OVERVIEW OF THE PRINCIPAL ISSUES AND THEMES

Economic and population growth in the U.S.-Mexico border area has had a significant effect on urban and regional air quality. Today, air pollution presents a significant environmental risk in some border communities. Many border residents are frequently exposed to elevated concentrations of carbon monoxide, sulfur dioxide, ozone, and particulate matter. Emissions from industrial sources; residential combustion (heating and cooking); trash burning; and cars, trucks, and buses and dust from unpaved roads are significant contributors to poor air quality. In some border communities, inhalation exposure to toxics, including pesticides, is another concern. In addition, air pollutant emissions within and outside the border region also threaten visibility in some border protected areas, such as Big Bend National Park, Texas.

Formal binational efforts between the United States and Mexico to protect and improve air quality in the border region began with the signing of two annexes to the *La Paz Agreement*.[1] Annex IV, signed in 1987, outlines a sulfur dioxide emission limit for border copper smelters. Annex V, signed in 1989, directs the United States and Mexico to assess the causes of and develop solutions to air quality problems in border sister cities. In addition to the *La Paz Agreement*, the Clean Air Act, as amended in 1990, authorizes the U.S. Environmental Protection Agency (EPA), in cooperation with its counterpart Mexican agencies, to monitor and improve air quality in regions along the border. The 1996 *Ley General del Equilibrio Ecológico y la Protección al Ambiente* (LGEEPA, or General Law of Ecological Balance and Environmental Protection) enables Mexico's *Secretaría de Medio Ambiente, Recursos Naturales, y Pesca* (SEMARNAP, or Secretariat of Environment, Natural Resources, and Fisheries) to work to improve air quality in cities and the international border areas of the country.

Air

OBJECTIVES OF THE AIR WORKGROUP AND PROGRESS TOWARD GOALS

Since 1984, the workgroup has endeavored to protect air quality in border cities through air quality planning and management activities, such as developing emissions inventories; deploying, operating, and maintaining air monitoring networks; and designing air quality plans to reduce and control air pollution. The workgroup, which is co-chaired by EPA and Mexico's *Instituto Nacional de Ecología* (INE, or National Institute of Ecology), was created to promote regional and border-wide strategies to improve air quality. The workgroup's goal is to implement those strategies to achieve U.S. and Mexican health-based ambient air quality standards. To achieve that goal, the workgroup identified the eight objectives listed in table 4-1 in the *1996 U.S.-Mexico Border XXI Program: Framework Document (Framework Document)*.

The workgroup focuses its efforts in three geographic areas of priority, because of the larger populations and severity of the air pollution problem in those locations: San Diego County, California-Rosarito and Tijuana, Baja California;

Objectives

- Develop air quality assessments and improvement programs to attain air quality standards in border communities.
- Continue to build institutional infrastructure and expertise in the border region through technical assistance, training, and information and technology transfer.
- Encourage the ongoing involvement of local communities.
- Review and recommend the implementation of air pollution abatement strategies that do not require extensive technical evaluation.
- Study the potential for economic incentive programs to reduce air pollution faster and more cost-effectively than "command-and-control" methods.
- Explore the development of a new source notification protocol between the United States and Mexico.
- Pursue the development of an energy and air quality subworkgroup.
- Pursue the development of a subworkgroup on border vehicle congestion.

The objectives listed above may have been paraphrased from the Framework Document. For a more detailed description of the objectives, please refer to that report.

The objectives described in this section may be referred to by number. The numbers are intended for ease of reference only and do not imply order of importance.

Table 4-1

[1] The *Agreement between the United States of America and the United Mexican States on Cooperation for the Protection and Improvement of the Environment in the Border Area* was signed in La Paz, Baja California Sur, Mexico on August 14, 1983, and entered into force on February 16, 1984.

Imperial Valley, California-Mexicali, Baja California; and El Paso County, Texas-Ciudad Juárez, Chihuahua-Doña Ana County, New Mexico. Short-term air quality monitoring and pollutant exposure studies also are being conducted in Nogales, Arizona-Nogales, Sonora and Douglas, Arizona-Agua Prieta, Sonora. In addition, air quality monitoring is being conducted in the lower Rio Grande Valley. The workgroup also has conducted a preliminary analysis of how long-range air pollution transport impacts visibility in the Big Bend National Park-Sierra del Carmen area. Finally, the workgroup has addressed border-wide air quality issues, such as vehicle congestion and the relationship between energy generation and air quality.

Progress Toward Goals

Table 4-2 presents the objectives addressed by each geographic area, program, or project. Table 4-3 on the following page summarizes the ambient parameters measured by the Border XXI air monitoring networks.

Progress Toward Objectives by Geographic Area or Project

Geographic Area/Project	Air Quality Assessments and Improvement Programs	Institutional Infrastructure	Local Involvement	Abatement Strategies	Economic Incentives	Development of New Source Notification Process or Protocol	Analysis of Energy and Air Quality	Analysis of Border Vehicle Congestion
San Diego County-Tijuana-Rosarito	•	•	•					
Imperial County-Mexicali	•	•	•	•				
Tecate, California-Tecate, Baja California	•							
Nogales-Nogales	•	•	•					
Douglas-Agua Prieta	•	•	•					
El Paso County-Ciudad Juárez-Doña Ana County	•	•	•	•	•			
Brownsville and Laredo, Texas	•							
Emissions Inventory Methodology	•	•	•					
Energy and Air Quality	•	•	•	•			•	
Border Vehicle Congestion	•	•	•	•				•
Air Pollution Training Program for Mexico		•	•					
New Source Notification						•		
Big Bend Air Quality	•							
California-Baja California Intensive Air Quality Monitoring Study	•							
Annex IV Report	•							
Air Pollution Training Program for Senior Managers		•						

• Indicates objective addressed

Table 4-2

Border XXI Air Monitoring Station Measured Parameters

Border City or State/County	PM-10	PM-2.5	SO_2	CO	NO_x	O_3	Pb[3]	Air Toxics[4]	Meteorological Parameters
El Paso County, Texas	●	●	●	●	●	●	●	●	T/RH/WS/WD/SR/UV
Doña Ana County, New Mexico	●	●	●		●	●			WS/WD
Ciudad Juárez, Chihuahua[1]	●			●		●			T/WS/WD
San Diego County, California	●		●	●	●	●	●	●	T/WS/WD
Tijuana and Rosarito, Baja California[1]	●		●	●	●	●	●	●	T/WS/WD
Imperial County, California	●		●	●	●	●	●	●	T/WS/WD
Mexicali, Baja California[1]	●		●	●	●	●	●	●	T/WS/WD
Nogales, Arizona	●	●							T/WS/WD
Nogales, Sonora	●	●							T/WS/WD
Douglas, Arizona	●	●							T/WS/WD
Agua Prieta, Sonora	●	●							T/WS/WD
Yuma, Arizona[2]	●	●				●			T/WS/WD
San Luis Río Colorado, Sonora									
Big Bend National Park			●		●	●			T/RH/WS/WD
Laredo, Texas		●		●		●	●		T/WS/WD
Nuevo Laredo, Tamaulipas			●		●	●			T/WS/WD
Lower Rio Grande Valley Area	●		●	●	●	●	●		T/WS/WD

[1] Additional air monitoring stations are expected to be added to monitor for PM-2.5 in Mexicali and Tijuana and Rosarito. A lead air monitoring station also is planned for Ciudad Juárez.

[2] At the time this report was prepared, Yuma had one PM-10 air monitoring station. At that time, a similar study in Nogales-Nogales and Douglas-Agua Prieta was being planned.

[3] High-volume PM-10 samplers are used to gather data on lead.

[4] For a list of air toxics monitored, see the Information Center on Air Pollution (CICA) home page at *www.epa.gov/ttn/catc/cica*

T = Temperature; WS = Wind speed; WD = Wind direction; RH = Relative humidity; SR = Solar radiation; UV = Ultraviolet radiation; PM-10 = Particulate matter less than 10 microns in diameter; PM-2.5 = Particulate matter less than 2.5 microns in diameter; SO_2 = Sulfur dioxide; CO = Carbon monoxide; NO_x = Oxides of nitrogen; O_3 = Ozone; Pb = Lead

Table 4-3

San Diego County-Rosarito-Tijuana, Tecate-Tecate, and Imperial County-Mexicali Air Programs

Through the workgroup, EPA and SEMARNAP have initiated and conducted binational air quality planning and management activities in the sister cities of San Diego-Tijuana; Tecate, California-Tecate, Baja California; and Imperial County-Mexicali. The focus of recent efforts has been to establish and operate air quality monitoring networks in Tijuana and Rosarito and Mexicali that are similar to those operating in San Diego County and Imperial County.

In 1996, the workgroup launched the Rosarito-Tijuana Air Quality Monitoring Network in cooperation with the California Air Resources Board (CARB), the *Instituto Tecnológico de Tijuana* (Institute of Technology at Tijuana), state and local representatives of Tijuana and Rosarito, and the *Universidad Autónoma de Baja California* (Autonomous University of Baja California). In 1997, the workgroup collaborated with CARB, the Imperial Valley Air Pollution Control District, the Western Governors' Association (WGA), the *Instituto Tecnológico de Mexicali* (Institute of Technology at Mexicali), the *Universidad Autónoma de Baja California,* and municipal and state government in Baja California to launch the Mexicali Air Quality Monitoring Network.

These air quality monitoring efforts are intended to lay the foundation for a binational air quality management program with the overall goals of determining ambient air pollutant concentrations, determining contributing emission sources and their relative impacts, recommending cost-effective control strategies, and measuring progress and compliance with the health-based national ambient air quality standards of each country.

In February 2000, a binational group, the Binational Border Air Quality Alliance, was formed, with a membership of 20 citizens from each country. Members include local officials from San Diego County, Rosarito, and Tijuana, as well as representatives of nongovernmental organizations in those areas. The objective of the alliance is to recommend air quality issues to state and federal authorities and to the Border XXI Air Workgroup.

Also in February 2000, the three levels of the Mexican government launched a program to improve the ambient air quality of Mexicali between 2000 and 2005, the primary objective in addressing the air quality problems of the city.

The local level binational participation that has occurred in the San Diego County-Tijuana-Rosarito and Imperial County-Mexicali air programs has helped build institutional infrastructure and increase expertise in air quality planning and management.

In late 1998, the workgroup, after hearing the concerns of the public regarding air quality in the Tecate-Tecate region, decided to launch a one-year study of the Tecate-Tecate region to determine whether there were any air pollutants of concern. However, because of power outages, consistent data were not always obtained. Therefore, the area will be monitored for an additional year to obtain enough data to evaluate. Assessment of the area should be completed later this year.

Nogales-Nogales and Douglas-Agua Prieta Air Programs

As a result of increases in population, vehicular traffic, and industrial activity in the Nogales-Nogales air basin, there was a need to evaluate levels of air pollutants in that area. For that reason, eight monitoring stations operated on both sides of the border from 1994 to 1995. Six of the stations were capable of measuring particulate matter less than 10 microns in diameter (PM-10), particulate matter less than 2.5 microns in diameter (PM-2.5), and meteorological parameters, while four of the stations were capable of measuring air toxic pollutants. After one year of intensive sampling, four stations (two on each side of the border) were left in place to continue monitoring for PM-10 and PM-2.5.

The general public has been involved in this air program in a number of ways. First, local public concern regarding a myeloma cancer cluster prompted the subworkgroup to include air toxics monitoring in the one-year study. In addition, the Ambos Nogales Subworkgroup conducted a series of meetings to obtain public input on the site location for the monitoring stations. The public was further involved in (1) determining the location of an air monitoring station on Carrillo Street in Nogales, Arizona, where the local community believed the epicenter of the myeloma cluster was located, and (2) selecting some of the air toxics for which the air should be analyzed. Volunteers from the community also participated in the subworkgroup and facilitated the collection of PM-10 and PM-2.5 air monitoring filters. Following the air monitoring study, an emissions inventory was completed for Nogales-Nogales in 1997.

At the request of the local community, a similar study was conducted in the Douglas-Agua Prieta area to determine the concentrations of ambient air contaminants on both sides of the border. The first phase of the *Study of Airborne Particulate (PM-10) and Toxic Substances in Douglas-Agua Prieta*, completed in 1997, determined the most appropriate location for the air monitoring stations. The stations were established in January 1999. Air quality monitoring was completed in February 2000. Field work on the emissions inventory of the region began, with completion expected in late 2000. Analysis of the air sampling data also is currently underway.

El Paso County-Ciudad Juárez-Doña Ana County Air Program

The workgroup continues its efforts to improve air quality in the El Paso County-Ciudad Juárez-Doña Ana County area of the border, known as the Paso del Norte region. This binational community of almost two million people is frequently exposed to air quality that does not meet U.S. and Mexican health-based standards for ozone (O_3), particulate matter (PM), and carbon monoxide (CO).

Under the workgroup, EPA and INE led the planning and analysis efforts to complete comprehensive air quality assessments in the shared air basin. Federal, state, and local authorities have performed both long- and short-term air monitoring, developed emissions inventories, and performed air quality modeling exercises. This work, initiated in 1989, created an area-specific mobile source emissions model, as well as a study of population exposure to PM-10 and associated emission sources. The *1996–1997 Paso del Norte Ozone Study*

created a comprehensive emissions, air quality, and meteorological data base for the airshed to allow air quality modeling for the entire air basin.

The *Paso del Norte Air Quality Modeling Study* will evaluate, through air quality modeling, the efficiency of potential binational ozone and carbon monoxide control strategies. Ambient concentrations and meteorological field data collected in the $1.6 million *1996–1997 Paso del Norte Ozone Study*, and the emissions inventories for El Paso County; Sunland Park, Texas; and Ciudad Juárez will be used for this exercise. The area-wide compilation of emissions inventories was completed in September 1998, under a cooperative program involving INE, EPA, and the Texas Natural Resources Conservation Commission (TNRCC).

Selection of Paso del Norte Air Quality Documents

Air Quality Management Program for Ciudad Juárez, 1998–2002. SEMARNAP. 1998.

Analysis of Meteorological and Air Quality Data for the 1996 Paso del Norte Ozone Study. Paul T. Roberts, Clinton P. MacDonald, Hilary H. Main, Timothy Dye, Dana Coe, and Tami Haste. Sonoma Technology, Inc. Under Subcontract to Science Applications International Corporation for EPA. September 1997.

Data Collected by 915-MHZ Radar Profilers and Surface Meteorological Stations During the 1996 Paso del Norte Ozone Study. Charles Lindsey, Scott Ray, Timothy Dye, Mark Arthur, Paul Roberts, and Charles Stuart. Sonoma Technology, Inc. Under Subcontract to Science Applications International Corporation for EPA. July 1997.

Data Collected by the STI Aircraft During the 1996 Paso del Norte Ozone Study. Jerry Anderson, Dave Wright, Bastian Shoell, and Paul Roberts. Sonoma Technology, Inc. Under Subcontract to Science Applications International Corporation for EPA. November 1996.

Hydrocarbon Source Apportionment for the 1996 Paso del Norte Ozone Study. Eric Fujita. Desert Research Institute. Prepared for EPA. March 1998.

Compilation and Evaluation of a Gridded Emission Inventory for the Paso del Norte Area. Tami Haste, Naresh Kumar, Lyle Chinkin, and Paul Roberts. Sonoma Technology, Inc. Under Contract to Pacific Environmental Services, Inc. for EPA. September 1998.

Winter Season Air Pollution in El Paso-Ciudad Juárez. Wayne Einfeld and Hugh Church. Sandia National Laboratories. Under Contract to EPA. March 1995.

JAC Strategic Plan. Joint Advisory Committee for the Improvement of Air Quality in the Paso del Norte Air Basin. May 1999.

Web Sites: www.ozonemap.org www.bordercleanair.org

All documents available through CICA at *www.epa.gov/ttn/catc/cica*

Table 4-4

A final report on the modeling will be completed later this year. The report will be shared with U.S. and Mexican policy makers for discussions about implementing recommended bilateral control programs in Paso del Norte that can help the region attain U.S. and Mexican health-based air quality standards. The workgroup also has supported local efforts to document haze intensity and movement in the Paso del Norte air basin through the use of video and digital cameras. To further public understanding of air pollution in the region, some of those images are being placed on the web site *www.ozonemap.org*. Table 4-4 lists a number of documents that provide information about air quality in the Paso del Norte air basin.

As part of these activities, EPA and INE have worked to increase technical capacity to institutionalize air quality control programs at the local level. In 1988, staff of the EPA, SEMARNAP/INE, the University of Texas at El Paso (UTEP), and TNRCC were trained in the use of the Comprehensive Air Quality Model with Extensions (CAMx) ozone-carbon monoxide air quality model. In the near future, EPA and INE will complete initial modeling runs that will indicate control programs that are likely to improve ozone and carbon monoxide air quality in the region.

One of the most important strategic achievements in the past three years has been SEMARNAP's establishment of the *Programa de Gestión de la Calidad del Aire de Ciudad Juárez 1998–2002* (Air Quality Management Program for Ciudad Juárez 1998–2002) in May 1998. Public- and private-sector entities were involved in the development of the program. The strategy outlines an extensive regulatory and policy agenda that would result in significant improvement in air quality control in Ciudad Juárez. In conjunction with state implementation plan (SIP) air quality management activities in El Paso County and Doña Ana County, the air pollution reduction priorities in the Ciudad Juárez air quality management program serve as the foundation for additional binational air quality improvement efforts.

In May 1996, EPA and INE committed significant resources to the effort to foster citizen participation in air quality improvement in the area by signing Appendix 1 to Annex V of the La Paz Agreement, which created the Joint Advisory Committee (JAC) for the Improvement of Air Quality in the El Paso County, Texas-Doña Ana County, New Mexico-Ciudad Juárez, Chihuahua Air Basin. This panel of 20 representatives of governmental and nongovernmental

agencies and organizations on both sides of the border prepares for the workgroup recommendations directed at solving the area's air quality problems. In 1999, the JAC completed a strategic plan outlining 26 priority actions for improving air quality. A selection of strategic priorities is presented in Table 4-5 on the following page. The JAC forwarded the recommended priorities to the workgroup for implementation. Some of the priorities, such as establishing the designated commuter lane (DCL) and distributing oxygenated gasoline in Ciudad Juárez, have been implemented.

Select JAC Strategic Priorities

Priority	Status
Enforce vehicle importation regulations	Options being developed
Strengthen vehicle inspection and maintenance	Options being developed
Promote DCL in 1999	Stanton Street Bridge DCL opened September 1999
Promote distribution of seasonally appropriate gasoline throughout air basin	Distribution of oxygenated gasoline for wintertime carbon monoxide season began in Ciudad Juárez in October 1999.
Conduct epidemiological studies to determine health effects of air pollution	Study in progress in El Paso
Develop health education program related to air pollution	Binational Ozone Action Day program initiated in summer 1999
Establish epidemiological surveillance program	Program in progress in Ciudad Juárez
Promote economic incentive mechanisms for air pollution control	Workshops held June 1996 and September 1999
Establish guidelines to promote and implement a clean air investment fund	Activity in progress

Table 4-5

Economic mechanisms have been discussed as a potential strategy to improve air quality in the Paso del Norte air basin. The Paso del Norte Air Quality Task Force has proposed that implementing economic incentives in the region may be a more cost-effective alternative for reducing emissions than traditional "command-and-control" measures. The Paso del Norte Air Quality Task Force is a binational, grassroots organization formed in 1993 with the objective of reducing air pollution and improving air quality in the Paso del Norte region. It also catalyzed the formation of the JAC. The use of economic incentives, and emissions trading in particular, is highlighted in the language of the *La Paz Agreement*. Since its inception, the JAC has held a workshop on International Supplemental Environmental Projects (ISEP). Promoting the use of economic instruments is also a priority under the JAC strategic plan. The Southwest Center for Environmental Research and Policy (SCERP) also sponsored a workshop in September 1999 on emissions trading within the air basin. The workgroup continues to explore the application of economic incentives in the binational context.

The workgroup has supported the efforts of the Paso del Norte Clean Cities Coalition to establish and operate the first binational ozone alert program to reduce the number of days on which ozone reaches unhealthy levels and to decrease the severity of the ozone episodes on days on which pollution levels exceed the standard. When the TNRCC predicts that meteorological conditions are favorable for producing high ozone, the Ozone Action Day Program coordinates notification of the community through employers, television, radio, and newspapers. Individuals are encouraged to take an active role in reducing their contributions to air pollution by carpooling, taking mass transportation, and reducing the number of vehicle trips they make. An integral part of the program is the ozone mapping software developed by Austin College under a cooperative agreement with EPA. The mapping software models the formation and transport of ozone throughout the binational air basin and displays color-coded ozone concentrations on a geographic information system (GIS) map of the airshed. The map is produced daily by UTEP and is available to the public on the Internet at *www.ozonemap.org*. Local television stations have used the map to supplement their weather programming.

Brownsville-Laredo Air Quality Program

Five new air monitoring stations have been established, one each in Brownsville, Mission, and Edinburg, Texas and two in Laredo, Texas. Although none of these areas currently violates the U.S. national ambient air quality standards, increased industrialization and truck traffic make it necessary to more closely track air pollution in the region.

Emissions Inventory Development Program in Mexico

In conjunction with the WGA, the workgroup initiated the Emissions Inventory Development Program in Mexico to help build capacity in that country. The development of

emissions inventories will provide Mexico with a better understanding of its own air pollution sources and will help form the basis for designing emissions control programs. To achieve that purpose, the *Mexico Emissions Inventory Methodology* was developed through a series of manuals that cover the basics of developing an emissions inventory and the need for and development of more sophisticated emissions inventories. In some cases, the initial volumes provided the basis for workshops held in Mexico before the entire program was completed.

The final work plan for the development of the entire methodology was completed in 1996. Training course materials and inventory manuals continue to be developed. General emissions inventory training was provided in Ciudad Juárez (August 1996) and Tijuana (November 1996), as well as in five other areas of Mexico outside the border region. Technical studies planned consist of five parts: special studies and refinement of inventory methodology, methodology testing, validation of emissions estimates, emission factor applicability to Mexico, and uncertainty analysis. Four of the five manuals have been translated into Spanish. To build Mexico's technical capability to develop emissions inventories, training course materials also were created in the final implementation plan of the project. Pilot methodology implementation projects with hands-on training were planned for Mexicali and Tijuana, where actual emissions inventories were to be developed as part of the training. The pilot program for Mexicali was completed, and the final emissions inventory report was presented to the Border Advisory Committee (a committee of emissions inventory experts from states in the border region, as well as representatives of SEMARNAP) in November 1999. Table 4-6 lists the documents included in the Mexicali program.

The pilot implementation for Tijuana was initiated in 1999. All the products resulting from the project are available on the U.S.-Mexico Centro de Información sobre la Calidad del Aire (CICA, or Border Information Center on Air Pollution) home page and the INE home page at *www.ine.gob.mx*, and will be available in both languages later this year.

Mexicali Emissions Inventory Methodology Documents

Product/Document	Description
Fundamentals	Fundamentals of emissions inventories
Basic Emission Estimating Techniques	Basic techniques for estimating emissions from various sources
Point Sources	How to develop emissions inventories for point sources
Area Sources	How to develop inventories for area sources
Motor Vehicles	How to develop inventories for mobile sources
Advanced Training Workbook	Taking all the techniques learned thus far and providing advanced training
Point Source Questionnaire	Questionnaire used to obtain emissions inventory information from major sources in Mexico
Database Options Analysis	An analysis of what options are available for Mexico to use as a data base for emissions inventories, and the various costs of implementing each
MOBILE-Mexico	A mobile source emissions estimation model based on MOBILE-5 and MOBILE-Juárez, customized for use anywhere in Mexico
Mexicali Emissions Inventory	An air pollution source emissions inventory for the Mexicali area

Table 4-6

Subworkgroup on Energy and Air Quality

The workgroup established the Subworkgroup on Energy and Air Quality, composed of representatives of government, the private sector, nonprofit organizations, and academic institutions. The subworkgroup was formed to identify actions to promote energy conservation and expand the use of alternative energy sources, such as renewables and clean fuels that would improve border air quality. The subworkgroup focuses on encouraging and facilitating sustainable or renewable energy projects, encouraging energy efficiency, and providing a data base of energy needs and resources in the border region. The subgroup has created a workplan, which is available at the WGA homepage at *www.westgov.org/wga/initiatives/border.htm*.

Subworkgroup on Border Vehicle Congestion

The workgroup and the WGA created the Subworkgroup on Border Vehicle Congestion to advise the workgroup on potential strategies to reduce vehicle congestion in border communities. The subworkgroup hosted a series of focus groups along the border in San Diego; Nogales, Arizona; El Paso; and Laredo to solicit input from stakeholders on how to solve the vehicle congestion problem. A meeting was held in San Antonio, Texas to present the results to border

decision makers. Recommendations developed by the sub-workgroup can be found on the WGA homepage at *www.west-gov.org/wga/initiatives/border.htm*.

U.S.-Mexico Border Information Center on Air Pollution

To provide technical assistance and information about air quality planning and management to government, academia, industry, and the general public in the border region, the workgroup established the CICA program in May 1995. The program, which is implemented by the Clean Air Technology Center of EPA's Office of Air Quality Planning and Standards, maintains telephone and facsimile services and has established a web site at *www.epa.gov/ttn/catc/cica*.

The site provides (1) access to air quality data from all monitoring sites in Mexico and the United States located within 100 kilometers of the border; (2) information about and access to CICA products and other available border-related air quality documents; (3) links to other border-related web pages; (4) information about how to navigate EPA web pages; and (5) an e-mail link for use in submitting requests and comments. Air quality data for both criteria and hazardous air pollutants are updated quarterly. Other information, including the *Mexico Emissions Inventory Workbook* and program manuals prepared by the WGA, is also available on the CICA site. More than 40 products can be downloaded from the web site in both English and Spanish. CICA has also funded two grants, one to monitor air quality in Tecate, Baja California and the other to study transportation issues in Ciudad Juárez.

Air Pollution Training Program for Mexico

Another priority of the workgroup is to build local capacity to manage air quality in border communities. The Air Pollution Training Program has played a significant role in achieving this objective. This program has coordinated the efforts of INE, EPA, the *Universidad Autónoma Metropolitana* (UAM, or Autonomous Metropolitan University), the University of Texas at Arlington (UTA), and the technological institutes of Matamoros, Tamaulipas; Ciudad Juárez; Nogales; and Tijuana to assess the training needs of local air quality managers. Results of the study helped partners identify the present and future air quality training needs of federal, state, and municipal employees in Tijuana; Nogales; Ciudad Juárez; Ciudad Acuña, Coahuila, and Matamoros, Tamaulipas. The *Air Pollution Training Blueprint* was subsequently developed, outlining specific priorities for fulfilling air pollution training needs. In addition, a core air pollution curriculum and train-the-trainer and course materials were developed and translated into Spanish. Training courses were delivered in the border region in 1996 and 1997. Table 4-7 lists the accomplishments of the Air Pollution Training Program.

New Source Notification Protocol

Since before the inception of the Border XXI Program in 1996, the workgroup has been addressing the issue of notifying impacted parties when proposing to site a new source of air pollution that could have cross-border air quality impacts. The workgroup wanted to use the air-related template from a multi-media agreement that was being developed at the tri-national level by the United States, Mexico, and Canada as a model for the new source notification protocol. Recently, progress has been slow on the trilateral agreement. However, the workgroup continues to focus on this issue.

Accomplishments of Air Pollution Training Program

Project/Workshop	Date
Air Pollution Training Needs Assessment for Tijuana, Nogales, Ciudad Juárez, Ciudad Acuña, and Matamoros	1996
Air Pollution Training Blueprint	1996
Control of Particulates Training Course	April 1996 - Tijuana June 1997 - Ciudad Juárez
Emissions Inventory Development Training Course	August 1996 - Ciudad Juárez
Training Course for Control of Gaseous Emissions	Activity in progress

Table 4-7

ENVIRONMENTAL INDICATORS

Many border area residents are exposed to health-threatening levels of air pollutants, including CO, nitrogen dioxide (NO_2), O_3, and PM with an aerodynamic diameter of 10 micrometers or less (PM-10). Evaluating levels of targeted air pollutants is a priority for EPA and SEMARNAP, especially in heavily populated urban areas where air quality problems are caused by emissions from vehicles, many of which are older and poorly maintained; extensive industrial activity; and numerous other sources, such as unpaved roads and solid waste disposal fires.

In this section, the workgroup provides updated information about the indicators for ambient concentrations for CO,

Criteria Air Pollutants and Associated Health Effects

Carbon Monoxide (CO)

Carbon monoxide binds to the hemoglobin in the blood, reducing delivery of oxygen to the body's tissues and organs. The health threat from exposure to lower levels of carbon monoxide is most serious for those who suffer from cardiovascular disease, such as angina pectoris. At much higher levels of exposure, carbon monoxide can be poisonous to healthy individuals. Visual impairment, reduced work capacity and manual dexterity, poor learning ability, and difficulty in performing tasks are all associated with exposure to elevated carbon monoxide levels.

Sulfur Dioxide (SO_2)

Sulfur dioxide is a gas emitted through the combustion of fuel containing sulfur (primarily, coal and oil), metal smelting, and other industrial processes. High concentrations of sulfur dioxide can result in temporary breathing impairment in asthmatic children and adults who are active outdoors. Short-term exposures of asthmatic individuals to elevated sulfur dioxide levels at moderate exertion may result in reduced lung function that may be accompanied by such symptoms as wheezing, chest tightness, or shortness of breath. Other effects that have been associated with longer-term exposures to high concentrations of sulfur dioxide, in conjunction with PM-10, include respiratory illness, alterations in the lungs' defenses, and aggravation of existing cardiovascular disease.

Together, sulfur dioxide and nitrogen oxides are the major precursors to acidic deposition (acid rain), which is associated with the acidification of soils, lakes, and streams; accelerated corrosion of buildings and monuments; and reduced visibility. Sulfur dioxide also is a major precursor to PM-2.5, which is a significant health concern, as well as a principal pollutant that impairs visibility.

Nitrogen Dioxide (NO_2)

A stifling, brownish gas, nitrogen dioxide is one of several highly reactive gases that belong to the group of nitrogen oxides. The major sources of man-made nitrogen oxide emissions are high-temperature combustion processes, such as those occurring in automobiles and power plants.

Short-term exposures (for example, less than 3 hours) to current nitrogen dioxide concentrations may lead to changes in airway responsiveness and lung function in individuals who have pre-existing respiratory illnesses and increases in respiratory illnesses in children (5 - 12 years old). Long-term exposures to nitrogen dioxide may lead to increased susceptibility to respiratory infection and may cause alterations in the lung. Atmospheric transformation of nitrogen oxides can lead to the formation of ozone and nitrogen-bearing particles, which are both associated with adverse health effects.

Nitrogen oxides also contribute to the formation of acid rain and a wide range of environmental effects, including potential changes in the composition and competition of some species of vegetation in wetland and terrestrial systems, visibility impairment, acidification of freshwater bodies, eutrophication of estuarine and coastal waters, and increases in levels of toxins harmful to fish and other aquatic life.

Ozone (O_3)

Ground-level ozone is not emitted directly into the atmosphere, but derives from reactions between nitrogen oxides and volatile organic compounds (VOC) in the presence of heat and sunlight. Peak ozone concentrations generally occur during hot, dry, stagnant summertime conditions. Common sources of VOCs include motor vehicles, chemical plants, refineries, factories, consumer and commercial products, and other industrial sources. Nitrogen oxides are emitted from motor vehicles, power plants, and other sources of combustion. Ozone formation is sensitive to variability in meteorological conditions. Ozone and precursor pollutants that cause ozone also can be transported into an area from pollution sources located hundreds of miles upwind.

Ground-level or tropospheric ozone should not be confused with stratospheric ozone, which occurs naturally and provides a protective layer high above the earth.

Ambient ozone exposures have been associated with increased hospital admissions and emergency room visits for respiratory causes. Repeated exposures to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate such pre-existing respiratory diseases as asthma. Other health effects attributed to ozone exposures include significant decreases in lung function and increased respiratory symptoms, such as chest pain and cough. These effects generally occur while individuals are engaged in moderate or heavy exertion. Children active outdoors during the summer when ozone levels are at their highest are most at risk of experiencing such effects. Other at-risk groups include adults who are active outdoors (for example, outdoor workers), and individuals who have pre-existing respiratory disease, such as asthma or chronic obstructive lung disease. In addition, long-term exposures to moderate levels of ozone present the possibility of irreversible changes in the lungs, which could lead to premature death or chronic respiratory illness.

Ozone also affects vegetation and ecosystems, leading to reductions in agricultural and commercial forest yields; reduced growth and survivability of tree seedlings; and increased susceptibility of plants to disease, pests, and other environmental stresses such as harsh weather. In long-lived species, those effects may become evident only after several years or even decades; therefore, there is a potential for long-term effects on forest ecosystems. Ground-level ozone damage to the foliage of trees and other plants also can decrease the aesthetic value of ornamental species as well as the natural beauty of national parks and recreation areas.

Particulate Matter (PM)

Particulate matter is the general term used for a mixture of solid particles and liquid droplets found in the air. Particles exist in a wide range of sizes and originate from many different sources. Fine particles, or PM-2.5 (particles less than 2.5 microns in diameter), result from fuel combustion from motor vehicles, power generating facilities, and industrial facilities, as well as from residential fireplaces and wood stoves. Coarse particles (particles larger than 2.5 microns in diameter and less than 10 microns in diameter) generally are emitted from vehicles traveling on unpaved roads, materials handling, and crushing and grinding operations, as well as windblown dust. Some particles are emitted directly from their sources, such as smokestacks and cars. In other cases, gases such as sulfur oxide and sulfur dioxide, nitrogen oxides, and VOCs interact with other compounds in the air to form fine particles. Their chemical and physical compositions vary depending on location, time of year, and degree of humidity.

Inhalable PM (PM-10, particles less than 10 microns in diameter) includes both fine and coarse particles. The particles can accumulate in the respiratory system and are associated with numerous health effects. Exposure to coarse particles is associated with the aggravation of such respiratory conditions as asthma. Fine particles are associated most closely with such health effects as increased hospital admissions and emergency room visits for heart and lung disease, increased respiratory symptoms and disease, decreased lung function, and even premature death. Sensitive groups that appear to be at greatest risk for such effects include the elderly; individuals who have cardiopulmonary disease, such as asthma; and children. Particulate matter is also the major cause of reduced visibility, and airborne particles can cause damage to paints and building materials.

Lead (Pb)

In the past, automotive sources were the major contributor of lead emissions to the air. As a result of regulatory efforts in the United States to reduce the content of lead in gasoline, the contribution from the transportation sector has declined over the past decade. Since 1997, Mexico removed lead from gasoline countrywide. Today, metals processing is the major source of lead emissions to the air.

Exposure to lead occurs primarily through inhalation of lead in air and ingestion of lead in food, water, soil, or dust. It accumulates in the blood, bones, and soft tissues. Lead can have adverse effects on the kidneys, liver, nervous system, and other organs. Excessive exposure to lead may cause neurological impairments, such as seizures, mental retardation, and behavioral disorders. Even at low doses, lead exposure is associated with damage to the nervous systems of fetuses and young children, resulting in learning deficits. Recent studies also show that lead may be a factor in high blood pressure and subsequent heart disease. Lead also can be deposited on the leaves of plants, presenting a risk to grazing animals.

Table 4-8

Types of Environmental Indicators

P	PRESSURE: ACTIONS OR ACTIVITIES THAT INDUCE PRESSURE ON THE ENVIRONMENT
S	STATE: ENVIRONMENTAL AND NATURAL RESOURCE QUALITY AND QUANTITY
R	RESPONSE: ACTIONS TAKEN TO RESPOND TO ENVIRONMENTAL AND NATURAL RESOURCE PRESSURES

Comparison of Mexican and U.S. Health-Based Ambient Air Quality Standards

	Mexico		United States	
Pollutant	Units	Average	Units	Average
Ozone (O_3)	0.11 ppm	1 hour	0.12 ppm	1 hour
Sulfur Dioxide (SO_2)	0.33 ppm 0.03 ppm	24 hours* Annual	0.14 ppm 0.03 ppm	24 hours Annual*
Nitrogen Dioxide (NO_2)	0.21 ppm	1 hour	0.25 ppm 0.053 ppm	1 hour Annual*
Carbon Monoxide (CO)	11 ppm	8 hours	9 ppm 35 ppm	8 hours 1 hour
TSP**	260 µg/m³ 75 µg/m³	24 hours Annual		
PM-10	150 µg/m³ 50 µg/m³	24 hours Annual*	150 µg/m³ 50 µg/m³	24 hours Annual*
Lead (Pb)	1.5 µg/m³	3 months*	1.5 µg/m³	3 months*

* Arithmetic mean
** Total suspended particulate - The EPA revoked the TSP standard when it adopted the PM-10 standard.
ppm = Total parts per million
µg/m³ = Micrograms per cubic meter

Because EPA revised the particulate matter and ozone standards, this table may be revised at a later time. The revisions include the use of a new PM-2.5 standard and a new 8-hour ozone standard. With the new standards, the EPA also has modified the method for determining whether an area should be re-designated to non-attainment status (that is, the extent of the exceedances rather than the frequency of the exceedances). While the new standards have been passed into law, they currently are not enforceable, under an order by the U.S. Supreme Court. Until the new standards become enforceable, EPA will publicize air quality data based on the new standards so the public need not wait for such information. In addition, the old standards will be enforced until the new standards are installed.

EPA also has published a standard for regional haze. The regional haze standard makes use of a deciview to determine improvement of visibility. However, at this time, the binational environmental indicators for this Border XXI report will be limited to standards that are similar for both countries.

Table 4-9

sulfur dioxide (SO_2), NO_2, O_3, PM, and lead (Pb). (Each pollutant is described in further detail in Table 4-8.) In addition, the section presents new information about those border cities that exceed ambient air quality standards (Table 4-9 compares Mexican and U.S. standards) and the number of exceedance days for each of those cities. Emissions inventory data also are provided for El Paso County, Ciudad Juárez, and Doña Ana County, as well as Imperial County and Mexicali.

The data represented in the graphics for the air indicators are taken from EPA's Aerometric Information Retrieval System (AIRS), CICA, and INE. The AIRS data were collected directly by state and local agencies and quality assured according to EPA guidelines. In addition, the data from the border region were collected through collaboration of the United States and Mexico.

Additional ambient air information for cities in the United States is available to the public through EPA's AIRS database. Binational air information is also available through AIRS and on the CICA and INE web sites at www.epa.gov/ttn/catc/cica and www.ine.gob.mx, respectively.

Criteria Pollutants and Associated Health Effects

On the preceeding page is a discussion of each of the criteria pollutants, including pollutant characteristics and known or potential human health and environmental impacts. Both the United States and Mexico set health-based ambient air quality standards, as listed in Table 4-9. These standards are set to protect public health with an adequate margin of safety.

S AREAS THAT EXCEED, OR POTENTIALLY EXCEED, AMBIENT AIR QUALITY STANDARDS

Table 4-10 on the following page lists areas that exceed or potentially exceed the ambient air quality standards for the six criteria air pollutants. This indicator suggests which cities have potentially harmful air quality problems.

S NUMBER OF EXCEEDANCE DAYS OF EACH AMBIENT AIR QUALITY STANDARD

Figures 4-1 and 4-2 on the following page present for 1997 and 1998, respectively, the number of days per year on which one or more exceedances of the air quality standard are measured. The data suggest the extent of the air quality problems in the border cities. It should be noted that the exceedances for PM-10 include all high-wind events, as well as anthropogenic events.

Figures 4-3 and 4-4 present the percent of the year each of the

Border Cities That Exceed or Potentially Exceed Ambient Air Quality Standards

Border Non-Attainment Areas	PM-10	SO_2	CO	NO_2	Pb	O_3
United States						
El Paso County, Texas	●		●			●
Doña Ana County, New Mexico	●					●
Imperial County, California	●					●**
San Diego County, California			●			●
Douglas, Arizona	●	●				
Nogales, Arizona	●					
Yuma, Arizona	●					
Mexico						
Tijuana, Baja California	●			●		●
Mexicali, Baja California	●		●	●		●
San Luis Río Colorado, Sonora*	●					
Nogales, Sonora	●					
Agua Prieta, Sonora	●					
Ciudad Juárez, Chihuahua	●		●			●

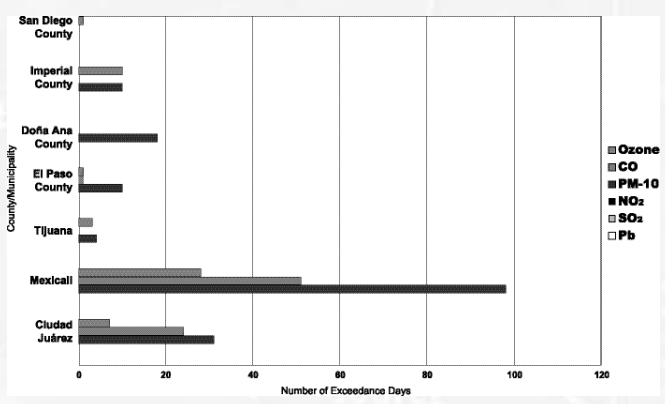
* San Luis Río Colorado has not been monitored at this time. However, because of its proximity to Yuma, Arizona, a PM-10 non-attainment area, the workgroup believes that San Luis Río Colorado experiences air quality problems similar to those of Yuma.

** The area currently is designated as a "transitional" non-attainment area for ozone. It is likely that the area will be redesignated to serious since the area continues to have ozone exceedances.

Table 4-10

Number of Exceedance Days

1997

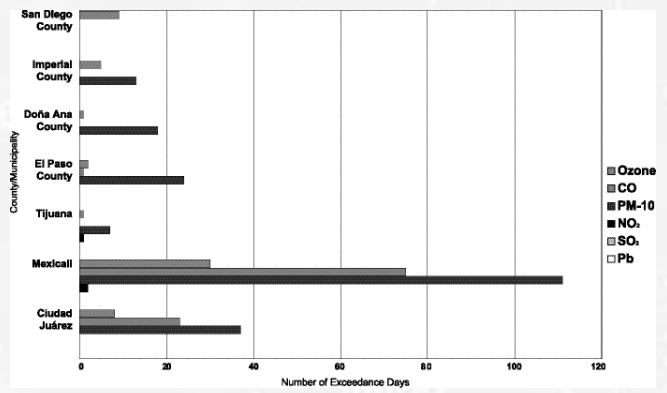


Information for Rosarito was not available at the time of publication.

Figure 4-1

Number of Exceedance Days

1998



Information for Rosarito was not available at the time of publication.

Figure 4-2

border cities studied had exceedances for 1997 and 1998, respectively.

As figures 4-3 and 4-4 illustrate, Mexicali exceeded the Mexican air quality standard for O_3 on 28 days in 1997 and 30 days in 1998. The CO standard was exceeded on 51 days in 1997, compared with 77 days in 1998. The PM-10 standard was exceeded on 34 days in 1997 and 30 days in 1998. The NO_2 standard was exceeded on 3 days in 1998 in Tijuana. In San Diego County, the only U.S. standard that was exceeded was that for O_3, on 1 day in 1997 and 9 days in 1998.

In the Paso del Norte air basin, Ciudad Juárez exceeded the Mexican air quality standards for O_3 on 7 days in 1997 and 8 days in 1998; the CO standard was exceeded on 24 days in 1997 and 23 days in 1998; the PM-10 standard was exceeded on 11 days in 1997 and 7 days in 1998. El Paso County exceeded the U.S. standard for ozone once in 1997 and twice in 1998; the CO standard was exceeded once in 1997 and once in 1998; the PM-10 standard was exceeded on 10 days in 1997 and on 24 days in 1998. In Doña Ana County, the ozone standard was exceeded on 1 day in 1998, and the PM-10 standard on 18 days in both 1997 and 1998.

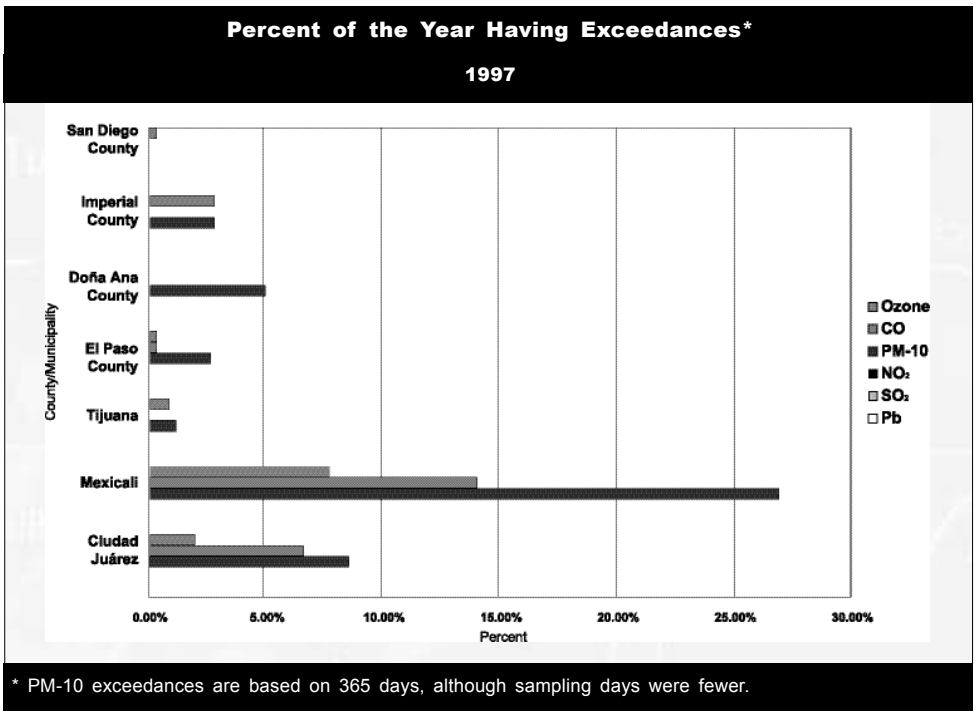


Figure 4-3

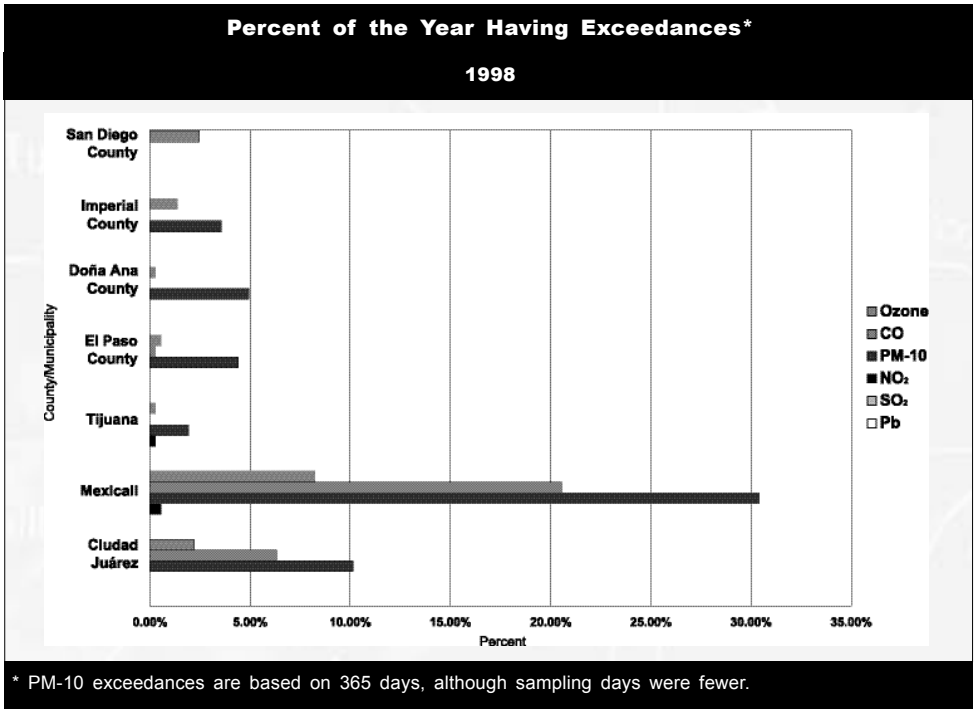


Figure 4-4

S AMBIENT AIR CONCENTRATIONS OF SELECT CRITERIA AIR POLLUTANTS

This indicator presents maximum monthly ambient concentrations for select pollutants in the three priority regions (figures 4-5 through 4-11).

The plot of maximum monthly ambient concentrations provides a visual representation of seasonal variations and annual trends for pollutants.

Mexico's reports *El Segundo Informe sobre Calidad del Aire en Ciudades Mexicanas 1996 (Second Report on Air Quality in Mexican Cities 1996), El Tercer Informe sobre Calidad de Aire en Ciudades Mexicanas 1998 (Third Report on Air Quality in Mexican Cities 1998), Programa de Gestión de la Calidad del Aire de Ciudad Juárez* (Air Quality Management Program for Ciudad Juárez 1998–2002),

Doña Ana County, El Paso County, and Ciudad Juárez
Maximum Monthly 24-Hour PM-10 Concentration

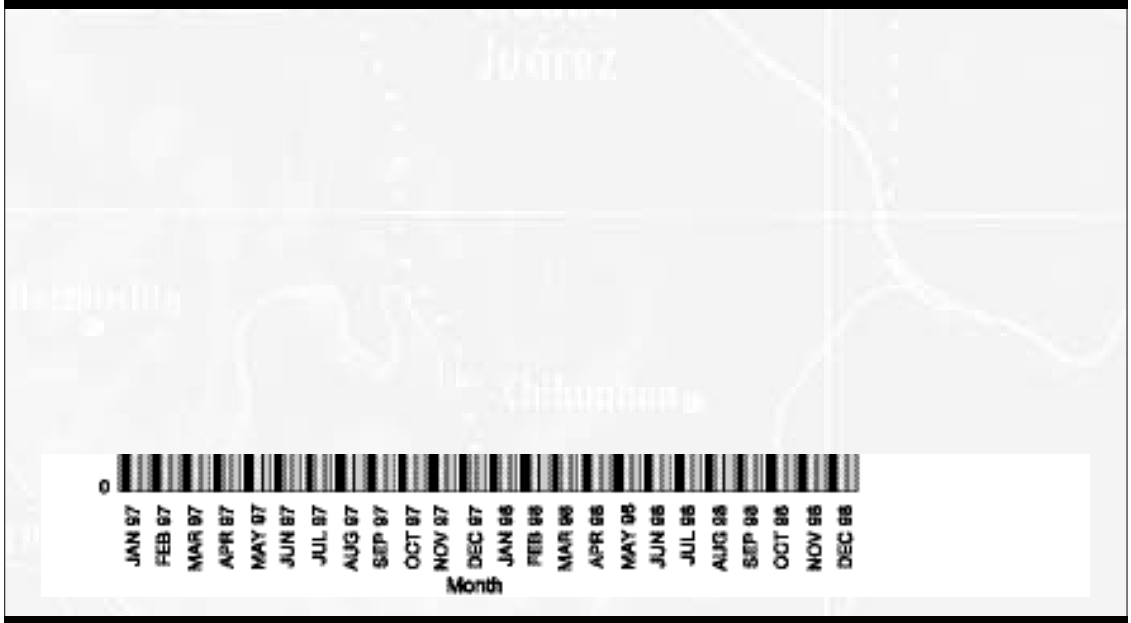
Standard = 150 µg/m³ for both United States and Mexico

PM-10 concentration values include high-wind events.
STD = Standard

Figure 4-5

Doña Ana County, El Paso County, and Ciudad Juárez
Maximum Monthly 1-Hour Ozone Concentration

0.12 ppm = United States standard; 0.11 ppm = Mexican standard

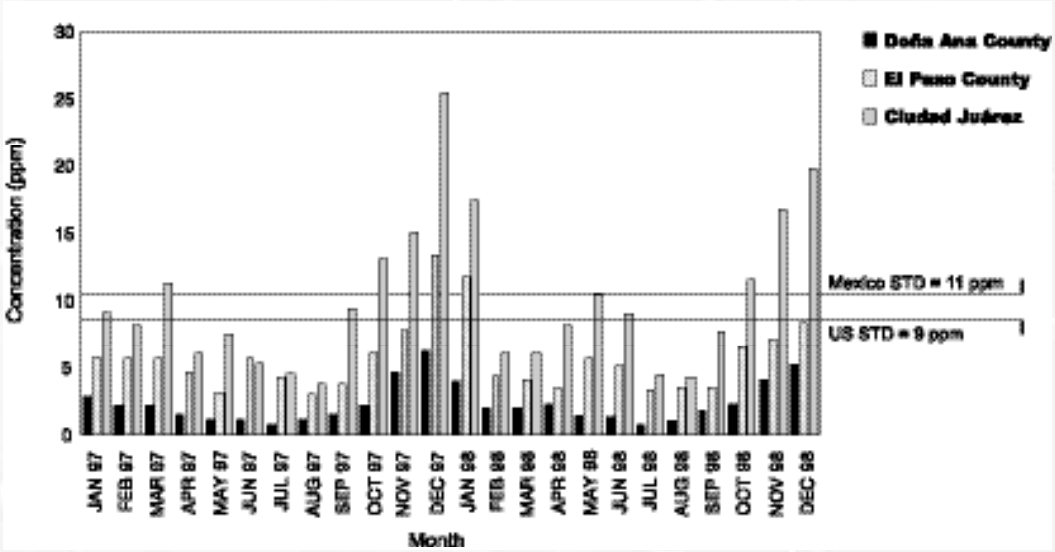


ppm = Parts per million
STD = Standard

Figure 4-6

Doña Ana County, El Paso County, and Ciudad Juárez
Maximum Monthly 8-Hour CO Concentration

9 ppm = United States standard; 11 ppm = Mexican standard

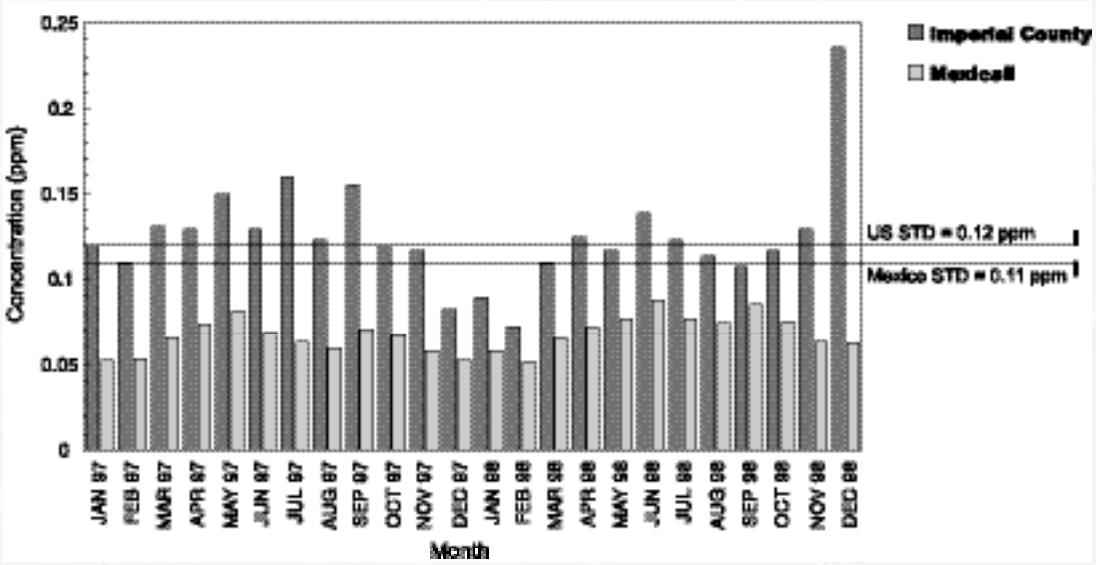


ppm = Parts per million
STD = Standard

Figure 4-7

Imperial County and Mexicali
Maximum Monthly 1-Hour Ozone Concentration

0.12 ppm = United States standard; 0.11 ppm = Mexican standard

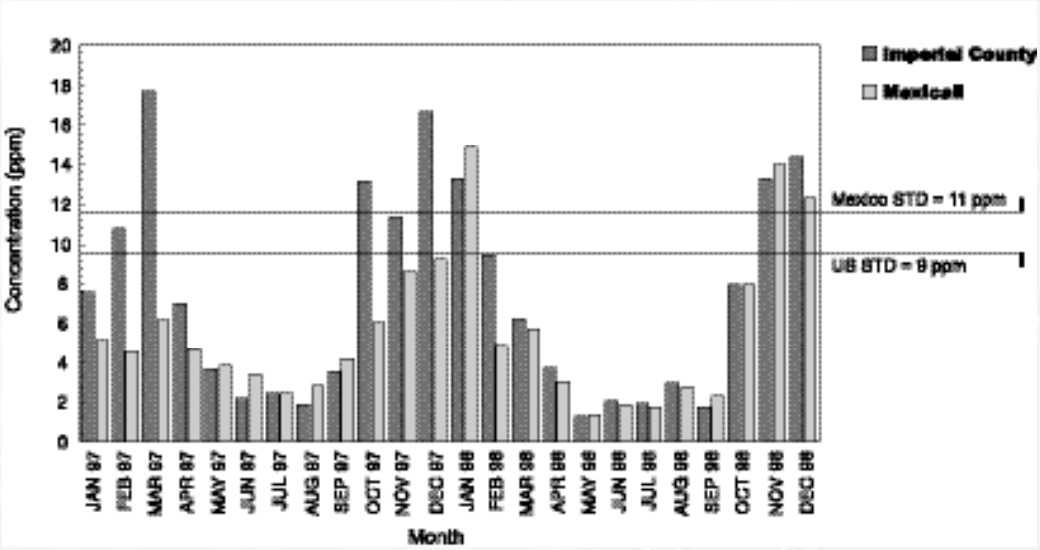


ppm = Parts per million
STD = Standard

Figure 4-

Imperial County and Mexicali
Maximum Monthly 8-Hour CO Concentration

9 ppm = United States standard; 11 ppm = Mexican standard

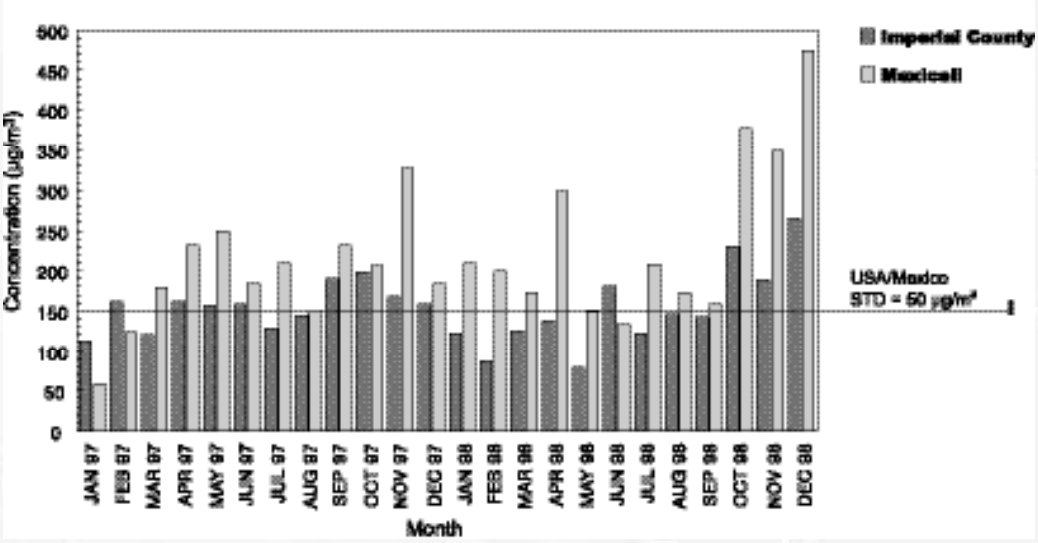


ppm = Parts per million
STD = Standard

Figure 4-9

Imperial County and Mexicali
Maximum Monthly 24-Hour PM-10 Concentration

Standard = 150 µg/m³ for both United States and Mexico

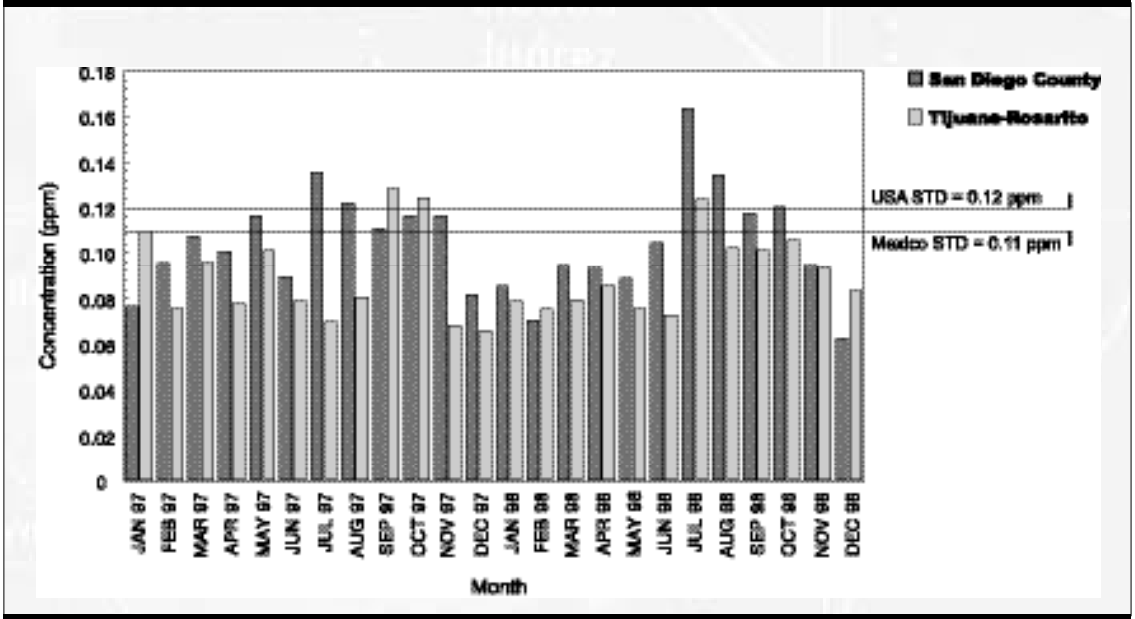


PM-10 concentration values include high-wind events.
STD = Standard

Figure 4-10

San Diego County and Tijuana-Rosarito
Maximum Monthly 1-Hour Ozone Concentrations

0.12 ppm = United States standard; 0.11 ppm = Mexican standard



ppm = Parts per million
STD = Standard

Figure 4-11

and *Programa para Mejorar la Calidad del Aire de Mexicali 2000–2005* (Air Quality Improvement Program for Mexicali 2000–2005) also provide important air quality information.

P EMISSIONS OF AIR POLLUTANTS

This indicator presents emissions contributions by source type in select border areas. The data provide information about which source types are the greatest contributors to air quality problems (Figures 4-12 through 4-32).

The emissions inventory data shown below for El Paso County-Ciudad Juárez-Doña Ana County are those for the 1996 inventory year. The emission inventory data shown for Mexicali and Imperial County are those for 1996 and 1997, respectively. The workgroup currently is preparing emissions inventories for the Tijuana-Rosarito-Tecate-San Diego County region. In addition, the workgroup, through the Arizona Department of Environmental Quality, has created an air emissions inventory for the sister cities of Nogales-Nogales and currently is working to create an emissions inventory for Douglas-Agua Prieta. Completion of that inventory is expected in 2000. Other sister city emissions inventories may be developed after the emissions inventories currently in progress have been completed.

El Paso County
1996 VOC Emissions Inventory

Total = 99 Tons per Day

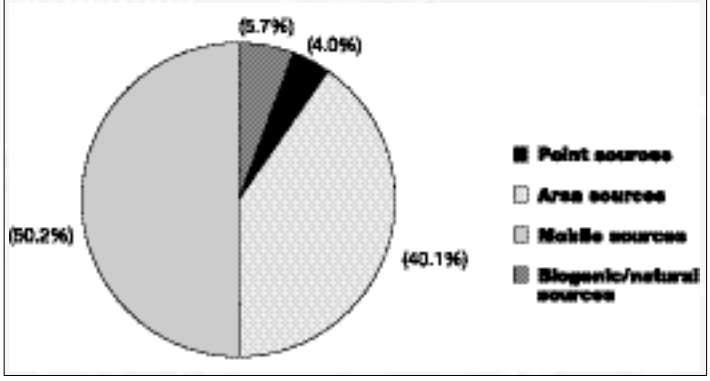


Figure 4-12

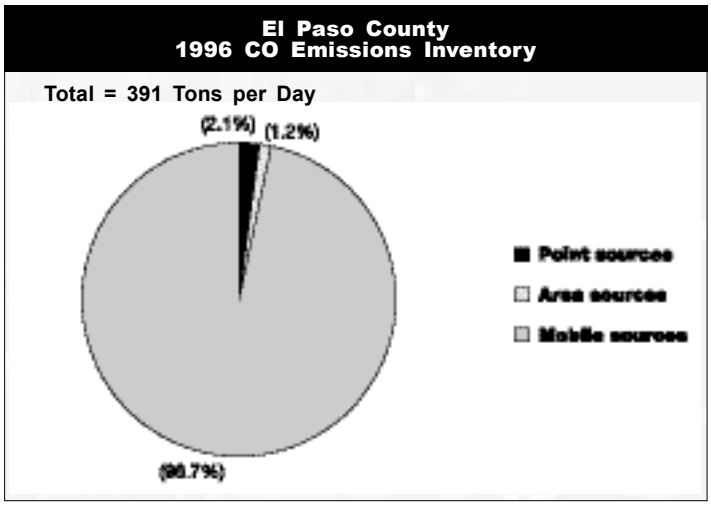
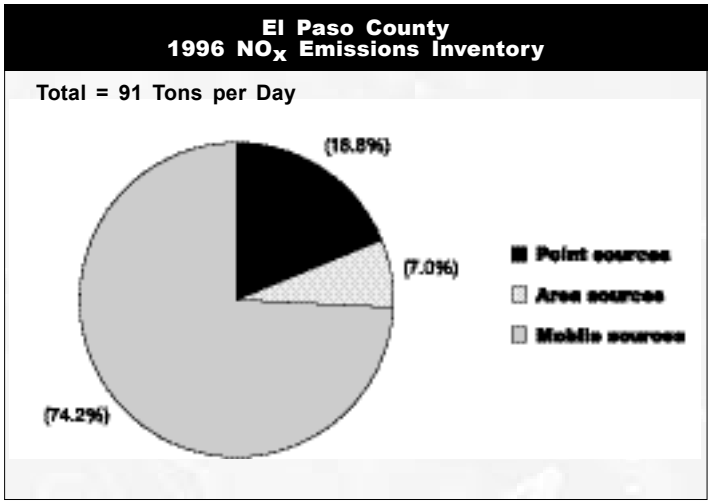


Figure 4-13



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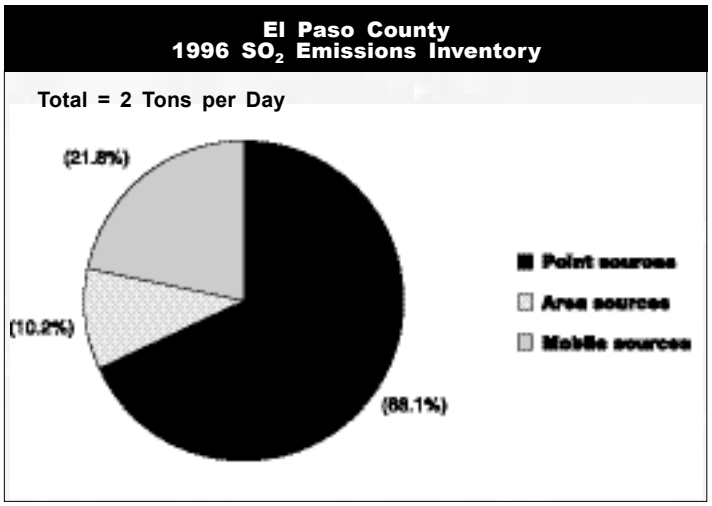

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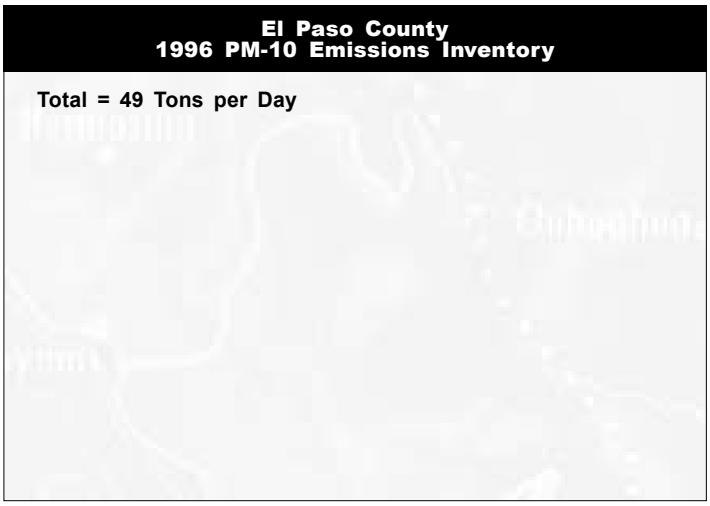

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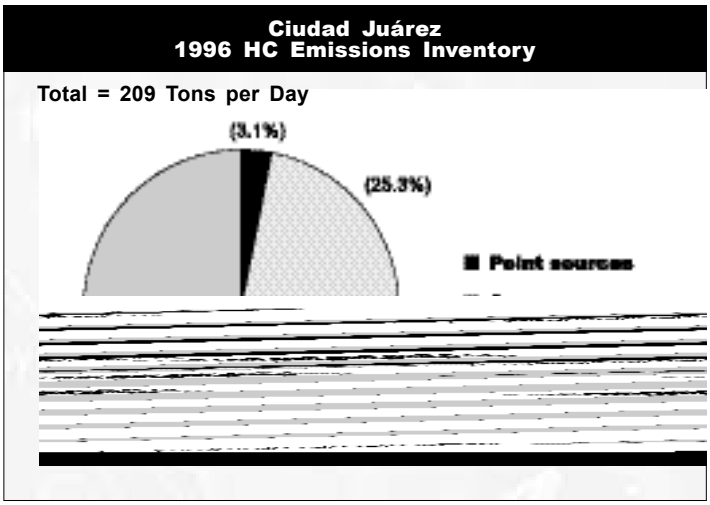

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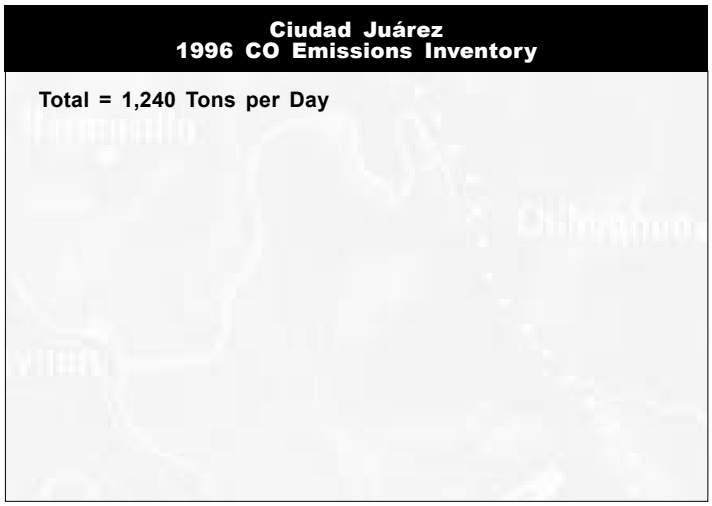

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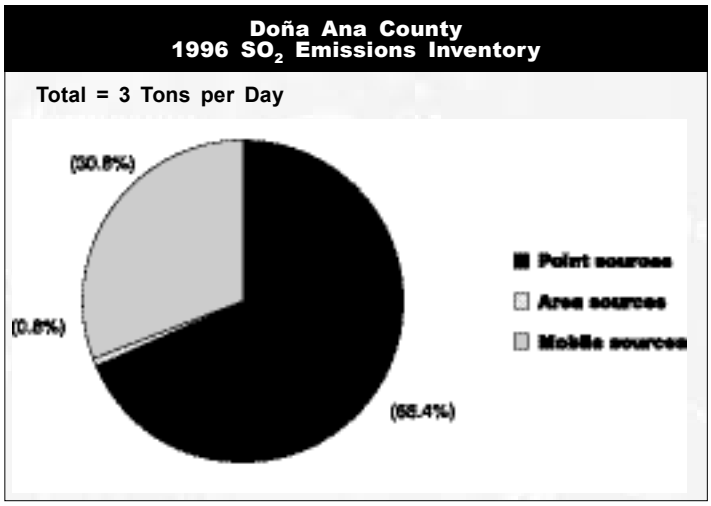

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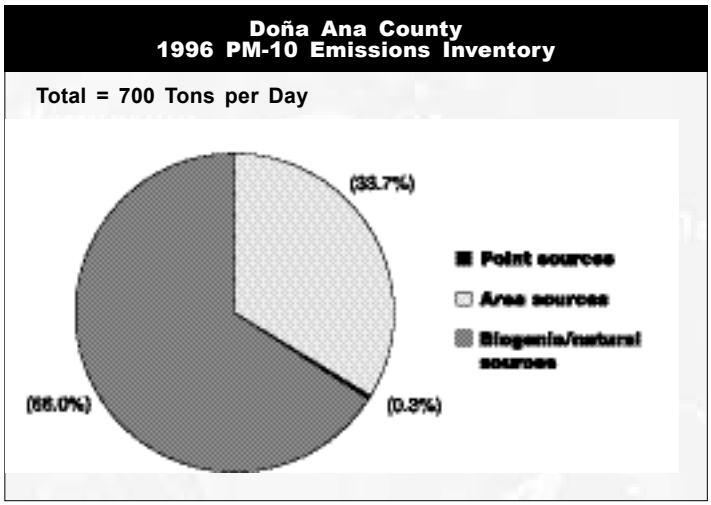

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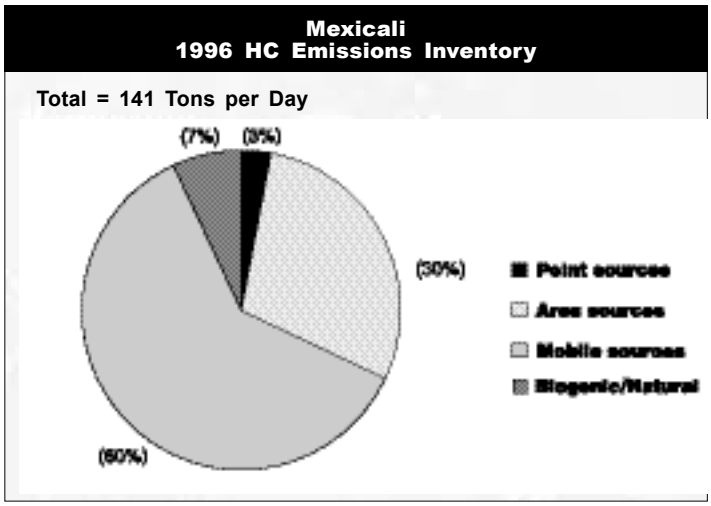

Figure 4-27

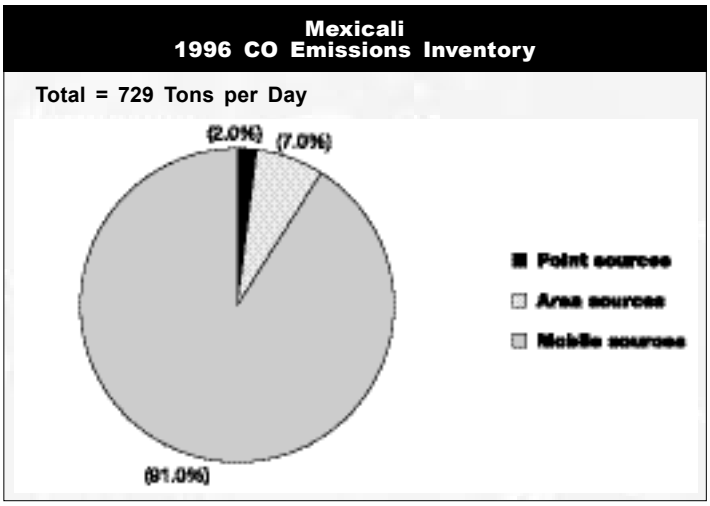

Figure 4-28

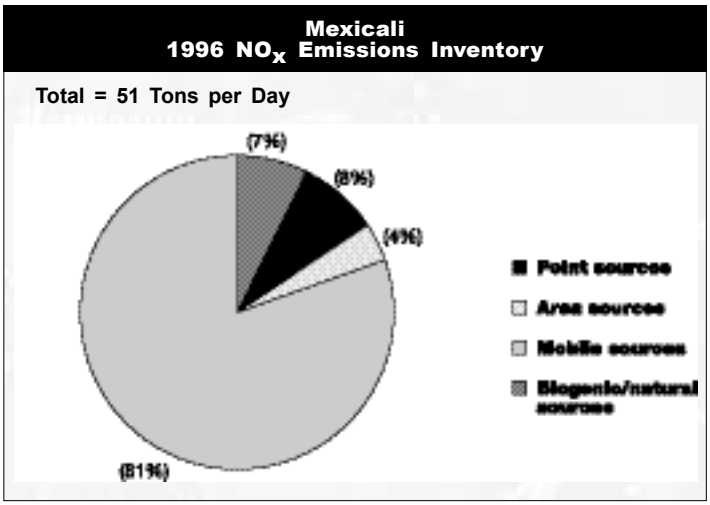

Figure 4-29

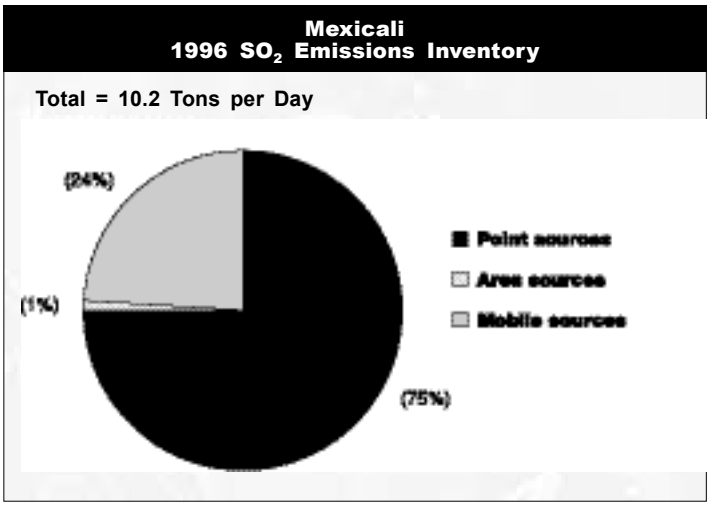

Figure 4-30

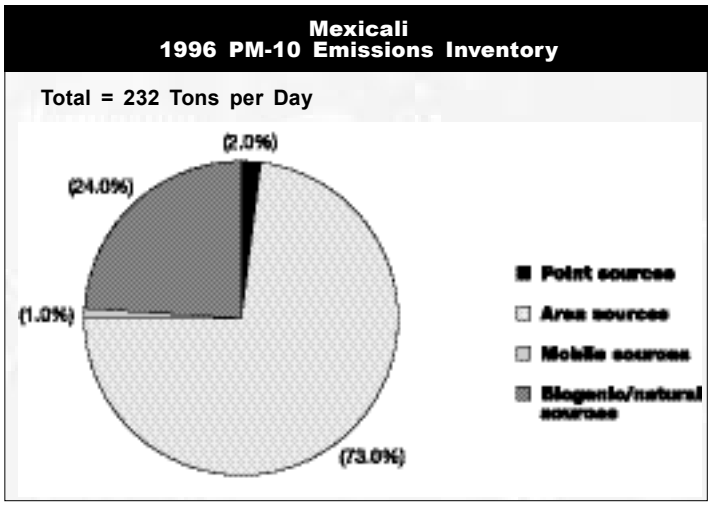

Figure 4-31

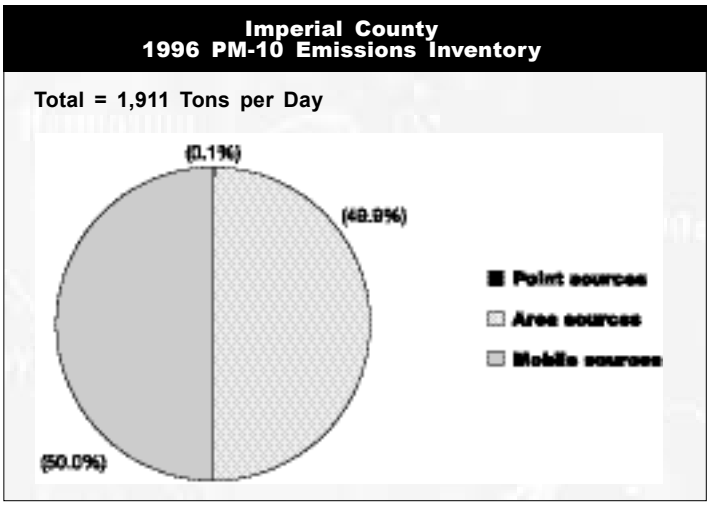

Figure 4-32

OTHER NOTABLE ACTIVITIES AND ACHIEVEMENTS

Big Bend Air Quality

Since the inception of the Clean Air Act of 1977, EPA has enforced a regulatory program to protect the visual aesthetic quality of pristine lands in the United States from the impacts of distinct stationary sources. In 1998, the program, known as the Regional Haze Program, was expanded to include impacts from other sources, some of which may be hundreds of miles from the protected lands.

The United States and Mexico agree on the broad need to protect and improve natural ecosystems and regions that span the U.S.-Mexico border. To that end, the workgroup has endeavored to identify the sources of regional haze that endangers visibility in the Big Bend region of Texas. EPA and the *Procuraduría Federal de Protección al Ambiente* (PROFEPA, or Federal Attorney General for Environmental Protection) designed a preliminary study of visibility, sampling 19 sites over a five-week period.

The field component of the pilot study took place in September and October 1996. In January 1999, the agencies reached agreement on basic conclusions about the issue and released a report to the public entitled *Big Bend National Park Regional Visibility Preliminary Study*. On the basis of limited field sampling and monitoring, the agencies concluded that visibility was being affected by sources on both sides of the border and that the amount that any particular source contributed to haze varied by season and meteorology.

The initial study provided enough information to allow the design of a broader study, upon which the agencies could base more definitive conclusions. In 1999, the United States conducted a more extensive study, the Big Bend Regional Aerosol and Visibility Observational Study (BRAVO) that included sampling of aerosols at 40 locations to measure the pollution that contributes to regional haze. To better ascertain which sources in which regions emit such pollution, EPA employed perfluorocarbon tracers to estimate dispersion of emissions over long distances.

In 2000, EPA and the U.S. National Park Service published the results of the BRAVO study in a preliminary report. A final report will be issued in 2001 (Table 4-11 lists documents and web sites that provide more information about air quality in the Big Bend region).

Big Bend Air Quality Documents and Web Sites

(Documents available through CICA at *www.epa.gov/ttn/catc/cica*)

Big Bend National Park Regional Visibility Preliminary Study. Big Bend Air Quality Workgroup. January 1999.

www.nature.nps.gov/ard/parks/bibe/usmexico.htm (Data from preliminary study).

Big Bend Regional Aerosol and Visibility Observational (BRAVO) *Study Conceptual Plan* (Draft), Marc Pitchford, Mark Green, and Hampden Kuhns. November 1997.

www2.nature.nps.gov/ard/bravo (BRAVO study home page).

Table 4-11

California-Baja California Intensive Air Quality Monitoring Study

In 1996, the workgroup decided that an intensive air quality study was needed to better understand the air quality transport process in the California-Baja California region. Therefore, the workgroup decided to undertake that effort through a two-phased project.

Phase I

In 1996, EPA and CARB planned to undertake a special monitoring study to provide the additional information required to understand ozone transport in the southern California region. The study, referred to as the 1997 Southern California Ozone Study-North American Research Strategy for Tropospheric Ozone (SCOS-NARSTO), was carried out between June 16 and October 15, 1997. The workgroup was able to leverage the efforts of the study by expanding the study to include the northern Baja California region within its modeling domain. The study entailed a meteorological and air quality study that supplemented the air monitoring data collected from the existing ambient air quality networks in Tijuana and Mexicali. One of the study's many objectives was to provide information about transport of pollutants in the California-Baja California border region.

The data collected during the field study will be used to support detailed photochemical modeling and analysis to obtain a better understanding of the processes involved in the formation of high ozone concentrations in the southern California and northern Baja California regions (see *www.arb.ca.gov/research/scos/scos.htm* for more details).

In addition to the data collected during the 1997 SCOS field study, CARB, through its contractor, collected ambient data in the Calexico, California-Mexicali, Baja California border region in September 1999. The additional data collection was a part of the workgroup's effort to conduct a volatile organic compound source apportionment study and emission inventory evaluation. The apportionment will be based on regionally specific source composition profiles developed for these studies and appropriate profiles used in past studies.

Phase II

In 1999, CARB, its subcontractor, and environmental officials of Mexico's federal, state, and municipal governments carried out a study to collect emissions and activity data for Mexican vehicles that cross the Mexico-California border at the following crossings: Otay Mesa, San Ysidro, and Calexico. The purpose of the study was to improve the mobile source emissions inventory along the California-Baja California border. The study, carried out in August 1999, included the testing of 240 Mexican-plated vehicles crossing the border.

The tests conducted will allow CARB to develop average gram-per-mile and gram-per-hour emission rates. Several variables that may have an impact on motor vehicle emissions were analyzed, including: (1) emission measurements under load and at idle and (2) characterization of vehicle age and technology distribution, driver behavior, and fuel properties. The information will help to establish the impact of cross-border traffic in the California-Mexico border region, provide tools for refining the process of forecasting future emission trends, and assist the cities of Tijuana and Mexicali in the development of strategies for emission controls. The information also will be used as a tool in evaluating mobile source inventories for the border region.

Therefore, the first phase of this supplemental study will provide an ambient hydrocarbon and meteorological data set for the Baja California area that can be integrated into the Southern California Ozone Study and that can be used to estimate uncertainties in the emissions inventory through source-receptor mathematical models. The primary objective of the Southern California Ozone Study is to develop a meteorological and air quality data set that will be used as input to a regional photochemical air dispersion model. The second phase of the supplemental study will provide information about the border region's mobile source inventory. The mobile source inventory is a critical input to the photochemical model. Data collected during this phase of the study will be used to validate the mobile source inventory for the border region.

Annex IV Report

At the workgroup meeting held in Mexico City in 1997, the non-governmental organization Border Ecology Project prompted the workgroup to evaluate how well Annex IV of the *La Paz Agreement* was meeting its objectives. As a result, the workgroup decided to provide resources to a contractor to conduct an independent study of Annex IV. The Annex IV report, entitled *Technical Basis for Appendices to Annex*

IV of the La Paz Agreement, had been drafted by late 1998. After EPA, SEMARNAP, and other interested parties commented on the draft document, a final report was prepared at the workgroup meeting in December 1999. Although the report concludes that Annex IV is meeting its objectives, it also provides recommendations for enhancing Annex IV by (1) including other sources of air pollution, and (2) providing additional requirements governing border copper smelters. At the December 1999 workgroup meeting, the co-chairs decided that the recommendations would be addressed in the following manner. First, all recommendations related to sources other than copper smelters would be addressed through the ongoing efforts of the workgroup under Annex V. Second, all recommendations related to enhancements of Annex IV would be addressed through a subgroup on Annex IV. The charge of the subgroup would be to determine the feasibility of the recommended actions and to determine whether these recommendations can be addressed through a mechanism that does not require major revisions of Annex IV. A copy of the report can be obtained at the CICA web site at *www.epa.gov/ttn/catc/cica*.

Development and Delivery of Workshops in Air Quality Management for Senior Managers in Mexico

The Air Workgroup recognized the need for a strategic training program that would deliver basic information desired by recently appointed senior managers and a need to design a process for providing timely access to information needed for effective air quality management. Therefore, through a collaborative effort among agencies and professionals in Mexico and the United States in designing, developing, and delivering specialized workshops for Mexican officials responsible for air quality management, the Workshop for Air Quality Management for Senior Managers was created, with a pilot delivery provided in Mexico City in July 1999 for senior officials of SEMARNAP.

The strategic training program is directed to senior officials in government agencies who have limited backgrounds in the science and complexities of air pollution and its control. In general, the senior professionals have extensive backgrounds in law, finance, business management, public administration, or other relevant disciplines. As the senior officials assume responsibility in a government organization charged with air quality management, they must quickly acquire sufficient supplemental knowledge to perform effectively. Such officials may hold elected positions with broad responsibilities and authorities for public affairs or be appointed managers who have direct authority for environmental protection.

The primary focus of this program is on air quality managers in the region of the U.S.-Mexico border. Nevertheless, the program purposely addresses a broader population of managers. For example, several elements of air quality management in the border region are developed and implemented by federal agencies. Therefore, officials in Mexico City who have national perspectives and responsibilities are important program participants. Further, many important air quality concerns are national, multi-national, or global in scope - for example energy policies, border congestion, ozone depletion, and climate change. Consequently, training program participants will include federal, state and municipal officials from throughout Mexico.

FUTURE PERSPECTIVES

The workgroup will continue to engage in activities aimed at attaining air quality standards in border communities. Overall, the workgroup will continue to look for commonsense solutions that can be applied before study results are available. Workgroup activities can be divided into two categories: ongoing projects and new projects.

The workgroup will continue developing the San Diego County-Tijuana-Rosarito, Imperial County-Mexicali, and El Paso County-Ciudad Juárez-Doña Ana County air programs, integrating the air quality planning and management activities of the respective on-going air quality management programs and SIPs. The following specific activities are planned:

- Publication of the air quality program for Tijuana-Rosarito; the effort, to be completed by SEMARNAP, will include control strategies for Tijuana-Rosarito.
- Continue to maintain and operate the air monitoring networks currently established, with a focus on efforts to transfer the operation and maintenance of air quality monitoring networks from EPA-SEMARNAP to local Mexican authorities (with support from SEMARNAP).
- For the El Paso County-Ciudad Juárez-Doña Ana County air basin, EPA and SEMARNAP will work with state and local agencies and community representatives

to identify basinwide emissions reductions needed to achieve U.S. and Mexican ozone and carbon monoxide standards. The workgroup also will continue to work with the JAC to develop recommendations to improve air quality in the Paso del Norte area. In addition, EPA will continue to work with the Paso del Norte Clean Cities Coalition and its Ozone Action Day Program to develop a vehicle maintenance outreach program for the binational air basin. EPA also will continue to work with UTEP to enhance ozone mapping software and to develop a web site for the Ozone Action Day Program.

- Continue the implementation of the Emissions Inventory Development Program in Mexico.

New efforts undertaken by the workgroup will include the following:

- Provide assistance to help the regulated community comply with the new air quality programs in border cities.
- Institutionalize air monitoring networks and emissions inventory development and refinement in Mexican border cities.
- Continue to assess air quality in other border cities, such as Yuma; San Luis Río Colorado, Sonora; and Tecate.
- Provide emissions data to the public from major sources in the border region.
- Perform modeling exercises to identify cost-effective emissions reduction strategies that are of regional benefit.
- Examine potential for binational work to address global warming and improve energy efficiency.

Specific projects will include:

- EPA will work with the agency's Environmental Finance Centers to develop a framework for a Paso del Norte Clean Air Investment Fund, an economic incentive program that has the potential to achieve emission reductions at lower cost than traditional command-and-control strategies.
- INE will develop the Fourth Report on Air Quality in Mexican Cities (2000), which will include data for some border cities.
- EPA will work with the American Lung Association (ALA) to provide asthma management workshops for asthmatic children in schools in border cities through the ALA's Open Airways for Schools Program.