams that are promoting in particular women's health at the workplace and in the community.

The right to know.

> *Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.*

Mexico does not currently have a law that is comparable to the U.S. Emergency Planning and Right- to- Know Act (EPCRA). However, the NAFTA side agreements, moreover, make provisions for public participation and public information with regards to environmental matters.

The consequences of environmental degradation are often suffered unevenly by socially and economically disadvantaged groups. It is necessary to develop laws, regulations, and policies in Mexico for the fair treatment of people of different incomes, races, cultures, education, etc. Fair treatment implies that no person or group should bear a disproportionate share of the negative environmental (or social) impacts resulting from industrial or other type of activities.

Toxic release reporting requirements were established both in the U.S., with the Toxic Release Inventory (TRI) in 1986, and in Canada, with the National Pollutant Release Inventory (NPRI) in 1991. Mexico is in the process of establishing its own system.

It is necessary to increase public accountability in Mexico. Public accountability should be part of the commitment to social responsibility.

The federal, state and municipal governments, as well as industry, NGO's, and other border institutions have a collective responsibility to society.

Housing.

There is not enough affordable housing to satisfy the great need of the Border Region, therefore workers will naturally move to another job, particularly if they find it with nearby housing.

The sustainable development criteria of the BECC.

A good example of border initiatives that take into consideration social responsibility are the type of projects supported by BECC and NADBank. BECC supports projects in areas such as: water pollution, wastewater treatment and municipal solid waste.

Projects submitted to the BECC will be will be mainly; and will be evaluated based on the following sustainable development criteria

- Holistic approach to natural resource management
- Natural resource sustainability.
- Energy sources
- Energy efficiency

- Negative direct environmental impact at project site
- Voluntary environmental mitigation enhancement measures
- Contamination reduction.
- Prevention of contamination at project sites.
- Monitoring and enforcement.
- Human health issues.

Recommendations for action.

(a) The business community will need to learn how to advance in this new socially-conscious environment by establishing more fluent, coalitions with different groups, including state, federal and municipal authorities, local community groups, NGO's, and environmental advocates. The success of this endeavor and the vigor, congruence, and integrity of these coalitions will decide the health and stability of the Border Region's economy in a socially responsible manner.

(b) Among the most critical challenges facing the border communities and their individuals, organizations and Institutions are the conservation, restoration and wise management of the Border region resources.

(c) In view of the limited water supplies, a bi-national effort is required to guarantee the water supplies in the border region. The U.S., for example, enacted a Water Desalination Act. It is necessary to emulate this on the Mexican side.

(d) At the federal level there are many initiatives that can be push forward, primarily through the political process. Examples of these are the promotion of civil rights and democratic structures, the legal recognition to give to state and municipal governments greater responsibility in regard to policy-making and law enforcement; and the inclusion of local community needs in the development of national economic policy.

(e) The two countries need to work together to develop policies and programs focused on overcoming the technological disadvantage of Mexican farmers and on securing this important source of

agricultural products for both Mexico and the U.S. Economic development and prosperity depend also on preserving a reasonable flow of the vital services provided by natural ecosystems. Therefore, it is important to develop and implement a sustainable development management framework that makes possible the creation of profit with care of the environment and in general with social responsibility.

(f) The participation of NGO's is extremely important in promoting social responsibility in the border region, either as policy advocates or by providing technical assistance, education and training, as well as disseminating information.

(g) Although there is a growing awareness within industry in the NAFTA region about the importance of pollution prevention, the economic benefits of pollution prevention are still not well understood. Even when many companies have implemented pollution-prevention programs, these initiatives are frequently scattered and disconnected. Pollution prevention is still not perceived by industry in the Border Region as an opportunity for business improvement.

(h) Financing of pollution prevention programs can be a problem for small and medium sized companies. Lenders, still preceive pollution prevention as costly with the most costly and prefer instead to lend money to more traditional activities such as the purchase of equipment.

(i) In addition to developing tax incentives to help stimulate investment in pollution prevention programs and in pollution control equipment. It is important for border communities to enact laws to restrict the use of land in order to balance economic development, environmental management, and natural resources conservation and protection.

(j) A huge problem for the border region is how to integrate the high-wage economy of the United States with the low-wage emerging economy of Mexico. It is difficult to promote social responsibility with these types of inequalities. Therefore, It is necessary to bring investment but with social consciousness. It is

important to give incentives to employment but also to improve wages.

(k) The Mexican government has the opportunity to include some strategies for improvement of wages now that is working to extend the existing tariff structure for imports along the border, to the year 2002.

(l) It is necessary to increase public accountability in Mexico. Public accountability should be part of the commitment to social responsibility.

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Endnotes

1. Dr. Alberto Bustani, is currently the Dean of the School of Engineering and Architecture at the Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM. He was from 1992 to 1997 the Director of the Center for Environmental Quality also at ITESM. He is a Chemical Engineer (1976, ITESM) and has a PhD (1987, University of Sheffield) and is a full-time professor of the Chemical Engineering Department,of which he was Chairman until February of 1992. Priorly, he served at a steel company in Monterrey

2. Maquiladoras are in-bond assembly or manufacturing plants that can be wholly or partially owned and managed by a non-Mexican company. A Maquiladora uses competitively priced Mexican labor to assemble, process or perform manufacturing operations. Maquiladora must temporarily import most component parts from the United States or other countries. Mexican law allows these operations to bring in most capital equipment and machinery from abroad. Maquiladoras are generally labeled labor-intensive cost centers with most production geared toward export from Mexico. Under Mexican law, Maquiladoras can manufacture a board array of products. Exceptions to the law include petroleum, petrochemical, other chemicals, weapons and item with radioactive elements.

Appendices

- List of Participants
- About The Aspen Institute
- About LEAD
- Selected Bibliography

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About The Aspen Institute

The mission of the Aspen Institute is to enhance the quality of leadership through informed dialogue about the timeless ideas and values of the world's great cultures and traditions as they relate to the foremost challenges facing societies, organizations, and individuals. The Seminar Programs enable leaders to draw on these values to enrich their understanding of contemporary issues. The Policy Programs frame the choices that democratic societies face in terms of the enduring values and ideas derived from those traditions. The Program on Energy, the Environment, and the Economy (EEE Program) convenes leaders of business, government, academia, environmental groups, and other non-governmental organizations to engage in civil discourse about policy issues specific to these three areas..

EEE uses candid, not-for-attribution dialogue among a diverse range of stakeholders to help them discover the values and interests of their colleagues in order to develop innovative policy alternatives. The process of discovery in the context of specific environmental issues facilitates the reach beyond positions to identify interests in common that help move participants from ideas to better decisions and actions. At minimum, leaders take from these dialogues improved skills in civil dialogue, increased understanding of the full range of subject issues, insights into and increased understanding of others' interests, and networking grounded in the genuine exchange

of ideas. At best, a set of recommendations can emerge for dissemination to a larger audience, and as a basis for action. Previous projects have resulted in business, environmental, and government leaders overcoming a history of confrontation to develop proposals for new environmental policies and practices. These were not necessarily experts, although they listened to experts; rather they were leaders with a desire to achieve results and a willingness to engage in a collaboration designed around intentional, values-based dialogue to try to discover new approaches to longstanding problems.

The dialogue on the Mexico-US Border complements other projects of the EEE Program, particularly the *Series on the Environment in the 21st Century,* a multi-stakeholder dialogue which has made recommendations in the following reports, *The Alternative Path, A Cleaner, Cheaper Way to Protect and Enhance the Environment, The Stewardship Path to Sustainable Natural Systems,* and *Uncovering Value:Integrating Environmental and Financial Performance.*

About Lead

Leadership for Environment and Development, or LEAD, was created to help meet the need of the next generation of leaders to create and implement policies that reflect the link between economic prosperity, a healthy environment and social equity.

There are currently 12 affiliated chapters of LEAD encompassing some of the most populous and economically dynamic areas of the world. LEAD chapters include: Brazil, Canada, China, the Commonwealth of Independent States, Europe, India, Indonesia, Japan, Mexico, Nigeria, Pakistan and six countries in Southern Africa. El Colegio de Mexico is the host institution for LEAD-Mexico.

Once annually, each LEAD Member Program selects 15 promising young mid-career professionals, aged between 28 to 40 years, to take part in an intensive international training program. Participants, or LEAD Associates, have opportunities as a Cohort, to explore e a variety of issues related to environment and development during and after the formal LEAD training period.

The primary responsibilities of LEAD-Mexico with respect to this dialogue are to advise in the planning and help disseminate and present our results particularly in Mexico. In addition, LEAD-Mexico and El Colegio's participation in the Aspen Institute Dialogue on the Mexico-US Border will provide an opportunity to expand its cur-

riculum. To disseminate and present the results in future LEAD sessions will give associates and colleagues the opportunity to update their information and knowledge on border governance issues and on the importance of transboundry interaction by multiple stakeholders.

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