

Failures and successes in the implementation of an air quality management program in Mexicali, Baja California, Mexico

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Abstract

The Program to Improve the Air quality of Mexicali 2000-2005 (PROAIR) was released in the year 2000. The implementation of the program was based on 5 strategies and their specific actions that if applied according to the program would have helped to reduce the emissions of the different contaminants that exceeded the acceptable values of air quality. The PROAIR followed national guidelines to evaluate, what at the time were considered the most polluted cities in Mexico, such as Mexico City, Guadalajara and Jalisco among others. The program's strategies and their actions were directed to the following components and work areas: industry, commerce and services, vehicles, urban management and transport, ecological recovery and research, and international agreements. Mexicali, being located at the California-Baja California border has received many environmental benefits derived from border protocols established between Mexico and the USA, such as the Border 2012 Program, still running. Seven years after the implementation of PROAIR in Mexicali, very little progress has been observed in the actions outlined in the Programs' strategies. The analysis of the actual situation of the Program is presented in this document along with recommendations on how to improve it to benefit community health.

Keywords: air quality management program, Mexicali, Baja California, Mexico, airshed, Border 2012.



1 Introduction

1.1 Brief description of the Valley of Mexicali

The Valley of Mexicali, Baja California, with 878,000 inhabitants, is located in a strategic place at the border of Mexico with the USA, that emerges as agricultural land at the start of the twentieth century (Fig. 1). The valley is characterized by very hot weather during the summer months and an air pollution problem caused primarily by suspended particles arising from the desert environment [1], a large agricultural sector, vehicular activity, and unpaved streets in Mexicali. The location of the Valley of Mexicali and its neighbor Imperial Valley, CA, USA, where the cities of Calexico, El Centro and Brawley are located, give cause to consider the region as a unique international atmospheric airshed, which, combined with the increasing production activity, makes it more important, not only at the border but at a national level.

Due to the development and evolution of the region, the air quality has deteriorated in recent years. Actually, Imperial Valley does not comply with the North American air quality standards for PM₁₀, and in Mexicali the values exceed the Mexican official norms for PM₁₀, carbon monoxide and ozone [2].



Figure 1: The city of Mexicali is located in the northwest of Mexico.

The Program to Improve the Air Quality of Mexicali 2000-2005 represents [3] a joint effort of society, local economic sector and the three levels of government to design and implement a set of actions which have as a final goal to control the sources of pollutants that degrade the air quality of the city.

The proliferation of a great number of industrial, commercial and service activities, as much as an accelerated motorization, have caused a degradation of the air quality of Mexicali, especially due to the poor conditions of the public transport and private automobiles and in particular, due to the importation of

preowned vehicles that generally failed to pass the smog check in the USA [2]. Additionally, the situation gets exacerbated due to the emissions of particles and dust from the urban and agricultural clandestine burns [4] and emissions from paved and unpaved streets [5].

2 Description of the program to improve the air quality of Mexicali 2000-2005 (PROAIR)

The “PROAIR” had as a general objective to protect the health of the population, reducing the concentration of pollutants in the atmosphere, by the application of coordinated actions that assist in controlling the emissions generated by industry, commerce, services, transport and soil [3].

-Objectives and general strategies of the program

An analysis of the air quality was performed at the integration of the program. A detailed emissions inventory was prepared and it was divided into the following sectors: industrial, commerce, and services, and in a different category, motor vehicles. An integral diagnosis of the pollution problem was realized, with the actual air pollutants data obtained from known production sources.

2.1 Strategies and actions

The “PROAIR” contains five strategies and each one of them group a different number of specific actions that once applied according to the program, would reduce the emissions of the different pollutants that exceed the acceptable values of the air quality. The strategies are oriented to the following components and areas of work.

- Industry, commerce and services
- Motor vehicles
- Urban and transport management
- Ecological recovery
- Research and international agreements

With a total of 27 actions focused on diverse sectors and with responsibilities well identified and defined for each sector. The number of actions per sector were: industry, commerce and services (7 actions); motor vehicles (5 actions); urban management and transport (9 actions); ecological recovery (2 actions); research and international agreements (4 actions).

2.2 Work that was proposed in the PROAIR (27 actions)

Seven years after the initial proposals to improve the quality of the air in Mexicali few actions have been taken. The following table describes each one of them and their progress.



Table 1: Actions, responsibilities and realization of the program.

Industry, commerce and services

Actions	Responsible	Realization
1. Reduce the emissions of the most polluting industry through the installation of control equipment and bench marking processes	CANACINTRA, Industrialist	Yes
2. Implement a program to recover vapours in storage terminals and gasoline service stations	PEMEX, Owners, SEMARNAT	No
3. Strengthen the inspection and vigilance of industrial, commercial and service establishments	SEMARNAT, St. Gov., Mun. Gov.	Yes
4. Convene with the industry the implantation of a program of reduction of VOCs	Association of Maquiladoras, SEMARNAT	In progress
5. Realize on behalf of the CFE an environmental impact assessment of air emissions produced by Cerro Prieto geothermoelectrical power plant and, if necessary, a program of actions to reduce them in a maximum of one year	CFE	No
6. Realize environmental audits and autoregulation actions in the industrial sectors	St. Gov, Mun. Gov., CANACINTRA and Assoc. of Maquiladoras	In progress
7. Integrate a registry of emissions and pollutants (RETC) for Mexicali	SEMARNAT, St. Gov, Mun. Gov., CANACINTRA and Association of Maquiladoras	In progress

Motor vehicles

Actions	Responsible	Realization
8. PEMEX will evaluate the possibility of supplying oxygenated gasoline and low pressure vapor (PVR)	Pemex	Yes
9. Design a model, concense and application of a smog check program by the municipality, SCT	Mun. Gov, SCT	In progress
10. Condition the importation of second hand vehicles to the certification of smog check of the original country	SHCP, SECOFI	No



Table 1: (continued).

Actions	Responsible	Realization
11. Promote the utilization of LP gas and natural gas in public transportation	Private drivers	Partially
12. Design and implement a program to stop vehicles polluting ostentatiously	Mpal. Gov, SCT	Yes

Urban and transport management

Actions	Responsible	Realization
13. Application of soil stabilizers for the control of PM10 emissions in streets, unpaved areas and intense urban traffic	SEMARNAT, State Gov. Mpal. Gov.	Partially
14. Intensify a program to pave streets and roads	St. Gov., Mpal. Gov	Yes
15. Participation of PEMEX in a preferential way in fuels and asphalt prices to be utilized in paving infrastructure	PEMEX	Partially
16. Convene the transfer, operation and maintenance of the air quality monitoring net	Mpal. Gov., St. Gov.	Yes
17. Develop an integral study and execution of improvement of public transport	Mpal. Gov.	In progress
18. Promote a program of social participation and environmental education	Mpal. Gov.	Partially
19. Consolidate a program of epidemiological vigilance associated with pollution, as much as implanting corrective and preventive measures	SSA	No
20. Develop a program of fiscal stimuli for people, institutions and organisms to promote prevention and pollution control programs	SHCP	No
21. Integrate the Ecology Municipal Commission as a part of the COPLADEMM to follow up the Program	Mpal. Gov.	No



Table 1: (continued).

Ecological Recovery

Actions	Responsible	Realization
22. Study and establish emission factors and control options	SEMARNAT, SAGAR, St. Gov.	No
23. Design a reforestation program and preservation of grove of trees areas	St. Gov. Mpal Gov., SEMARNAT, Sedena	In progress

Research and International Agreements

Actions	Responsible	Realization
24. Review and update periodically the emissions inventory and the PROAIR, SEMARNAT	St. Gov., Mpal.Gov.	Partially
25. Establish agreements with Higher Education Institutions to realize studies in relation to pollution	St. Gov., Municipal Gov., SEMARNAT	Yes
27. Establish agreements with international Institutions to perform training activities and studies in relation to air pollution	St. Gov. Mpal. Gov. SEMARNAT	Yes
28. Reinforce the actions of the Border XXI Program and subsequent binational programs	SEMARNAT, St. Gov., Mpal Gov., CANACINTRA, SECOFI, CFE, SAGAR, SCT, SHCP, PEMEX, SSA.	Yes

CANACINTRA – National Chamber of the Transformation Industry

CFE – Federal Electricity Commission

Maquiladora – In bond industry

Mpal. Gov. – Municipal Government

SAGAR – Secretary of Agriculture and Social Development

St. Gov.– State Government

SECOFI – Secretary of Commerce and Industrial Promotion

SCT – Secretary of Communications and Transport

SHCP – Secretary of the Exchequer

SEMARNAT – Secretary of Environment, Natural Resources and Fishery

SEDENA – National Defense Secretary

PEMEX – Petróleos Mexicanos

SSA – Secretary of Health and Welfare

RETIC – Registry of emissions and pollutants.



3 What has partially or totally worked in Mexicali in relation to the “ProAir”

- Incorporation of the air quality monitoring net of Mexicali under the management of the State of Baja California.
On June 24, 2004, the agreement of collaboration between SEMARNAT and US Environmental Protection Agency (US EPA) was signed in Tijuana, Baja California, for the transfer of the air quality monitoring net of Mexicali, Tijuana, Tecate and Rosarito for the year 2006 from USEPA which managed and financed the monitoring of the net since 1997. In June 2007 the state government took over the management of the monitoring net.
- Public Information on the state of the air quality in real time
The data collected by the monitoring stations on air quality is published in a site on the web: www.airebajacalifornia.gob.mx The information shown is the air quality index (IMECAS for its acronym in Spanish) of all the reference pollutants where recommendations are given to protect the health of the community in case of unhealthy air. The website of the air quality information on the neighboring city of Imperial Valley is www.imperialvalleyair.org for anyone interested in comparing the air quality between the two valleys.
- Development of an integral study and improvement of the public transport.
Up to the present time the municipality of Mexicali has improved its transportation after several studies have been carried out such as: the Integral Study of the Transit and Urban Transport in 2002; the Determination of New Buses Routes in Mexicali in 2004; and the Update of the Transit and Public Transportation System of Mexicali in 2007. These types of projects resulted in the acquisition of 200 new buses equipped with air conditioned systems that although the fare increased it gave a different feature to the urban transportation in the city, and to and improved the air quality.
- Integral Paving Program and Air Quality (PIPCA for its acronym in Spanish)
At the state level, the PIPCA is being developed in the five municipalities of the state including Mexicali. This project is in charge of the Urban Board of Mexicali, which is part of the Secretary of Infrastructure and Urban Development of Baja California (SIDUE for its acronym in Spanish). It was calculated a 14.50% reduction of PM10 after paving [6].

4 What has not worked of PROAIR as relevant issues

- Realize an environmental impact assessment of the Compañía Federal de Electricidad (CFE) on the air emissions produced by Cerro Prieto geothermoelectrical power plant.
Cerro Prieto Geothermoelectric power plant with a capacity of 720 MW is a major producer of H₂S and CO₂ as the main pollutants. It is located 30 miles to the south of Mexicali and there has not been any attempt to control the



pollutants, either by reinjecting the non condensable gases or installing an abatement process to stop polluting the neighboring settlements [7].

- Program to recover vapours in storage terminals and gasoline service stations
This is an important issue taking into account the number of gasoline filling station in Mexicali and the size of the vehicular fleet. As it is known the transport urban system is very inefficient in Mexicali, forcing people to buy old vehicles to fulfill their transportation needs. By establishing this program the amount of VOCs will be severely reduce.
- Develop a program of fiscal stimuli for people, institutions and organisms to promote prevention and pollution control programs
An environmental tax was approved by the Baja California State Congress which was published by the State Official Newspaper (POE) on December 22nd 2002. This tax was created to tax emissions of CO to the atmosphere that are generated by fixed sources that used fossils fuels in their industrial processes [8]. Although the tax was approved in December of 2002 and put into effect in January 2003, it was accorded an exemption up to April 2003 due to an inconformity by the owners of the plant. The measure was derogated since it was vetoed by the state Governor based on the fact that the main CO polluters was the old vehicular fleet of Mexicali and not so much the industry.

An attempt was made to establish environmental taxes in Baja California at a municipal level in particular after two thermoelectric power plants of combined cycle, the Thermoelectric of Mexicali and Rosita Power Plants were built up in the outskirts of the city. The tax was approved by the municipal Council based on the pollutants that would be generated by these two power plants but later cancelled by the Mayor of the city of Mexicali based on the facts that the tax was approved without taken into account the parties involved.

- Importation of pre-owned vehicles
The Mexican American border has been characterized by the importation of second hand cars into Mexico at lower prices than the national vehicles since the “free zone” was created in Northern Mexico. Cars aged 5 years and older are allowed to be imported to Mexico, without fulfilling the smog check verification imposed on American cars in USA. The main fleet in the city is integrated by this type of cars (58%) which constitute the main contributors for CO and O₃ pollution in the city.
- Program of epidemiological vigilance associated to pollution
Although air pollution has a direct effect on health not a single program of epidemiological vigilance associated to pollution has been implanted by any level of government based on lack of economical resources. Therefore, no corrective and preventive measures have been considered so far. Mexicali is classified as the city with the highest rate of allergic and asthma cases in Mexico.

5 Conclusions

-It is recommended to appoint a committee to follow up the air program from the start. The permanent follow up of the advancement in the development of the PROAIR will allow to evaluate its efficiency and to orient its course in a dynamic way.

-The solution to the problem of atmospheric pollution in this airshed would be possible if it involves the people that live and work in the region and the adequate coordination of the authorities in the application of the necessary measures.

-Strengthen the citizens' conscience on the importance of their role for protecting the environment and achieving a bigger participation, will be necessary.

-Instrument mechanisms that promote the participation of the private sector through economic incentives including cross border investment.

-Binational programs such as Border XXI, and Border 2012 [9] established between USA and Mexico are extremely important to have a cleaner air.

-Out of the 5 strategies considered in the air program some actions are urgently needed to be fulfilled:

- Industry, commerce and services: recovery of vapor in storage terminals and gasoline service stations; environmental impact assessment at Cerro Prieto geothermal power plant; implantation of a program to reduce VOCs in industry.
- Motor vehicles: condition the importation of pre-owned vehicles to the certification of smog check of the original country.
- Urban and transport management: consolidate a program of epidemiological vigilance associated to pollution, as much as implanting corrective and preventive measures; develop a program of fiscal stimuli for people, institutions and organisms to promote prevention and pollution control programs.

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