2016 marked 12 years since the creation of the Mario Molina Center (MMC) and we are still working more than ever in favor of the environment, sustainable development, the efficient use of energy and fighting against climate change.

Through five general working areas –energy, climate change, air quality, sustainable cities and education- we have been able to influence the design and implementation of public policy which favors the environment and the population in the entire country. Furthermore, we have undertaken the task of strengthening our communication channels with opinion leaders, media, and government players. It is essential for us to have a well-informed society concerned about the environmental challenges we are facing.

With this in mind, during 2016 we carried out a series of projects in diverse areas. One of them was concerning energy efficiency as a priority in the development agenda for Mexico, and studies on the costs, benefits and feasibility of a low-carbon strategy in the electric sector, in order to effectively combat the climate change problem. We analyzed by region bioenergy in agriculture and livestock farming; and we continued our work in fostering sustainable practices for impoverished communities.

With regards to cities, we developed criteria for the surroundings of social interest housing in Mexico, with the intention of bettering the quality of life of low income population in Mexico. Special attention was given to the location as a factor to lower costs for individuals, emissions reductions, as well as the design, infrastructure and general services of the location of this type of housing in the country.

In addition, we developed mobility strategies for urban freight transportation for the Metropolitan Area of the Valley of Mexico; we created the project “Metropolitan Profile”, which establishes scenarios for growth and urban load capacity for metropolitan areas in the country; we worked on school mobility programs; in the creation of Low Emission Zones or “Ecozones” in coordination with state governments; and we continue to foster tools for adequate management of urban growth.

One of the main issues this year was air pollution in many of the main cities of our country. Hence, we continued to strongly work on the design of solutions and implementation of more efficient public policies which tackle the following questions: Where does pollution originate? What are the impacts on human health of the various types of pollutants? We have achieved this by working together with groups in charge of carrying out measurements and compilation of data, as well as by taking and presenting this information to government decision-makers.

Finally, at the Mario Molina Center, we will continue to unite efforts with multiple government instances, international development agencies, businesses and organizations alike, in order to benefit the population and in favor of education, the environment and sustainable growth for the country.

Mario Molina
President
MESSAGE FROM THE EXECUTIVE DIRECTOR

During 2016, Mexico went through tough challenges in urban, environmental and energy areas. An Urban Reform was carried out; a series of measures were implemented to address the problem of air quality in the Metropolitan Area of the Valley of Mexico; discussions continued to deal with natural disasters and to combat climate change; and there were advances in the implementation of projects related to the energy transition.

The Mario Molina Center followed-up on the development of these events to contribute to the design and implementation of public policies by engaging government decision-makers with the results of our projects.

Regarding air quality, we have proposed public policies that may be established transversally in order to reduce emissions, recognizing that this metropolitan problem has to be addressed from various fronts and there is not only one solution. For example, the Mario Molina Center was part of the interdisciplinary group made up of seven government institutions, academia and civil society for analyzing proposals to the new Atmospheric Environmental Contingency Program for the Valley of Mexico.

Furthermore, we developed proposals for managing urban land which respond to the changing paradigm fostered by the Urban Reform in Mexico and the New Urban Agenda worldwide. In particular, we generated proposals to accompany investments in structured public transportation with the intention to limit urban expansion in favor of efficient land use and the conservation of environmentally valued areas. We proposed metropolitan governance mechanisms to be able to benefit from the incremental value associated to public investment works for developing financial instruments in urban development. Another one of our projects consisted in strengthening the benefits of bettering mobility, stemming from polices to widen the network, operational integration and vehicle substitution in favor of cleaner technologies for public transportation, as well as recommendations for its implementation. With this, we are fostering compact, connected, and coordinated cities.

Regarding energy, we actively worked within the energy transition framework; in proving that transition towards a clean energy mix is a favorable step in reducing greenhouse gas emissions, while having other environmental and social co-benefits not in detriment of economic growth. In addition, we worked to identify and determine the best cost-effective measures that allow increasing the efficiency of electric power use in Mexico, placing special emphasis on the residential and municipal services sectors.

For climate change and education, the Mario Molina Center implemented pilot test courses for middle and high school students incorporating in an integral project teacher training, through an advanced course for Climate Change Teaching. Also, we designed a course for public civil servants on this matter with the intention of promoting knowledge and skills of the environment with scientific, objective and precise information. This course promotes communication and dissemination of the causes, consequences and possible solutions for climate change.

In addition to the projects we carried out, the Center established a series of alliances and agreements with diverse government entities and offices to jointly advance in those topics of common interest. The Mario Molina Center joined the Green Growth Knowledge Platform; signed a collaboration agreement with the French Development Agency, the Latin American Development Bank, World Wildlife Fund, USAID, Potsdam Institute; and on a national level, we collaborated with the government of the State of Baja California, the State of Mexico, Mexico City’s Government, the Tequila Regulatory Council and the Metropolitan Environmental Commission.

The Mario Molina Center will continue to work to foster the development of real solutions to the problems we are facing. We hope to continue to work with decision-makers and other sectors involved, in order to promote our public policy recommendations and be a catalyst for change.

Dr. Francisco Barnés
Executive Director
During 2016, the Mario Molina Center continued to work in favor of sustainable development, the efficient use of energy and combating climate change with the valuable support of the National Council on Science and Technology (CONACyT), in collaboration with diverse development agencies, government offices and other national and international institutions.

- At the beginning of the year, the Center signed a collaboration agreement with the French Development Agency to work in favor of the energy transition in Mexico and sustainable mobility through public policy studies and proposals.

- In February 2016, the Center participated in the Smart City Expo Puebla Congress, where we organized two discussion panels with government officials in charge of directing mobility and environmental policies in the country, as well as with distinguished members of civil society. The panels were entitled “Tools for urban modeling” and “Regional Governance, actions in favor of a more sustainable Megalopolis”. This Congress is one of the most important events in Latin America on smart cities, and it seeks to gather local decision-makers to generate real urban transformation.

- In April 2016, the MMC and the Latin American Development Bank signed a collaboration agreement to foster scientific research and technology innovation, especially to combat climate change. This agreement contemplates the exchange of knowledge and developing programs and projects, and it has a strong environmental component, for it will foster the efficient use of energy, good practices in the fight against climate change, and the preservation of the environment. Later this year, in September, we signed another agreement to analyze risks to which highway infrastructure in Mexico is exposed due to extreme climate events. The intention is to propose action strategies and specific measures in climate change adaptation and risk management.

- In July 2016, the Environmental Defense Fund (EDF) in collaboration with the Mario Molina Center and the Pembina Institute from Canada released a report on energy policies entitled “North American Climate Change Leadership: A roadmap for global action on Methane emissions”. It was presented at an event in Mexico City organized by the Mexican Council on Foreign Affairs and the Mexico Institute of the Wilson Center.

- That same month, the MMC and CitiBanamex agreed to collaborate in the development of the most recent Environmental Performance Index for cities, which seeks to assist local governments in identifying best practices for environmental management to better the quality of life of the population.

- The Mario Molina Center actively participated in regional meetings for Latin America and the Caribbean previous to the United Nations Conference on Housing and Sustainable Urban Development, Habitat III, and we were part of the Mexican Delegation which assisted the Conference in Quito, Ecuador on October 2016. We presented tools and studies developed by the MMC to better plan and reduce negative impacts of Mexican cities in a conference entitled “Challenges and tools for urban planning with a climate perspective”.
In November 2016, the Tequila Regulatory Council and the MMC announced the conclusion and commitments of the project entitled “Sustainability Strategy for the production of Agave Tequila”. Both institutions collaborated to develop an action plan to incorporate sustainability as a fundamental ingredient of the Agave Tequila development strategy.

The German Potsdam Institute for Climate Impact Research and the MMC signed a Memorandum of Understanding to identify possible synergies in topics of interest in the generation of strategies to prevent risk, climate change adaptation and resilience building on urban surroundings.

Throughout the entire year, we jointly carried out three events with the German Embassy in Mexico to address the following three topics: 1) Agriculture: challenges against food security and climate change; 2) Sustainable Metropolis: betting on an integrated public transportation; and 3) Scientific collaboration for building urban resilience. Each of these forums was made up of a public section and a private discussion gathering Mexican and German experts.

In October 2016, the Xochitla Foundation, through its president Manuel Arango, gave the Mario Molina Center the Xochitla Prize, which recognizes non-governmental organizations for its achievements on sustainable development and sustainability education.

In the same month of October, the Government of the State of Baja California Sur, Mexico’s Climate Initiative, the Mexican Institute for Competitiveness, the Center for Renewable Energy and Environmental Quality, and the Mario Molina Center signed a collaboration agreement to assist the State Government with its Sectorial Energy Program. The Agreement has the objective of promoting economic and social growth with alternative energy sources. Baja California Sur will be the first state in Mexico with an energy program of its own.

Furthermore, the MMC participated in the Forum “Weighs and Dimensions for Vehicle Configurations which transit in federal highways”, organized by the Senate of Mexico, as part of the expert group that analyzed in previous years the Standards on these matters. Special emphasis was made on the integrated scope which must be given to freight transportation.

The MMC participated in the II Congress for City Leaders on Sustainable Mobility in Latin America which took place in Mexico City with the intention of 1) Establishing workplace indicators and methodologies to foster cooperation amongst cities in matters regarding transportation quality and mobility, and 2) international exposure to generate strong opinions in favor of incorporating urban mobility in public agendas.
• In December, the MMC participated in the “Constitution and Natural Resources Forum for Mexico City” organized by the local Government with the intention of discussing climate change, problems and solutions to land-use of conservation soil, and policies and management of water and green areas.

• To finish the year, the MMC became a Knowledge Partner of Green Growth Knowledge Platform, a group of international organizations whose purpose is to foster research in areas related to green growth. The MMC is only the second Mexican association to join this initiative.

PROJECTS
2016

ENERGY

Analysis of costs, benefits, and feasibility of a low-carbon strategy for the electricity sector on a medium term

The objective of this project was to identify, evaluate and determine the most cost-effective actions for increasing efficiency on electricity consumption in Mexico, putting special attention on the residential and municipal services sectors.

With the goal of mitigating emissions and being more competitive, the electricity sector in Mexico has modernized itself seeking better efficiency. It has adopted different strategies that, as a whole, have resulted in important improvements based mainly in technological advances that allow generating more electricity while polluting less, transmit and distribute energy to greater distances with lesser losses, and consume with more efficient equipment. Nevertheless, the number of users grows each year, as well as per capita energy consumption. This study quantifies historical and projected gains in emission reductions in the generation, transmission, and distribution chain, comparing them to a baseline trend. Having quantified the impact of the natural process of modernization in the electric sector, it concentrates on consumption making a diagnosis which reflects its current state through different approaches.
1. **Seasonability Approach**

It divides consumption according to building type (residential, commercial and services) and it is split in two consumption components: base (constant throughout the year) and stationary (due to weather), to determine the relevance of climate in electricity demand.

2. **Impact on Subsidies (domestic and agricultural tariff)**

It identifies the beneficiary consumer’s profile analyzing the macro effects which these subsidies have had in 1) consumer habits; 2) inclusion of high efficiency technologies, and, 3) effects on competitiveness levels of the agriculture industry.

3. **Municipal Consumption**

It divides consumption in two specific fields: lighting and water pumping. Increase in municipal electricity consumption is related to two factors: demographic expansion and population growth. With this information, we identified the main opportunity areas for saving, strategies for reducing consumption, economic feasibility to finance projects that better technology in these fields, and the impact that lowering demand of the National Electricity System could have.

The adopted actions in terms of incentives for the implementation of cleaner and more efficient technologies in generation, transmission and distribution of consumption have given positive results. There is however, potential for bettering efficiency in consumption. It is possible to achieve this through: 1) public awareness; 2) access to finance; and 3) send out price signals that reflect real costs.

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**Bioenergy: Regional analysis of overall harnessing of waste in the agriculture and livestock industries**

The agriculture and livestock industry, of great importance and magnitude in Mexico, generates significant quantities of waste, some of which are harnessed and treated, while others are simply discarded. It is key to prevent and minimize the production of this waste, as well as take advantage of their worth, whenever possible.

Our first priority was to geographically locate according to each industry, the main agriculture and livestock industries in the country, as well as create an inventory where we identified the type and quantity of waste produced, with the intention of finding opportunities for their use and to mitigate their negative impacts. We analyzed beer production; milk and its derivatives; fruit and vegetable preserves; production, processing and packaging of meat, fish and seafood; the sugar industry; and the tequila industry. We also evaluated oil, flour and coffee production.

Furthermore, we studied the state of the art in Mexico and the world regarding technologies to value and treat waste from agriculture and livestock. In this project, we detail available technologies and numerous examples of successful cases, some of which are relevant to the country. We also studied existent legislation in this matter in developed countries.

This is just the first step in identifying types, quantities and location of the main agro-industrial waste in Mexico, as well as the technologies for their disposal and harnessing. We have found various opportunities to give value to agro-industrial waste in Mexico. What follows now is to carry out detailed technical-economic evaluations for their implementation.
Analysis and Design of Sustainability proposals for National Education Infrastructure

The lack of maintenance in elementary level public schools in the country is resulting in significant damage that harms the quality of services. This study compared this issue to a major national program for maintenance that the current government is undertaking for this sector. The analysis focused on schools in Mexico City under a scope of environmental sustainability in two areas: energy performance and water management, and we proposed actions that may be included to improve the program.

The objective was to become aware of school infrastructure for elementary levels in the country and its environmental performance, to be able to propose public policy regarding efficient use of energy and water. For this, we carried out diagnoses of the situation which prevails in these types of buildings in the country, with a quantitative and qualitative scope.

On one side, we found that electricity consumption (main source of energy) of all school buildings during 2013 was of 34.14PJ, which represents 0.7% of primary energy consumed in Mexico. Emissions related were 4.31 MtCO2eq, representing 0.7% of national emissions. Furthermore, national water consumption was estimated at 109 million cubic meters (due to deficiency or lacking in many cases).

On the other hand, the evaluated Mexican schools are deteriorating due to age and lack of maintenance. Also, management of school buildings is deficient and comfort conditions are insufficient or inadequate in the majority of the buildings. To revert this situation, there is currently a program of major maintenance and remodeling headed by the government, a program called “Schools at 100”, which hopes to improve 16% of schools in the country by the end of 2018. These actions will not only improve building structures but will lower water and electricity consumption.

Finally, we evaluated improvement alternatives to better energy efficiency and rational use of water, besides establishing public policy proposals to increase and expand the benefits of the current program. The most urgent matter in schools is having the infrastructure required and access to it, as well as adequate comfort to receive proper education. For this reason, it’s necessary to expand the benefits of the program “Schools at 100” to every school, with a long-term view for its implementation. The program could be improved and sustainability policies for infrastructure in Mexican schools must be accompanied by maintenance actions.

It is also necessary to establish a maintenance program for schools from an institutional perspective and with a long-term planning strategy which will enclose with clarity the responsibilities of each government instance involved. This study was financed by CONACYT.
Sustainability for Impoverished Communities

This project, financed by CONACYT, focused on productive activities within five impoverished communities in the Mexican states of San Luis Potosí, Puebla and Campeche, and pilot testing on sustainable development in Puebla and Campeche. The objective was to propose production and technological alternatives to generate income, while preserving natural resources, bettering quality of life and harnessing knowledge from the communities involved.

As a result, we found that producers need to improve their agronomic practices, in order to increase the quality and yield of their products. Also, it’s necessary to create producer groups to organize collection centers to gather, transform, and commercialize each product.

We carried out a detailed analysis of an apiculture product and five agriculture ones, where we carefully analyzed their value chain, with the objective of identifying the options with the highest probability of success according to cultural, social, environmental and economic conditions of each community.

Regarding education in these impoverished communities, the objective was to review, restructure and implement Education Material for Sustainable Development, with a Hands-on and Inquiry-based Science Education Systems (SEVIC) methodology. To promote knowledge on sustainable actions and scientific thought, at a previous stage, we developed environmental educational material directed to children of ages 7-12. During this stage, we restructured this material with the SEVIC methodology and later implemented a pilot test in the communities of El Refugio, in Campeche (mestizo culture) and Tecpantzingo, in Puebla (nahualt culture), with the purpose of evaluating and validating, in order to replicate it in other parts of the country.

Source: CMM

Source: CMM
The project was developed for the Federal Mortgage Society (SHF) during 2015 and 2016 with funds from the World Bank and the Inter-American Development Bank. The objective was to create a methodology and guidelines to incorporate evaluation criteria for the surroundings of the social housing program EcoCasa. The intention was that houses benefited by this program not only mitigate greenhouse gas emissions (GHG) in their households, but that their location allows inhabitants to easily get to work or urban amenities, reducing their emissions and increasing their quality of life.

The result of this project was the creation of the Tool for Evaluating Housing Surroundings (HEEVi) and the strategy for its implementation. HEEVi evaluates employment density, proximity to public transportation, housing density, mix-land uses, uninhabited housing, and distance to education, health, sports, social assistance, and other urban amenities, near the housing unit to be evaluated. With this information, a score of 0 to 100 points is obtained, as well as an estimation of annual GHG emissions related to transportation and costs. The tool is currently available through the Housing Registry’s (RUV) platform. The information used by the tool comes from public and systematized sources such as urban contention perimeters (PCU), census from the National Institution for Statistics and Geography (INEGI) or from the Ministry of Education (SEP), among others.

After doing several trials on housing developments financed by SHF and case studies in the cities of Aguascalientes and Guadalajara, it is possible to determine that HEEVi is an excellent complement for PCU, for they guarantee continuity in the existent city and the quality of urban surroundings.

Starting 2017, SHF will demand as a requirement on their sustainable housing programs, including EcoCasa, to obtain a minimum score on its HEEVi. This score will gradually and progressively increase to allow the market to familiarize and align itself with the objectives of this tool. During this first stage, there will not be a requirement for a minimum score; starting the second year, a score of 30 is recommended, and an increase of 5 points per year (during the evolution stage); during the consolidation stage, a score of 70 will have to be obtained.

Currently we are working on broadening the impact HEEVi has had to aid programs managed by the Nacional Commission on Housing (CONAVI), the Institute of National Housing Fund for Workers (INFONAVIT), and the Housing Fund of the Institute of Social Security and Services of State Workers (FOVISSSTE). With this, we hope to direct social housing in Mexico towards locations that translate in lower emissions, lowers costs and better quality of life for the low-income Mexican population. Widespread use of HEEVi in the housing sector will directly impact national housing policy and will promote a compact development of Mexican cities.
Mobility Strategies for urban freight transport for the Metropolitan Area of the Valley of Mexico

Freight transportation in the Metropolitan Area of the Valley of Mexico (ZMVM) is fundamental in guaranteeing commercial activity and is essential for promoting economic development in the area. Nevertheless, it’s impossible to disassociate to negative externalities that affect society. Even though the majority of freight transport circulates on federal highways most of the time, it invariably enters urban areas, and that’s why it is partly blamed for deteriorating air quality and therefore an increase in respiratory diseases, greenhouse gas emissions, traffic congestion, noise, as well as damage to infrastructure and accidents.

Even though there has been progress in recent months made by the Federal Government and by the Mexico City and State of Mexico governments, there is still no integrated plan for the ZMVM which takes on the problems posed by freight transportation and that establishes a framework under which government authorities, associations and other players directly involved may work coordinately.

In addition, public policy proposed in this matter not always has technical, economic o financial feasibility evaluations, which often means it is not possible to implement such policies.

In this study, financed by CONACYT, we proposed public policy initiatives for bettering and modernizing the road and transit system for freight transportation, under an integrated sustainable urban mobility scope. The study considers all the players involved in freight transportation in the ZMVM and proposes actions to increase competitiveness and efficiency in the metropolis. The measures proposed are general and require further analysis before being implemented.

The diagnosis identified an important gap in the regulatory framework of the ZMVM when confronted to international best practices. This can be explained, among other things, due to lack of inter-institutional coordination and between levels of government, due to lack of environmental and security legislation, and for an absence in efficient implementation mechanisms of existing policies. The present study may be useful for decision-makers in revising the current legal framework and in the design of specific public policies for freight transportation. Among the main measures proposed are to:

- Evaluate the convenience of establishing a general law for freight transportation.
- Develop corridors with specific usage times in state mobility programs for freight transportation vehicles.
- Build road infrastructure devoted to loading and unloading merchandise and goods.
- Limit loading and unloading of merchandise at places such as customs, supermarkets, and department stores.
- Standardize freight transport vehicle verification between different states.
- Include in the General Law of Human Settlements the obligation of different states and municipalities to consider freight transport as a relevant element of urban planning.
As part of the research on sustainable cities and the projects in urban modeling, the study “Metropolitan Profile for 37 metropolitan areas of Mexico” was developed. The following questions were considered: 1) In what way municipal plans for urban planning foster an efficient management of land at the metropolitan level in Mexico? And 2) what are the key problems metropolitan areas should solve?

The study includes an analysis of the different patterns of land occupation through the generation of three scenarios of urban growth: the ownership, the planning and the vision, as well as an estimate of the environmental, social and economic impacts related to each scenario. On the other hand, urban capacity of each metropolitan area was evaluated in order to identify the key problems these zones should solve.

Given that the study is geared towards providing useful information for decision-making, a tool was created in order to consult the results in an efficient way. The compilation of information was one of the main obstacles that were faced when undergoing an analysis of this size. With information provided by two-thirds of the 367 municipalities that make up the 59 metropolitan zones, an analysis was able to be completed for 37 metropolitan zones. Also, it was found that only 15% of the municipal plans for urban development (PMDU) included geospatial information, which accentuates the need to develop technical capacities in the municipalities that make up the metropolitan zones. In order to ensure that the proposed methodologies be easy to replicate and update, the report pays special attention to discover the sources and procedures of calculations that were applied. The results and the tool that was developed as part of the Metropolitan Profile can be used by decision-makers to evaluate numerically their municipal plans for urban development, or recognize the opportunities in the current management mechanisms being used in their territories.

The information compiled through this project has helped to demonstrate the current situation in the metropolitan zones, mainly referring to urban planning. This information has been of great value to different governmental agencies (RUV, CONAVI, SEDATU, SHF) so that they may take this into account to generate other studies taking this information into account.

2016 Environmental Performance Index

For the third consecutive year, the Mario Molina Center with the help of CityBanamex created the Environmental Performance Index (IDA) which evaluates the environmental state of Mexican cities. In this occasion, the IDA made more analysis of the 20 cities that by 2030 will have between one and ten million inhabitants. This is to say, those cities that will grow and that from this moment should take decisions that will avoid deteriorating the environment through the evaluation of key environmental indicators in different spheres of human activity.

Through 45 indicators classified in seven subtopics (water use, air quality, urban land, energy efficiency, waste management, green spaces and mobility) the environmental performance of cities was evaluated, putting emphasis on the existence of two indicators or key dimensions: the current environmental circumstances and society’s response as well as the governments’ to reverse the environmental damage done in the present or that could be done in the future. The objective of evaluating these two dimensions independently is to identify in the long term the best practices for its positive environmental impacts.

The general results confirm the close relationship between the current situation and the environmental management. Even if all the cities have a medium-low environmental performance in both dimensions (between 25 and 50 points in a range between 0 and 100), the cities that showed a better state in their systems and natural resources were those that display the best actions in favor of the environment. Also, for each city it is possible to identify the opportunities by subject, and different success cases are proposed to promote good practices. The study also highlights the importance of boosting the green economy, due to the high investments that are needed for the betterment of infrastructure, technology and services to transition towards more sustainable cities.
School Transport Program in Guadalajara

Between 2015 and 2016, a study was carried out in order to design the rules of operation of the School Transport Program (PROME) for the metropolitan area of Guadalajara. Its main objective is to reduce the emissions caused by mobile sources associated with school transport. In Guadalajara, the most critical problems of air quality have to do with particulate emissions and ozone.

Based on a diagnosis of patterns of mobility of students from private and public schools, and the elaboration of a baseline of emissions for 6 pilot schools, a campaign of emissions counting from motors in circulation with remote sensor systems was made. The recommendation was to include in a PROME the reduction of use of private cars and the increase in non-motorized ways of mobility, to private schools of more than 400 students and to public schools of more than 800 students.

If the substitution of private vehicles by buses with particulate matter filters reaches 70% of the vehicle fleet, the following environmental benefits would hold: the carbon dioxide emissions would decrease by 20%, the carbon monoxide emissions and the particulate matter would average to a reduction in 35% and the nitrate dioxide emissions would decrease 10%.

Source: CMM
The following recommendations are: 1) Attribute the implementation of the PROME to the environmental mobility and educational authorities of the government of the state of Jalisco; 2) promote the modification of the legal framework to finance the school transport strategies; 3) develop and publish a general norm of technical character that establishes the environmental rules of operation of school transport; 4) create a technical committee comprising state authorities, local government, school centers and parents of students in order to advise the development and implementation of the school transport strategies as well as to monitor the compliance, evaluate and communicate the results.

The PROME is part of the Air Quality and Climate Change Integral Agenda of the government of the state of Jalisco. The results of the study facilitate the assignment of the funds of the state’s Green Fund to finance transportation projects that allow for the reduction of emissions.

Cuernavaca Ecozone

Within the established limits of the Cuernavaca Ecozone, 59% of the trips are made in buses, while 11% in private cars and 30% walking. However, the conditions for offering public transportation and of the non-motorized infrastructure promote the use of the private car. For example, 59% of the public transport fleet has surpassed its service life and are highly polluting. Moreover, it was estimated that the offer of transportation is five times superior to the quantity of trips demanded in two of the principal corridors of the city (Matamoros-Hermenegildo Galeana y José María Morelos y Pavón) situation that provokes congestion in the small roads of the city. Even more, 80% of the sidewalks are in bad conditions, and the public parking tariffs are so low that they incentivize the use of the car (between 8 and 18 pesos per hour). Also, only 50% of the private cars, 40% of small vans, 15% of buses and 32% of freight transport vehicles registered in the state are tested in the verification system.
This is why, parallel to the instrumentation of vehicle restrictions for non-tested vehicles and highly polluting vehicles, which could reduce emissions up to 63% in average, the following measures are recommended:

1. Improve frequency and environmental performance of public transport.
2. Implement actions to discourage the use of private cars in the zone (parking meters and stratification of public parking lots).
3. Improve walking and cycling infrastructure.

For each measure, goals and monitoring indicators were developed, as well as a critical route developed in collaboration with the authorities and key actors of the Cuernavaca Ecozone, for the implementation of the following priority actions: Program of Required Vehicle Verification (PVVO) and vehicle restriction; Plan of rearrangement of public transport; and non-motorized mobility infrastructure such as sidewalks, safe crossings, pedestrian roads and cycling paths; as well as the retrieval of public spaces.

In this project, various land use management tools were studies in order to evaluate their implementation potential in Mexico. After careful revision, it was concluded that there is no one existing tool that can resolve all urban planning issues. Thus, a pool and combination of instruments aligned under one overall strategy can be possible and specific urban area issues can be solved this way. In this way, two instruments were selected: the strategy for the Development of Transport and uptake of the added value, for its potential to solve two of the most important problems relevant to Mexican cities: the disconnection between housing and mobility policies and the lack of financial resources for urban development.

The area of study defined is the metropolitan zone of La Laguna (ZML), due to the projected construction of a public transport corridor, type BRT, which will enable more urban development in its area of influence, as well as the investments made to renovate or create public spaces in the center of the city. A priority DOT area was defined in the municipality of Torreon, in the zone which includes the Ciudad Universitaria of the University of Coahuila and the Technological University of Torreon, which surface covers 377 hectares. The zonification proposes a mixed real estate development, equipment, commerce and services, green areas and recreational spaces, pedestrian roads etc. which considers the integration of the adjacent settlements. Other proposals include spaces for the implementation of business incubators and a research center in order to boost scientific research for the cities. On the other hand, a conservation of agricultural areas located in the Matamoros municipality is also proposed, in order to contain urban sprawl. It is recommended to include principles, objectives and goals of a DOT policy and a Partial Plan for Urban Development in order to give legitimacy to the zonification proposal, or if not, to promote a constitution of polygons of action or priority intervention in order to define a more specific regulation at the property level.

This project was financed by CONACYT.

The various construction sites of urban renovation at the center of the city and the inclusion of the concept of added value to the Financial Code and the State Constitution offers the ideal conditions to take advantage of the impacts in land valuation.
The availability and access to urban information is fundamental for the proper elaboration of planning, regulatory and management urban instruments, as well as to facilitate the decision-making and accountability. For this reason, this project proposes a System of Urban Information (SIU), in order to ensure the proper interoperability of geospatial data, to guarantee public access in general, and in order to become a tool for gathering and publication of official information in relation to urban and territorial planning.

To generate a coherent proposal, several SIU examples were analyzed at the national and international levels. A revision also took place, of the legal and institutional frameworks and of the technical criteria that the SIU needs for its implementation. It is proposed that the SIU comprises four transversal components (base cartography, population, environment and economy) and five specific components (land and instruments of planning, mobility and transport; housing and settlements; risk and vulnerability; and infrastructure, equipment and services). It is recommended to start with the Digital Map of Mexico of the INEGI, a platform which was developed with the free software MxSIG, integrating more information and functionalities to transform into a SIU at the national level, which in accordance with the General Law of Human Settlements, Territorial Regulation and Urban Development, the Ministry of Agricultural, Urban and Territorial Development (SEDATU) should be in charge and initiate operations in within six months’ time (i.e May 28, 2017).

The potential area of capture of added value proposed is concentrated in a sector that integrated five public spaces: Paseo Morelos, Plaza Mayor, Plaza de Armas, Alameda y Bosque V. Carranza, with an area of influence of 75 blocks and 1,375 properties. It is recommended to define the technical aspects in order to determine the zones of implementation, guidelines of valuation and fees for the payment of taxes; include benefit zones and redistribution of urban areas, as well as the creation of a Municipal Fund for the management and transparent use of resources.

Urban Information System

The availability and access to urban information is fundamental for the proper elaboration of planning, regulatory and management urban instruments, as well as to facilitate the decision-making and accountability. For this reason, this project proposes a System of Urban Information (SIU), in order to ensure the proper interoperability of geospatial data, to guarantee public access in general, and in order to become a tool for gathering and publication of official information in relation to urban and territorial planning.

To generate a coherent proposal, several SIU examples were analyzed at the national and international levels. A revision also took place, of the legal and institutional frameworks and of the technical criteria that the SIU needs for its implementation. It is proposed that the SIU comprises four transversal components (base cartography, population, environment and economy) and five specific components (land and instruments of planning, mobility and transport; housing and settlements; risk and vulnerability; and infrastructure, equipment and services). It is recommended to start with the Digital Map of Mexico of the INEGI, a platform which was developed with the free software MxSIG, integrating more information and functionalities to transform into a SIU at the national level, which in accordance with the General Law of Human Settlements, Territorial Regulation and Urban Development, the Ministry of Agricultural, Urban and Territorial Development (SEDATU) should be in charge and initiate operations in within six months’ time (i.e May 28, 2017).
It is recommended to establish the following minimum criteria for the information that the SIU will have: create the information in systems of geographical information (Shape format), use the system of geographic projection used in the current System for the Consultation of Census Information (SCINCE), normalize the minimum guidelines of the database and include metadata.

The national SIU should be able to make at least the following four tasks: visualization of layers of information, filters of information through the layer selection and databases of interest for the user, downloading the information in editable formats of databases or layers of information (Shape) and statistic geoprocessing (calculation of distances, intersections of data through an area of influence, calculate density, amongst others).

The objective of this project was to dig deeper into the benefits of improving mobility, derived from policies of network extension, operative integration and substitution of vehicles with cleaner technologies in the public transportation system, as well as generating recommendations for its implementation.

The study develops around three bog proposals to improve mobility in the metropolitan area of the valley of Mexico. The first focuses on the extension of networks of public transport; the second on the exploration of different schemes for the substitution and scrapping obsolete vehicles; the third directed towards promoting intermodality through the integration at the metropolitan level of payment, services and points of transfer between different transport systems.

Through the analysis of current structured public transport networks (TPE) in the metropolitan area, several requirements were defined in terms of mobility, identifying the principal zones that lack infrastructure for adequate movement of the population, through the quantification of the economic, social and environmental benefits of the proposals.

For this, a case study was defined and supply and demand characteristics were analyzed, of the Tecámac-Indios Verdes corridor, in the context of the construction of the new Line 4 of the Mexibus as well as the different scenarios of integration with Line 1 of the Metrobus System. The social benefits as well as the consumption of fuel were quantified, through a cost-benefit analysis that amongst other factors emphasized the importance of lowering the travel times in public transport as a central element to guarantee the return of public investment in these systems.

In order to evaluate the political and economic feasibility of the proposals, it was necessary to know and analyze the position of different actors that were involved in the subject as well as the revision of the different schemes of finance that will allow the definition of the ideal way for the approaches.

One of the objectives is to contribute to the actions made to transform mobility in the city. The project was presented to decision-makers in the government of the State of Mexico as well as the city of Mexico. Also, a workshop was created with the participation of government members, industry, experts and civil society organizations. The results of the workshop and the central proposal to integrate modes of public transport at the metropolitan scale was picked up by the media and social media.

The message communicated to decision-makers has been that it is clear that it is fundamental to continue and accelerate the expansion and integration of public structured transport in combination with other urban factors as well as socioeconomic, and have a metropolitan vision with the financial participation of the federal government. It needs to be taken as a fundamental element the contracted public transport and the definition of routes that will feed into the adequate design of policies and strategies. Also, a major housing density should be considered as well as use of mixed land around public transport stations in order to promote pedestrian mobility and diminish the use of the private car. It should also be noted that the standardization of the methods of payment should be applied, in order to strengthen the integration amongst all systems.
Characterization of atmospheric emissions (PM$_{10}$ and PM$_{2.5}$) and reduction measures

The objective of this project, financed by CONACyT, was to design a monitoring campaign to identify the concentration and chemical composition of atmospheric particulate matter smaller than 2.5 microns in the Metropolitan Area of the Valley of Toluca (ZMVT). These particles are the ones that have the most impact in public health.

The design included the compilation of information analyzed by the air quality team of the Mario Molina Center related to: sources of emissions, inventory of emissions, analysis of air quality behavior; meteorological parameters, population density, sensible population location; floating population; schools and hospitals; that were integrated into a model created to identify the most environmentally significant places. The design pretends to locate the sectors with the major number of people that are exposed to atmospheric particulate matter below 2.5 microns (PM$_{2.5}$) and its principal sources of emission. The results of the present study will be used as support in the first phase of the design of public policies that will help diminish atmospheric pollution in sectors that are densely populated and thus improve the quality of life of its inhabitants.
The Mario Molina Center collaborated with the Tequila Regulatory Council in order to jointly develop an action plan to incorporate sustainability as a fundamental ingredient in the development strategy of the Tequila industry. After an evaluation was carried out to assess the current situation, the strategy proposes a pathway so that the industry can consolidate sustainability practices in three dimensions: social, economic and environmental.

The objectives achieved after a year of working together, are:

- The evaluation and quantification of the carbon footprint of the Tequila industry (carbon, water and emissions footprint).
- The acknowledgement and quantification of actions already ongoing to encourage sustainability.
- Identification and quantification of good practices and opportunities for improvement in the agricultural and industrial phases.
- A baseline and sustainability goals to be adopted by the Tequila industry.

Sustainability goals for the Tequila industry chain with respect to 2014

The results of this project will contribute to the efforts the Tequila agroindustry has been undergoing for the past 10 years, orienting and feeding the necessary information for decision-making that will result in better environmental results and more efficient investment.

Source: CMM
Pilot project in climate change courses developed for middle school and high school students

The main objective of this project was to complete a pilot project that includes a certificate for teacher training and adequate materials at the middle school level and new courses in high school oriented towards the following subjects: Ecology, Physics and Chemistry (high school), to evaluate if material contents, activities, texts and images are pertinent to the respective grades and given assignments.

During the 2016 pilot project, materials and courses proposed by the Mario Molina Center were analyzed, adding in an integral way teachers training, through the Certificate for Teaching Climate Change, as well as a performance evaluation of the proposed courses, where teachers took the Certificate knowledge to the students, and also used the middle school and high school materials, of which their pertinence was also evaluated.

For the teachers training, there were two groups: one at the middle school level and another at the high school level. The tests in the classroom where developed with 10 groups of approximately 50 students each, in four subjects: Ecology, Physics and Chemistry for high school; and the Elective State Courses option for middle school. In the end, the project worked with 21 high school teachers and 23 middle school teachers of the public education system and more than two thousand students from Mexico City and the State of Mexico.

The efficiency of the Certificate program was validated, considering several adjustments made from the 2015 pilot project. Appropriate comprehension of the subject matter was fostered in climate change, and the pedagogical enquiry method as well, which was able to improve substantially (94% score average vs 70% average in 2015).

With respect to middle school testing, only the first stage was reported on (2016), as the testing concludes in July of 2017. For now, it has been found that the application of the program is successful 94% of the times and that teachers have an excellent practice in the classroom (91/100). It was also found that the material applied for the subjects of Ecology and Chemistry were pertinent for the proposed grade levels (4th and 1rst semesters) as in each of the cases, 86% of the sessions were developed in accordance with the proposal in a successful way. However, it was found that it is necessary to complement with some content related to the subject matter. It was also found that the applied material in the Physics subject is pertinent to the appropriated grade level suggested (5th semester). However, it cannot be applied as the proposal intends, as it only embarks on one of the three thematic branches of the program. With respect to the subject branch applied, 85% of the proposed activities were achieved with success.
Design of a climate change workshop for public servants

This project was carried on with the objective of boosting public servant interest for environmental problems that are relevant such as climate change. Promoting in this sector an interest, knowledge and skills in these matters is fundamental so that they may get to know their surroundings, understand phenomena and participate in the decision-making process from an evidence-based perspective.

This course promoted communication and dissemination of themes related to climate change to explain the causes, consequences and solutions to climate change. A course was designed, which contains the development of theoretical as well as practical content for an in-person application of 15 hours, considering 10 sessions of 2.5 hours. The idea was to progress through the topics incrementally as well as prepare experimental activities. The pilot project of this course was made in the first semester of 2016 with 26 public servants. This project counted with the participation of the Environmental and Territorial Order Attorney’s Office of Mexico City.

Encouraging amongst public servants the interest in environmental matters such as climate change is a necessary task especially amongst the groups that are involved in the decision-making process in public policy design related to the environment. It is important to promote knowledge and skills that will allow the understanding of their surroundings and the phenomena that occur, through scientific research that is objective and clear. This course promoted communication and dissemination of the causes, consequences and solutions to climate change.

The course was possible with the financial support of CONACYT.

FINANCIAL AND HUMAN RESOURCES

The Mario Molina Center has evolved since it was founded and now counts with more than 60 experts working in transversally in multidisciplinary subjects, of which our studies in the physical, economics, engineering and public policy studies make our proposals have an inclusive and comprehensive perspective taken into account.

The resources used for our research comes from government sources, foundations, different public and private institutions of Mexico as well as international organizations. This diversity of funds gives us the necessary legitimacy and guarantees absolute independence in our actions.

The management of the resources obtained is done with transparency and is audited periodically by two external entities, a private firm and a governmental entity.