

## NUEVO LEÓN

### GENERAL DESCRIPTION OF THE NORTHERN BORDER

There are multiple situations and challenges to be faced with regard to environmental issues along the 3,200-kilometer (km) border between Mexico and the United States. This region has fluvial, marine, and wetland ecosystems, deserts, meadows, and several types of forests.

As the population grows on both sides of the border, so does the pressure on natural resources, which results in the degradation of air, land, and water. Thus, it is imperative to disseminate knowledge about the importance of and need for proper management to guarantee the sustainability of natural resources. The northern border strip is defined as the territory that lies within 100km in each country along the 3,300km between both countries, which includes six states in Mexico and four in the United States. The population on both sides of the border surpasses 9 million. According to the 1990 census, 3.9 million live on the Mexican side, equal to 5% of Mexico's total population. The population growth in this area has been fast, especially on the Mexican side. For example, between 1980 and 1990 Tijuana grew 61% and Ciudad Juárez grew 41%. Up to 30% of the population in this area is considered temporary.

The border economy is influenced by the maquiladora industry, since 70% of the latter's activities is located in this region. This industry employs 30% of the labor force in the 10 border states.

The border region has serious problems, including insufficient water supply and treatment, handling of solid wastes, air pollution, land pollution, and threatened natural resources.

### GEOGRAPHIC DESCRIPTION OF NUEVO LEÓN

The state of Nuevo León is located in the northeastern part of Mexico. To the north it borders with the states of Coahuila, Texas, and Tamaulipas. To the west it borders Coahuila, San Luis Potosí, and Zacatecas. To the south it borders San Luis Potosí and Tamaulipas, with which it also shares its eastern boundary. Its surface covers 64,081.94 km<sup>2</sup>. The state includes important portions of the three large natural regions—or physiographic regions—of the country: the Eastern Sierra Madre, the Great North American Plains, and the Coastal Plains of the Northern Gulf.

Metropolitan Monterrey is located at an approximate elevation of 500 meters above sea level and it is surrounded by the Eastern Sierra Madre, the Cerro de la Silla, the Cerro de las Mitras and the Cerro del Topo Chico. These mountainous elevations are a natural physical barrier to the circulation of wind and prevent the evacuation of contaminated wind toward the exterior of the zone.

Due of its geographic location, the metropolitan area is subject to the influence of the anticyclonic systems coming from the Gulf of Mexico that create atmospheric stability, inhibiting the vertical mixture of air.

Extreme semi-dry climates are predominant in Nuevo León. Precipitation is scarce, even though there are regions that register annual rains greater than 800 millimeters (mm). The general annual measure for the state varies between 300mm and 600mm, while the annual medium temperature is between 14°C and 30°C. The dry and semi-dry climates are distributed mainly in the northeastern part of the state, which forms part of the Great North American Plains, and in the southwestern region, separated from the first by the heights of the Western Sierra Madre. In the lower areas of the sierra region, in the central and south zone of the state and in the greater part of the San Juan river the semi-warm, moderate and semi-cold climates are more common.

#### SOCIO-ECONOMIC ISSUES IN NUEVO LEÓN

Nuevo León is composed of 51 municipalities and has a population of 3,549,273; the population was estimated to reach 4 million by 2000 and 5 million by 2015. Currently, this is a state that has a wide and growing productive infrastructure in the primary and industrial sectors that have earned it a place of great importance in Mexico. Monterrey, its state capital, has become one of the three most important cities in the country in just in a few years.

Nuevo León's metropolitan area—the municipalities of Apodaca, Cadereyta, Escobedo, García, Guadalupe, Juárez, San Nicolás de los Garza, San Pedro Garza García and Santa Catarina, representing 83.5% of the state's population—is an industrial center for the production of bricks, batteries, ceramic for construction, cement, soft drinks, machinery, and equipment, among other things. The main industries include, automotive, textile, construction, food, beer, non-metal minerals, electric, and electronic. Cadereyta Jiménez has one of the largest oil refineries in the country, and a wide variety of products derived from oil, such as lubricants and petrochemicals, can be obtained here.

In Monterrey's metropolitan area is concentrated 95% of the state's industrial activity, with 10,000 industrial and service businesses. The manufacturing industry supplies 35% of the Gross State Product, followed by service businesses with 30%, commerce with 22%, and transportation with 7%. Approximately 1.4% of the industries are located on the banks of the San Juan River, which drains into the Rio Grande. Nuevo Leon provides 6% of the Gross National Product.

The transportation sector has a strategic importance with regard to regional and urban development. It is estimated that within metropolitan Monterrey there are more than 1.5 million people traveling daily and that the number of daily trips totals 5.5 million.

Some 3.4 million trips are made on the mass transportation system, while 1.9 million trips are made by automobile. With the accelerated urban growth of Monterrey's metropolitan area, it was estimated that for 2000, the vehicle fleet would increase to 1.5 million units and the average length of the trips would increase from 7.5km to 20km.

Monterrey's potable water distribution system provides service to 96% of the population; the coverage of the sewage system is approximately 90%; currently 100% of the wastewater generated is treated. The garbage collection system covers 90% of the state population.

#### ENVIRONMENTAL STATUS OF NUEVO LEÓN

##### *Air Quality in Monterrey*

The Integrated Environmental Monitoring System (Sistema Integral de Monitoreo Ambiental, or SIMA) began operating on November 20, 1992, to provide continuous and reliable information on the levels of environmental pollution in the metropolitan area of Monterrey. Thus, the population is informed every day of the year about the air quality in metropolitan Monterrey.

SIMA is an information source for environmental conditions in the state of Nuevo León. Therefore, it supports educational and private institutions through the transfer of knowledge by way of conferences and visits to SIMA's environmental monitoring network. In addition, it informs on the pollution variables that are measured in the environmental monitoring network. This network consists of five environmental monitoring stations, one mobile monitoring unit, and one Sodar-Doppler system for measuring atmospheric conditions up to 1500 meters in elevation; it also detects thermal inversions. The environmental monitoring stations work automatically and their operations are supervised from SIMA's computation center.

The monitored pollutants are particulate matter with a diameter of 10 microns or less (PM<sub>10</sub>), nitrogen oxide (NO), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), and carbon monoxide (CO). The stations also measure meteorological parameters including wind direction, wind speed, temperature, solar radiation, atmospheric pressure, and rainfall.

The Metropolitan Index of Air Quality (Índice Metropolitano de Calidad del Aire, or IMECA) was created so that the general population might understand the existing levels of air pollution. This was done by implementing the same scale for all pollutants according to their capacity to cause discomfort to human beings (Table 1).

There are established levels of pollutants' concentrations and exposure times where average people can manage well without significant effects on their health. These levels are established by the Official Mexican Norms for Air Quality. There are different levels of the environmental norm for each pollutant, since the vulnerability of human beings differs according to each type of pollutant. IMECA takes the value of concentration and the exposure time that the environmental norm establishes for each pollutant and assigns it 100 IMECA points. Thus, any pollutant has the same weighting scale in the adimensional unit of IMECA. (Table 2)

Air pollution is present in large cities because of intense industrial activity and the flow of vehicles, and this is reflected in the high use of energy. In addition, there

are natural conditions that also contribute part of the contamination. Information on pollutants and their specifications are taken from Official Mexican Norms: NOM-020-SSAI-1993, NOM-021-SSAI-1993, NOM-022-SSAI-1993, NOM-023-SSAI-1993, and NOM-025-SSAI-1993.

#### *Air Quality*

As a starting point for the design of air pollution control strategies in metropolitan Monterrey, the Under-Secretariat of Environment began the operation of an air quality monitoring network in 1992. The air quality monitoring network currently has five fixed continuous monitoring stations, a mobile monitoring station and a Sodar Doppler system for measuring meteorologic conditions.

An analysis of the hours exceeding the air quality standard in the 1993-1996 period shows that the contaminant that remained for the greatest number of hours above the air quality standard was PM<sub>10</sub>, followed by ozone.

The behavior of the particles' maximum concentrations follows a pattern that establishes a considerable increase during the winter months and a notable decrease during spring and summer. This fact is explained by the meteorologic conditions that make the dispersion of contaminants difficult during the cold months. In comparing years, the descending trend in the number of hours exceeding the standard should be noticed. In fact, in 1995 and 1996 this number was reduced more than 50%. The main particle emission sources, according to the last emissions inventory, are of the industrial type and soil erosion.

Ozone is the second-highest ranking contaminant that exceeds air quality standards. The number of hours above the ozone standard usually increases in the summer and occasionally during the winter months. There was a downward trend in the number of violations during the 1993-1995 period. However, this increased again in 1996.

The last air emissions inventory carried out in 1995 for metropolitan Monterrey shows that transportation is responsible for half of the area's emissions. In order to prevent and control the contaminating emissions coming from automotive vehicles in circulation, an inspection/maintenance verification program, which is still in operation, was established in 1991.

Since March 1996, the government of the State of Nuevo León initiated the 1997-2000 Air Quality Management Program for metropolitan Monterrey, a program that includes 31 actions to combat air pollution.

#### *Water Quality*

The high number of industrial and service companies that discharge into the sewage system and the wide variety of industrial processes in metropolitan Monterrey propitiated the implementation of a Discharge Control Program for wastewater. This program began in 1994 and has been developed in close collaboration with the SSE and the Water and Sewage Services of Monterrey. Its

main objective is the establishment of specific wastewater discharge conditions for non-domestic generators to the sewage system.

There are currently 6,000 non-domestic wastewater generators registered. Local limits for wastewater discharge have been developed for 100% of these generators, all of whom are currently in the implementation phase. By carrying out an analysis of discharged contaminants by industry type, it is usually found that a given industry type provides more than 80% of a specific contaminant. It was also observed that more than 70% of some of the specific contaminants are generated by a reduced number of industries, which simplifies locating the contaminating sources. The main contaminating industry types are chemical, glass, plastic products manufacturing, and metal mechanic industries.

The main problems generated by industry for the sewage system are undesirable concentrations of greases and oils, chemical oxygen demand, ammoniacal nitrogen, biological oxygen demand, substances reactive to blue methylene, phosphorous, mercury, lead, organic nitrogen, and arsenic.

#### *Solid Waste Management*

The Solid Waste Processing Metropolitan System landfill provides service to the municipalities of metropolitan Monterrey. This landfill was built in 1991, has a surface of 213 hectares, and a 15-year useful life. In this site, it is possible to dispose of municipal waste and non-hazardous industrial waste, which classified as equivalent to municipal waste. There are nine additional landfills for final disposal of municipal waste outside of metropolitan Monterrey.

In Nuevo León there is a controlled confinement for final disposal of industrial waste with approximate extension of 800 hectares located 35km north of metropolitan Monterrey. The company in charge of the landfill provides collection, transportation, treatment, and final disposal services for hazardous and non-hazardous industrial wastes. In addition to the final disposal sites for wastes, there are some places where different types of wastes are deposited in an irregular and inadequate manner. Eight large illegal dumps have been located in metropolitan Monterrey.

#### ENVIRONMENTAL PROGRAM FOR THE NORTHERN BORDER

The Environmental Program for the Northern Border has two main components:

- Institutional Strengthening/Handling of Hazardous Waste
- Improvement of Environmental Services

Both focus on the environment and strengthening of environmental management in the border region related through sectorial programs at the national level. To begin the program's operations, the International Bank for Reconstruction and Development granted credit to the World Bank to be applied in different protection activities. An agreement was signed toward this end between the government of Mexico and the World Bank on June 10, 1994.

Within the Institutional Strengthening/Handling of Hazardous Waste component there is the Biodiversity and Ecological Areas subcomponent, which has a \$12 million investment. This project supports the first phase of the Governmental Program to protect the biological diversity in the U.S.-Mexican border. The project finances:

- The protection of areas of high biological diversity on the Mexican side of the border that are adjacent to the natural protected areas in the United States
- The protection of threatened migratory species and their habitats
- Studies on biological diversity and resource conservation in the border region
- Training on natural protected areas and handling of species

#### TEXAS-NUEVO LEÓN STRATEGIC ENVIRONMENTAL PLAN

On the Texas-Nuevo León border, the Colombia Bridge is a principal route of commerce between these states and their respective nations; it is an important symbol of the links they have in common. The state governments of Texas and Nuevo León share, among other things, a commitment to working for a clean environment. Represented by the Texas Commission on Environmental Quality in Texas and the Subsecretariat of Ecology in Nuevo León, these states have outlined specific objectives and areas for cooperation in the Texas-Nuevo León Strategic Environmental Plan (SEP).

SEP is the result of a commitment made by representatives from the state agencies responsible for environmental quality and protection from Arizona, Baja California, California, Chihuahua, Coahuila, New Mexico, Nuevo León, Sonora, Tamaulipas, and Texas at the “Ten State Retreat: A Regional Approach to the U.S. Mexico Border Environment” held in Austin, Texas, in 1996. The objective of the retreat was to exchange information and agree on actions supporting the environmental issues addressed at the XIV U.S.-Mexico Border Governors’ Conference (BGC) in 1996 in Santa Fe, New Mexico. The state representatives agreed that the most effective and efficient way to improve the quality of the environment and to protect the health of the citizens in the border region is through coordination and collaboration.

The environmental officials from the 10 states exchanged information about the issues facing their agencies, their jurisdictions, and successful existing programs. They then pinpointed desired outcomes and strategies for environmental quality within four areas: pollution prevention, data exchange and cooperative information gathering, low-cost community-based solutions to environmental problems, and technical exchange and strategy sharing. In a signed document, each of the 10 states committed to working together with at least one neighboring state in the following six areas:

- Establish programs for reuse, reduction, and recycling, including water conservation
- Develop a border-wide electronic environmental information sharing mechanism, support development of Geographic Information System databases, and pursue compatible methods and measures to enable information sharing
- Develop programs for volunteers (including professionals), and establish a

- recognition/award system
- Collaborate with maquiladoras and other industries as a source of technology and information exchange
- Develop state-to-state environmental strategic plans
- Develop and implement low-cost and clean technologies

At the BGC, Texas and Nuevo León signed an agreement committing to complete SEP within 60 days. Both states believe that they must work together to achieve:

- A clean border
- Watershed and airshed approaches to environmental issues
- Strengthened environmental management capacity of state agencies

This plan is part of a learning process undertaken by the U.S. and Mexican states sharing the international border, and as such is neither perfect nor comprehensive. At the time of its completion, both Texas and Nuevo León were undergoing a period of reorganization in their state governments, the first due to the conclusion of the legislative session, the second as a result of state elections. This plan should be seen as evidence of the commitment that each of the two states maintain to working together for common environmental priorities regardless of the political or economic changes the future may hold.

The goals of the SEP are to:

- Guide effective interagency cooperation and make the best use of existing resources toward multimedia state priorities for environmental protection
- Serve as a basis to leverage additional and outside resources to support actions prioritized in this plan

Both states will develop the following four strategies to meet their common interests:

- Exchange information
- Facilitate technical exchange
- Coordinate activities and programs
- Obtain contribution of human, technical and economic resources from industry, academic institutions and professional organizations

The objectives of the SEP are to:

- Establish a technical team responsible for carrying out the actions under the SEP, evaluating progress and making proposals for new activities
- Develop a Clean Border for Sustainable Development (pollution prevention program) for the border region
- Work toward compatible methods of measuring and reporting environmental parameters regarding air and water quality
- Establish an interstate recycling market
- Celebrate a common Recycling Day

### *SEP Action Plan*

#### Strategy 1: Exchange Information

The exchange of environmental information will:

- Enhance regulatory and institutional framework capabilities (e.g., each state will review its regulations under a different perspective, identify training and software needs, and improve public awareness)
- Provide a source of innovative environmental management approaches, better planning, and more accurate solutions
- Broaden the scientific and technical knowledge of staff members

Specific actions include plans to:

- Provide information on the general activities and programs administered by the agency in each of the areas of interest
- Inventory databases and identify data, activities, or programs relevant to the objectives of the SEP
- Exchange scientific and regulatory information via the Internet
- Identify a designated person to serve as liaison in areas of air and water quality, solid waste management, and pollution prevention and to be responsible for the collection and distribution of specified information

### Strategy 2: Facilitate Technical Exchange

The technical exchange will:

- Strengthen the operational framework by providing recommendations for procedures and resource requirements
- Strengthen the institutional framework by improving capacity to conduct comprehensive inspections, enhancement of staff productivity, promotion of project coordination
- Improve planning capabilities in prediction of critical air pollution episodes, air emissions inventory development, achievement of industrial pretreatment and solid waste management goals
- Improve the scientific base through specialized software management, quality assurance of environmental data, increased knowledge of health effects of environmental pollution

Specific actions will:

- Identify a designated person to serve as liaison in areas of air and water quality, solid waste management, and pollution prevention and be responsible for the technical exchange activities
- Hold periodic conference calls between agency personnel
- Conduct at least one meeting a year to review activities under this plan, exchange new ideas and experiences, and propose next steps
- Invite participants of state counterpart to technical and environmental workshops such as “Solid Waste Options” of Texas and “ProEco” of Nuevo León

### Strategy 3: Coordinate Activities and Programs

Coordinated activities and programs will:

- Make the best use of time and resources
- Create an opportunity to expand a “border environmental fellowship” along the U.S.-Mexico border and maintain the momentum of the Ten State Border Environment Dialogue

- Enhance public awareness and public participation

Specific actions include:

- Sharing calendar of events, as well as organizing and logistic strategies for specific model programs involving the public
- Identifying activities and programs with a potential to be developed in coordination
- Establishing at least one coordinated activity or program per year involving the public in areas related to air quality, water quality, and solid waste management, and pollution prevention

Strategy 4: Obtain contribution of human, technical and economic resources from industry, academic institutions and professional organizations

This line of action will:

- Result in a shared social responsibility in environmental pollution problems
- Promote the development of research studies, thus strengthening environmental management programs
- Encourage the commitment of highly specialized professionals to the solution of environmental pollution problems

Specific actions identify:

- Environmental programs carried out by industry that involve community participation in each state and work with industrial associations to match with industrial counterparts in the neighboring state
- Research carried out by academic institutions that could be beneficial for the neighboring state and facilitate the exchange
- Potential and existing training and education activities of professional associations related to the environment in the state and make the necessary contacts to extend these activities to the neighboring state

#### ACTUAL RESPONSIBILITIES

The Subsecretariat of Ecology (Subsecretaría de Ecología, or SSE) is the regulatory agency that establishes environmental policies throughout the state with three main sections: planning and environmental management, pollution prevention and control, and conservation of natural resources. The specific functions of each of these three areas of SSE are the following:

##### *Prevention and Control of Atmospheric Pollution*

- Operation of the air quality monitoring network
- Integration of the inventory of stationary sources of pollution
- Supervision and promotion of the vehicular verification program
- Prevention and control of water pollution
- Authorization of permits for industrial wastewater discharges into the sewer system
- Establish particular discharge conditions for generators of industrial wastewaters that are collected in the sewer system or in water streams under state jurisdiction

- Keep track of compliance plans of those generators of industrial wastewaters that are in a non-compliance situation
- Surveillance of the operation of the municipal and industrial wastewater treatment plants

#### *Prevention and Control of Land Pollution*

- Establish general outline for the proper operation of landfills
- Surveillance of the handling of nonhazardous waste
- Establish general outline for the handling of sludge from wastewater treatment plants
- Surveillance of the handling of sludge from wastewater treatment plants

#### *Natural Protected Areas*

- Preparation of the natural protected areas inventory
- Administration and operation of state parks as well as natural protected areas under state jurisdiction
- Collaboration in the National Reforestation Plan

#### *Environmental Management*

- Review and evaluation of environmental impact studies
- Issue operating licenses
- Participation in the resolution for granting permits for land use
- Participation in the resolution for granting permits for land clearing (deforestation)
- Participation in the review of municipal Urban Development Plans
- Keep track of permits for land use
- Registry of service providers with regard to environmental impacts

Table 1. Descriptors of the Metropolitan Index of Air Quality

IMECA	Health Effects
0 - 100	Favorable situation for carrying out all types of activities
101 - 200	Increase in minor discomforts within the sensitive population
201 - 300	Increase in discomforts and intolerances with regard to exercising within the population with respiratory and cardiovascular ailments; emergence of minor discomforts within the general population
301 - 500	Emergence of different symptoms and intolerance to exercising within the general population

Table 2. Concentrations that are Equivalent to 100 IMECA Points

Pollutant	Concentration	Exposure Time (hours)
Carbon monoxide CO	11.0 ppm	8
Sulfur dioxide SO <sub>2</sub>	0.13 ppm	24
Ozone O <sub>3</sub>	0.11 ppm	1
Nitrogen dioxide NO <sub>2</sub>	0.21 ppm	1
Particulates 10 microns or less PM <sub>10</sub>	150 µg/m <sup>3</sup>	24