

Air pollution in the Mexico City Metropolitan Area is among the worst in the world.
Can this growing metropolis escape the choke hold of pollutants
and rediscover the breath of life?



SUSPIRO DE VIDA

BY SUSANA GUZMAN

Mexico City Metropolitan Area is cleaner now than 10 years ago. But the nearly 3.5 million vehicles and thousands of industries that consume 40 million liters of fuel every day still make this urban area one of the most polluted in the world. The area includes Mexico City, 37 municipalities from the State of Mexico and one from Hidalgo.

Of the five criteria pollutants considered a human health risk — ozone, carbon monoxide, nitrogen oxide, lead and particulate matter — ozone and matter particulates are of major concern. These pollutants have shown a trend of stabilization. However, the ambient concentrations are high enough to be considered a health hazard for the 20 million inhabitants of the Mexico City Metropolitan Area.

Since 1988, the ozone standard has been exceeded by around 85 percent every year. The standard has been exceeded on more than 40 percent of the days since 1995, when monitoring began. (The exception was 1999, when just 10 percent of the days exceeded standards.) There are, however, some points of light in an otherwise dark history. Mexico has made gains in the battles against lead and sulfur dioxide.

“The presence of lead and sulfur dioxide have declined due to the changes in the composition of the gasoline, the reduction of the sulfur content of diesel, and the closing of the 18 de Marzo oil refinery,” explains Mario Molina, a 1995 Nobel laureate in chemistry. Carbon monoxide concentrations have also declined, after an aggressive program that began requiring catalytic converters on new automobiles.

In Mexico City, like many other polluted cities, the combustion processes of vehicles and industry are dirtying the air. In addition, small and medium-sized industries are a major source of pollution, while larger

HAZY METROPOLIS

The Mexico City Metropolitan Area, a region of some 20 million people, encompasses Mexico City, 37 municipalities from the State of Mexico and one from Hidalgo.



Source: U.S. Department of Energy

Randy Yeip/EJ

Two cities battle air pollution

The Mexico City Metropolitan Area shares similar geographic qualities with the Los Angeles metropolitan area. However, the air pollution problem in the MCMA exceeds that of the South Coast Air Basin.

	Mexico City Metropolitan Area	South Coast Air Basin*
Population (2000)	18 million	15 million
Total area	5,300 km ²	27,800 km ²
Urbanized area	1,500 km ²	17,500 km ²
GDP per capita (U.S. dollars)	\$7,750	\$32,700
Fuel consumption (1999)	5.3 million liters/day	10 million liters/day
Vehicle fleet (1999)	3.2 million	9.3 million
Average vehicle age	10 years	10 years
Peak ozone concentration (1999)	321 ppbV ^(a)	176 ppbV
Peak PM ₁₀ ^(b) concentration (1999)	202 µm/m ³	139 µm/m ³

* Comprised of the non-Antelope Valley portion of Los Angeles County, Orange County, Riverside County and non-desert portion of San Bernardino County.

(a) ppbV=parts per billion by volume

(b) PM₁₀ is particulate matter (PM) with a mass median aerodynamic diameter less than 10 micrometers.

Source: U.S. Department of Energy

Randy Yeip/EJ

industries have implemented anti-pollution equipment to reduce their emissions.

The battle against pollution in Mexico has been waged through international cooperation, in which institutions like United Nations for Environmental Program, the World Bank or countries like the United States have been involved. Scientists and authorities from Los Angeles worked closely with Mexican authorities over a decade. Why? Because both urban areas share similar air quality problems.

MEXICO CITY AND LOS ANGELES

Mexico City and Los Angeles County are among the largest metropolitan areas in the world — 18 million and 15 million, respectively. They have similar pollution problems with pollutants like ozone and particulate matter. Similar geographic shapes — a valley surrounded by mountains — serve to trap the pollutants, adding to both cities’ problems.

However, despite the size of its vehicle fleet — 9.3 million, triple the Mexican fleet — the maximum levels of ozone in California has faded away to less than half of what they were in the 1950s. “Compared to Los Angeles, the MCMA is experiencing the levels of pollutants of the ‘70s,” says Molina. The result is that the air in Los Angeles is far cleaner than in Mexico City.

The air quality in Los Angeles has improved because there are not as many old cars as in Mexico and its emissions control programs have been effective. In Mexico, half of the vehicles are old and don’t meet modern emission standards, explains Molina. In addition, the lack of monetary resources in Mexico affects the anti-pollution programs. For instance, the GDP per capita in the U.S. was \$32,700 in

2000; in Mexico, it was \$7,750 during the same period.

HEALTH AT RISK

The major concern about air pollution is human health. It is the drive behind the environmental standards against air pollution.

“In susceptible populations, like cardiovascular patients, an excess of 500 deaths has been observed every year,” says Mauricio Hernandez, a researcher of the National Institute of Public Health. Concerned about the health impact, Hernandez believes health authorities have failed to pressure Mexico City authorities to clean the air.

“The ozone standard is violated every day in Mexico City,” says Hernandez. “Pollutants like ozone interfere with pulmonary development, a chronic health effect. The poor are more vulnerable to the pollution due to nutritional factors, such as the lack of vitamin C and E ingestion.”

HISTORICAL ASSESSMENT

In 1997, Mexican environmental authorities announced that Molina, a Mexican-American scientist, would lead an interdisciplinary study about air pollution in Mexico. Control pollution measures, programs and information available up to then would be analyzed for a dozen institutions and researchers from Mexico and the United States. The study represents an impartial effort to understand the causes of the pollution.

After five years of research, the project has provided two major results. “The first stage of the project was used for the Mexican government to formulate the PROAIRE 3, the governmental program to face the air pollution problem” for the next decade, says Molina.

A second result is a book titled *Air* ▶

Quality in the Mexico Megacity: An Integrated Assessment, published in 2002 and edited by Mario Molina and Luisa T. Molina, both experts from the Massachusetts Institute of Technology.

For Mario and Luisa, solving the air pollution problems is not a matter of science and technology by itself. A planned urbanization that guarantees the health of millions of residents should take into account the social and economical forces driving the pollution, and the will of their politicians.

For example, the minibuses have represented an important environmental problem. About 50 percent of Mexico City's residents use the 27,000 "micros" as their primary mode of transportation. "The minibuses should be cleaner," points out Molina. "If you see this from an integral approach, this system affects the transportation efficiency because it produces pollution and traffic at the same time."

Taxis are another example. Old car models run constantly along the roads to pick up customers. "It is important to have interaction with the taxi organizations in order for them to comply with the environmental standards," Molina said. "Taxis five years old should have been replaced, but it didn't happen due to the lack of resources. The authorities gave the taxis eight years more to replace them, but they didn't comply with the environmental standards either."

As a recommendation, Molina thinks that low-interest loans may be offered to the taxi owners. "We keep working, it is not sufficient to set standards," he said. "They should be realistic to comply with them."

In a second stage, researchers and authorities are assessing the costs of the measures, strategies and health to group them by priorities. "We need up-to-date information about the inventories," explains Molina. "We are figuring out how the pollutants are produced in the atmosphere and who is producing what, because the pollution inventories stem from estimations of how much pollution, for example, a vehicle can emit."

LONG WAY TO GO

The implementation of new technology, changes in the composition of the gasoline, as well as political decisions — like closing down the "18 de Marzo" refinery settled in the middle of the city — have reversed the trend of some primary pollutants, such as lead and sulfur dioxide.

"The concentrations of lead are not of public health concern any longer," Molina said. "As is the case in Los Angeles, the most significant progress for the MCMA has come from the use of new technologies and improved fuel quality that mitigate exhaust emissions from automobiles."

"Sulfur dioxide is now at relatively low levels, below the national standard," Molina continued. "Dust storms, frequent in the past, have been eliminated." Nevertheless, other pollutants like ozone, nitrogen oxides and particulate matter show little improvement.

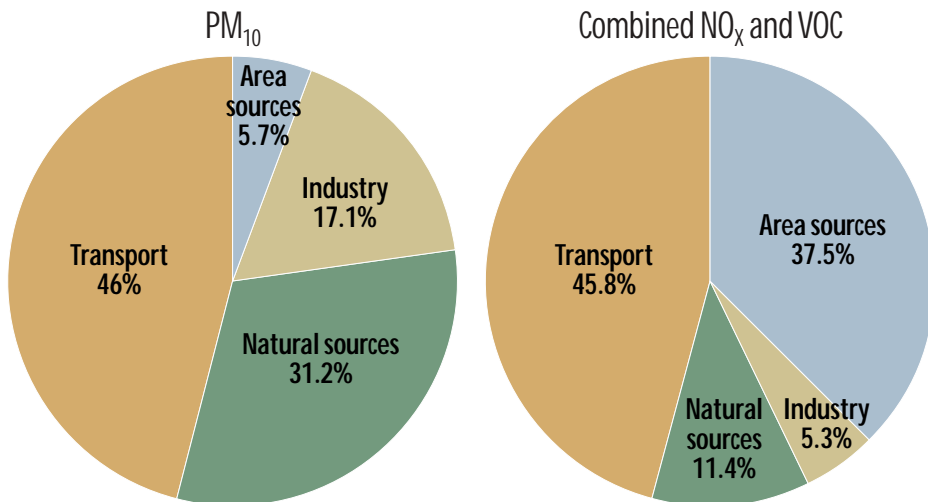
Even though scientists have assessed that some criteria pollutants have been declining over the past decade, they also warn that more effort needs to be made to avoid major environmental and health problems in the future. 🌍

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Mario Molina,
1995 Nobel laureate

Emissions inventory

Air pollution in the Mexico City Metropolitan Area comes from several sources. Here is the breakdown of pollution contributors. Oxides of nitrogen (NO_x) and volatile organic compounds (VOC) combine to form ozone air pollution.



*Industry" excludes heavy industry; "area sources" includes lubricant industry, solvent emissions, forest fires, services sector, and others; "transport" includes private vehicles, public transport, taxis and trucks; "natural sources" includes biogenic emissions and soil erosion. Source: Comision Ambiental Metropolitana on July 25, 2000



The winds around Mexico City swirl in the valley, making each day's pollution level uncertain. The top photo shows Mt. Iztaccihuatl and Mt. Popocatepetl on one of the clearer days in the valley. But as the pictures descend, so does the cloud of pollution that often blankets the city, making even the closest buildings hard to pick out.

Photos courtesy of www.sdg.ac.at/diplk/arsstudio/photo/mexico/gallery.htm