

GURME Pilot Project

Urban Health, Air Quality and Climate: Mexico City Case Study

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With information provided by
Mexico City Secretariat for Environment (CDMX – SEDEMA)

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Urban Health, Air Quality and Climate: Mexico City Case Study

Objectives

- By forecasting AQ conditions on short timescales, support the Mexico City government with information to take effective actions through mitigation to population exposure of high pollutants concentrations and lay the groundwork to develop policies to reduce pollutants emissions for air quality improvement and other co-benefits (e.g., climate, food security, etc.)
- Identify synergies with existing activities and create synergies with other initiatives (health, air quality and environment, development) of Mexico City's government
- Capacity building “**learning by doing**”
- Raising awareness of the health benefits of emissions reductions
- Expand model coverage, replicating in other cities and megacities, especially in developing countries.

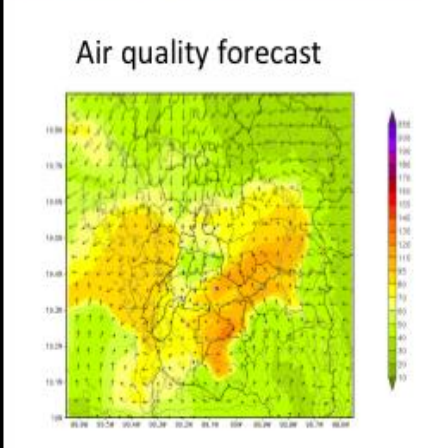
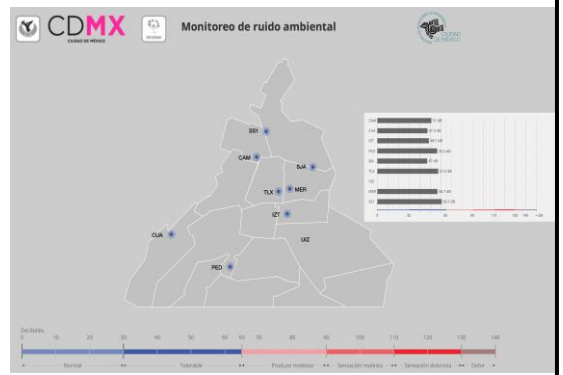
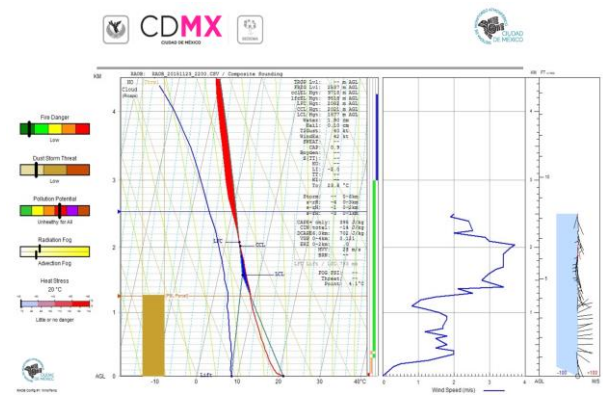
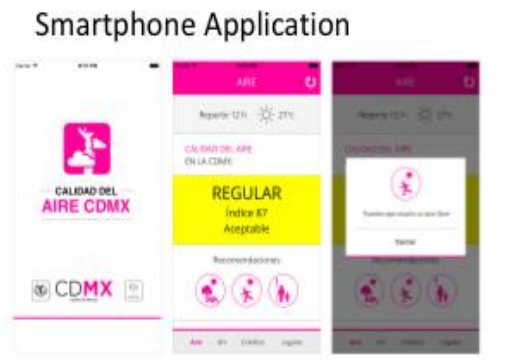
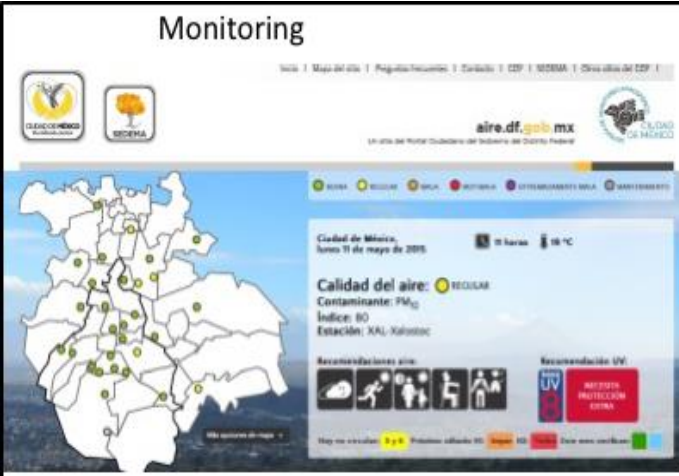
Activities currently being developed by CDMX Environment Secretariat

- Continuous strengthening of the air quality monitoring network
- Auditing of the Mexico City Metropolitan Area emissions inventory
- Follow up and assessment of PROAIRE's local competency actions
- Carrying out the historical health improvement assessment due to emissions reductions from 1990 to 2012 together with Harvard School of Public Health
- Developing the WRF-CMAQ parametrization for the specific case of Mexico City's megalopolis together with the Barcelona Supercomputing Center (BSC)
- Analyzing the possibility of measuring air pollution concentrations at street level to compare with background concentrations in order to assess health consequences of exposure to high pollutants levels in this microenvironment.

Technical Workshops to be supported by WMO-GURME (strengthening capacities to improve results of SEDEMA activities)

- Source apportionment
 - Pollutants - BC, PM2.5, PM10, ozone precursors (VOCs, NOx)
 - Sectors
- Health benefit and economic cost (BenMAP)
- Enhanced air quality forecasting (WRF-CMAQ)
- *Street canyon* type modelling to compare with street level monitoring
- Emission inventories improvement
 - uncertainty calculation methodology
 - HFC , aerosols calculation
- State of the art of policies and strategies to reduce emissions of ozone and PM2.5 precursors
- Determining the cost-benefit of implementing policies and strategies.
- Global trends in air pollution control

Mexico City Air Quality Management Tools



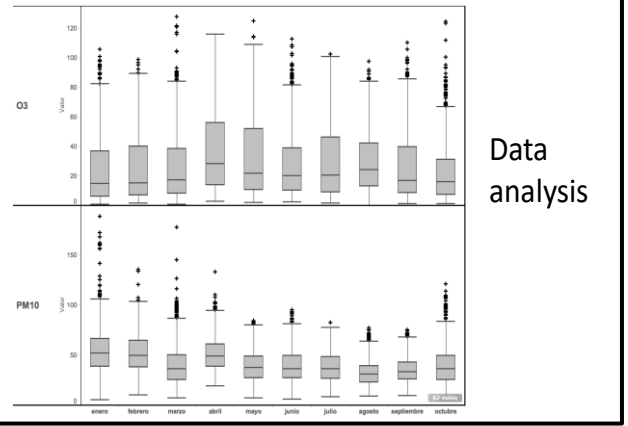
Research Collaboration

PM Proyecto AERAS INERIS/INEC/AMPA/AMPA/AMPA

BC Monitoreo de carbono negro

Ozone precursors Monitoreo de precursores de ozono

Altzomoni Observatorio Atmosférico Altzomoni



CDMX Air Quality Monitoring

<http://www.aire.cdmx.gob.mx/default.php>

The screenshot shows the homepage of the CDMX Air Quality Monitoring website. At the top, there is a navigation bar with links for Inicio, Mapa del sitio, Preguntas frecuentes, Contacto, CDMX, SEDEMA, and Otros sitios CDMX. The main header features the CDMX logo and the SEDEMA logo. Below this is a map of Mexico City with colored dots indicating air quality at various monitoring stations. A central panel displays the current air quality status: Ciudad de México, viernes 31 de marzo de 2017, 08 horas, 13 °C. The air quality is labeled as MALA (orange dot) with a PM₁₀ contaminant and an index of 111. It also shows UV recommendations and a 'Este mes verificar' bar. A bottom navigation bar includes links for Última hora, Pronóstico, Contaminación y tu ciudad, Origen de la contaminación, Monitoreo, Publicaciones, Datos, Investigación, and Estadísticas. The footer contains application icons for APLICACIONES, Aire (Apple, Android), Ecobici (Apple, Android), and Google Earth.

CDMX Emissions Inventory Reports

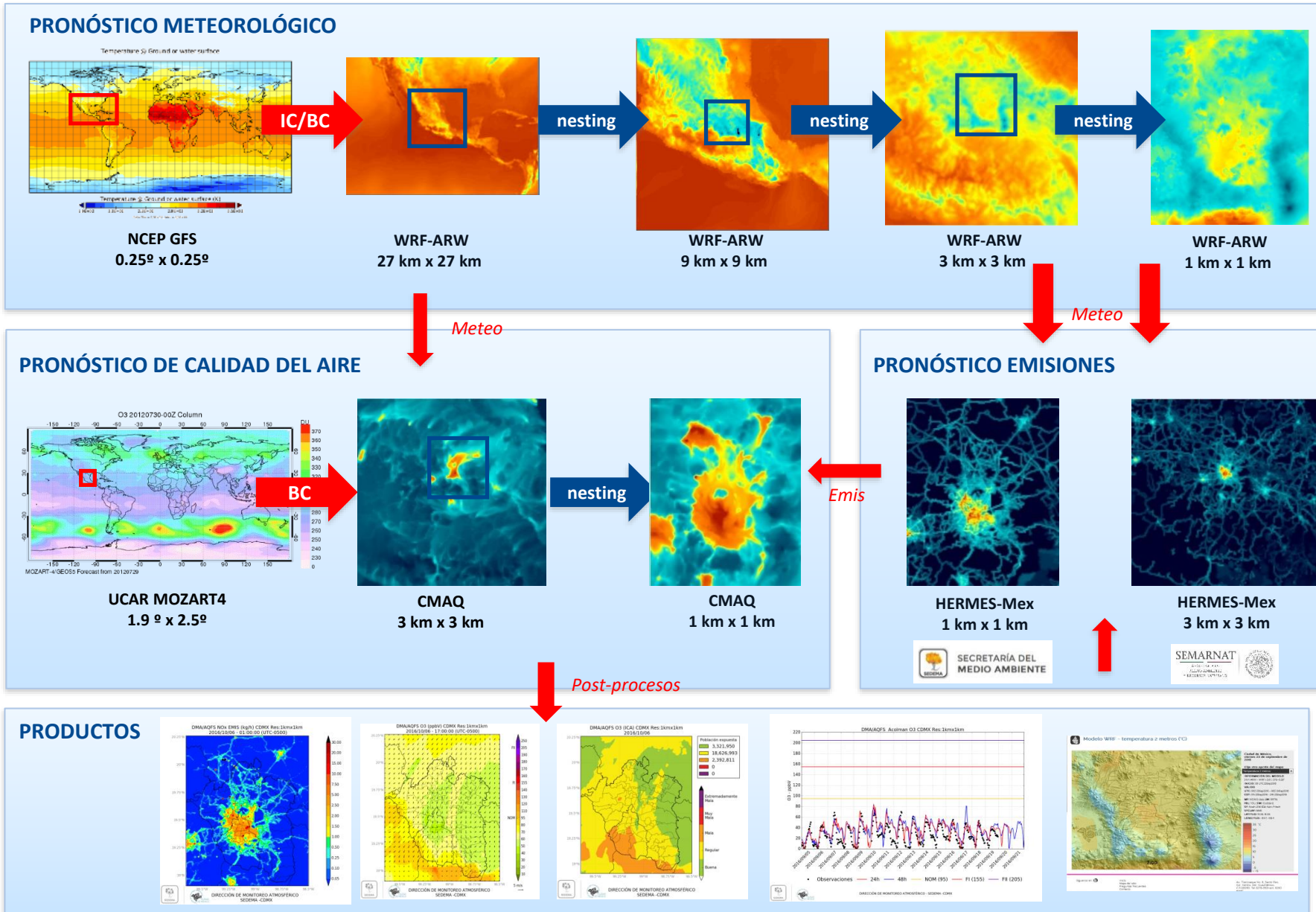
<http://www.aire.cdmx.gob.mx/default.php?opc=Z6BhnmI=&dc=Zg>

The screenshot shows the homepage of the CDMX Emissions Inventory Reports website. It features a navigation bar with links for Inicio, Mapa del sitio, Preguntas frecuentes, Contacto, CDMX, SEDEMA, and Otros sitios CDMX. The main header includes the CDMX logo and the SEDEMA logo. Below the header is a navigation bar with links for Última hora, Pronóstico, Contaminación y tu ciudad, Origen de la contaminación, Monitoreo, Publicaciones, Datos, Investigación, and Estadísticas. A central panel displays 'Inventarios de emisiones de la ZMVM'. Below this is a grid of 15 report covers, including titles like 'Inventario de Emisiones de la Zona Metropolitana del Valle de México', 'Registro de Emisiones de Gases de Efecto Invernadero del Distrito Federal', 'Contaminantes Tóxicos', and 'Gases de Efecto Invernadero'. The footer contains application icons for APLICACIONES, Aire (Apple, Android), Ecobici (Apple, Android), and Google Earth.

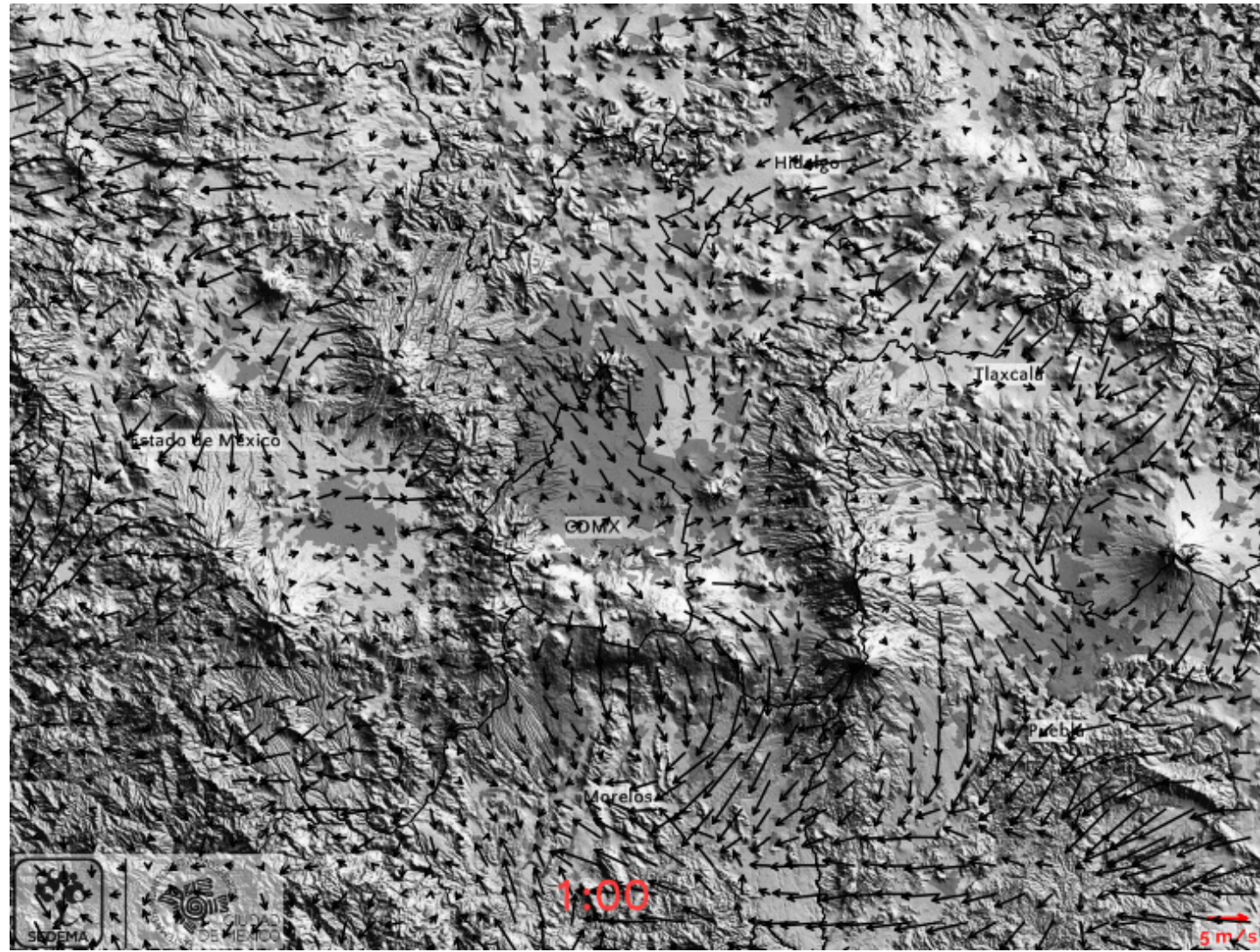
Mexico City Air Quality Forecasting System

- Although Mexico City has an air quality problem, it does not have a system based on modern numerical modeling tools that allows a relative degree of precision to anticipate an episode of contamination.
- Since the beginning of this administration, significant efforts have been invested in the development and implementation of a system capable of predicting through numerical simulation the manner in which air pollution behaves in Mexico City and its metropolitan area, with an anticipation of up to 24 hours.
- The forecast system for Mexico City was developed in collaboration with the Barcelona Supercomputer System.
- The model takes advantage of the scientific experience obtained during the large field measurement campaigns carried out during MCMA-2003 and MILAGRO-2006, as well as the improvements in the emission inventories carried out by SEDEMA in recent years.

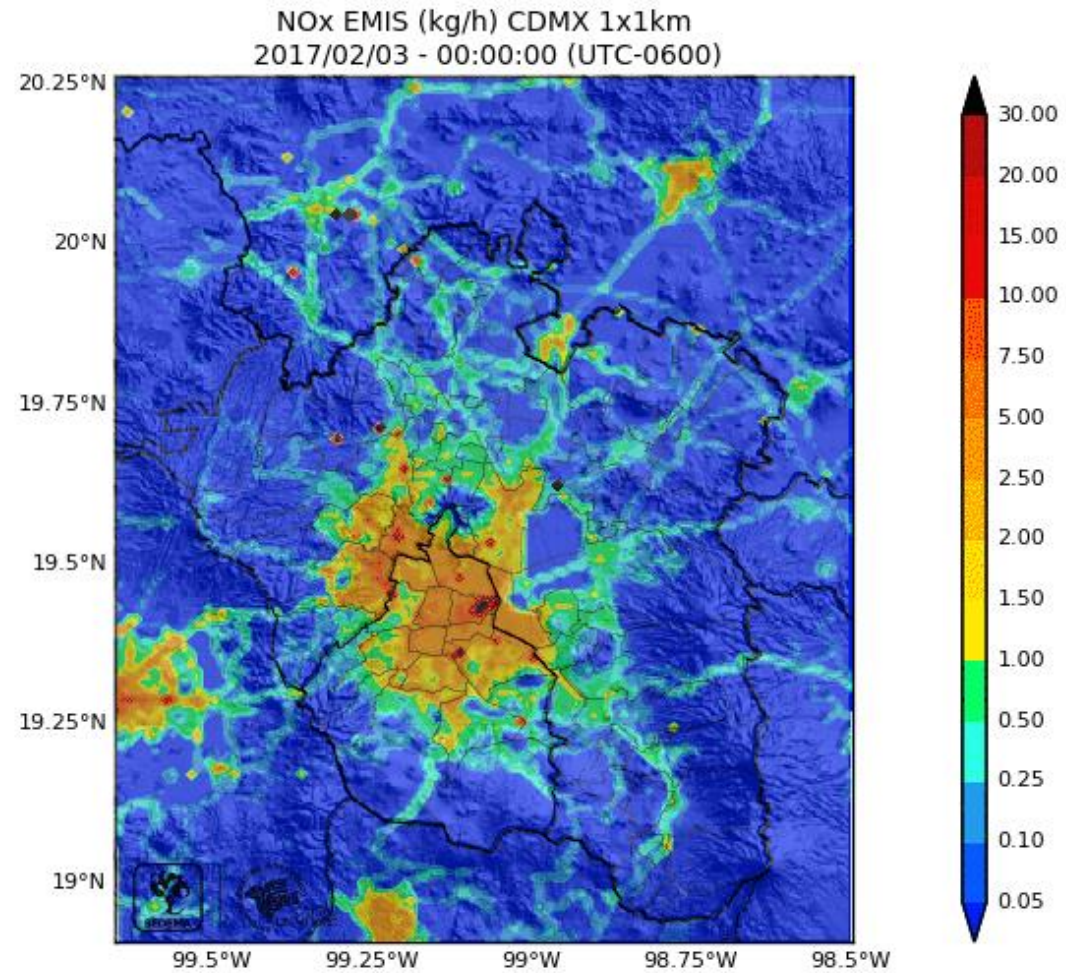
Air quality forecasting system for Mexico City



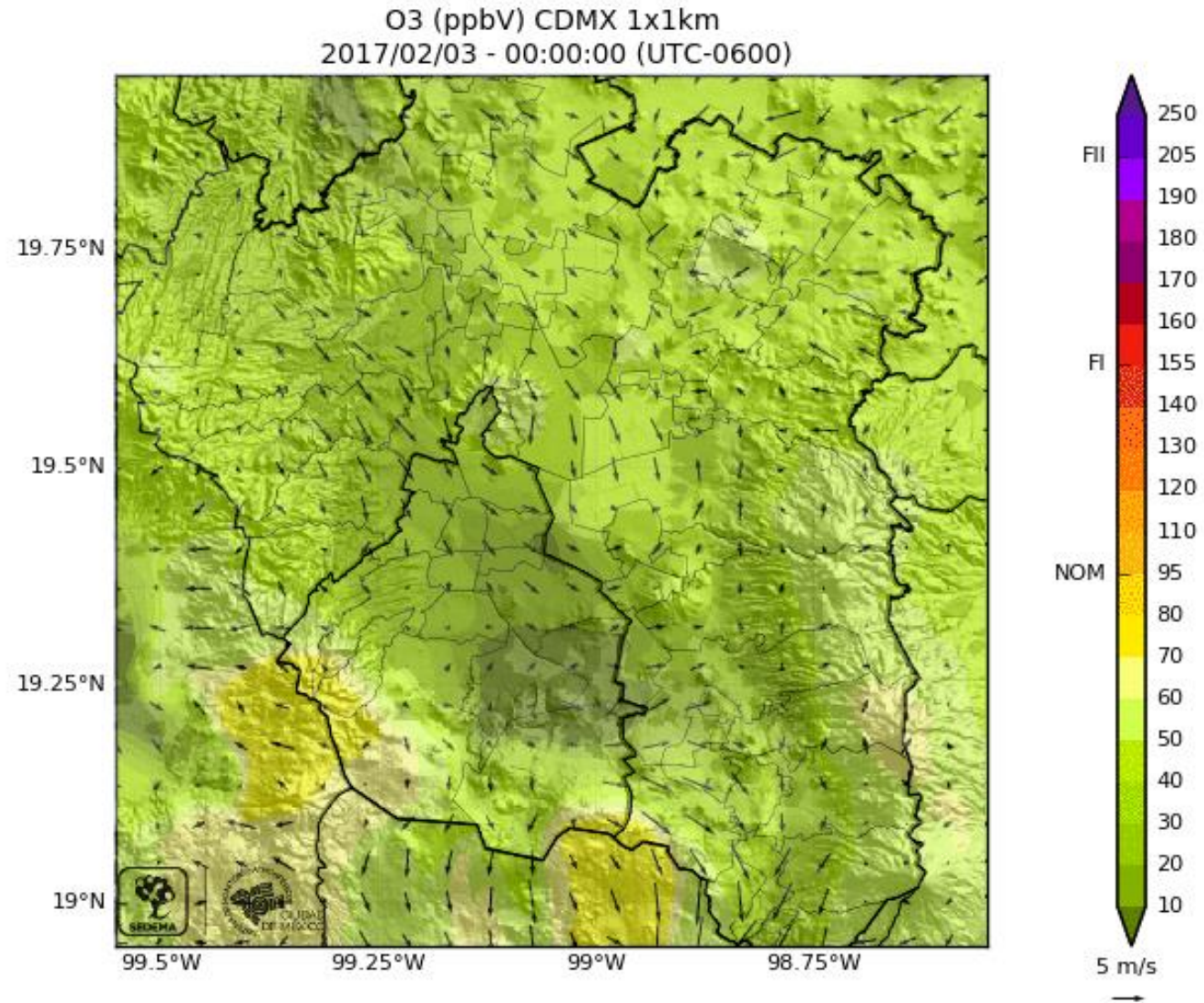
Example of Meteorological Modeling



Example of emissions modeling

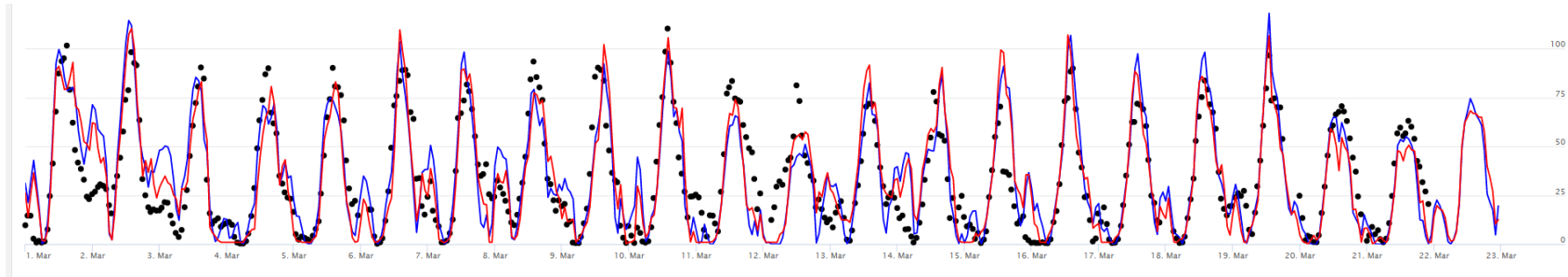


Example of Air Quality Modeling

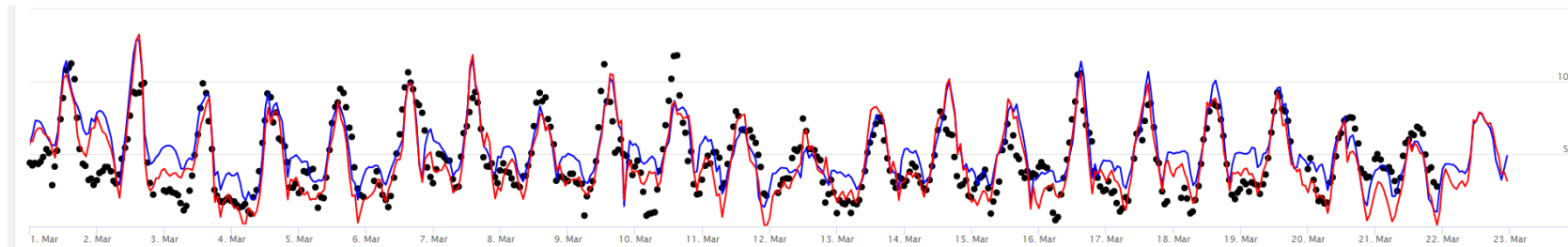


Model Evaluation

The model is evaluated by comparing the air quality data obtained from the SIMAT with the model output data to determine the uncertainty of the model.



Estación Benito Juárez (BJU), datos de marzo de 2017



Estación Ajusco Medio (AJM), datos de marzo de 2017

- datos observados del SIMAT
- Salida del modelo a 24h
- Salida del modelo con ajuste del sesgo a 24h

Dissemination of the forecasting system

The results of the AQF model is available to all citizens through the website aire.cdmx.gob.mx and the mobile “Aire” application.

Pronóstico de calidad del aire y meteorológico para la CDMX

Inicio Pronóstico de calidad del aire Pronóstico por contaminante Pronóstico meteorológico

El pronóstico de la calidad del aire (ozono) para el día sábado 04 en la ZMVM es: MALA

Ver recomendaciones

- Limita las actividades al aire libre de 13:00 a 19:00 horas
- Limita el tiempo para ejercitarte al aire libre de 13:00 a 19:00 horas
- Grupos sensibles permanecer en interiores de 13:00 a 19:00 horas
- Comparte tu auto

Pronóstico de calidad del aire



Pronóstico por contaminante



Pronóstico meteorológico



TELCEL 14:15 32%

AIRE CDMX

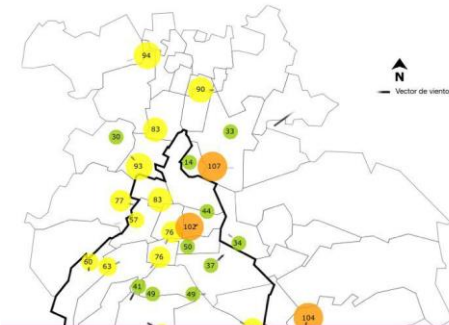
Pronóstico calidad del aire: Ozono para el día sábado 04 en la ZMVM

MALA

Más información +

Reporte 13 h 18°C INDICE UV7

CDMX MALA Índice: 102, PM ₁₀ Más información +	ZONA CONURBADA MALA Índice: 107, PM ₁₀ Más información +
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AIRE IUV AIRE EN MI UBICACIÓN MAPAS

TELCEL 14:15 32%

PRONÓSTICO

ADVERTENCIA/ACLARACIÓN

La información presentada en la siguiente sección es una predicción del valor máximo de Ozono en las estaciones de la red de monitoreo atmosférico, por lo que su uso y divulgación a través de otros medios es responsabilidad de quien la divulga.

Más información +

Pronóstico calidad del aire: Ozono para el día sábado 04 en la ZMVM MALA

Recomendaciones

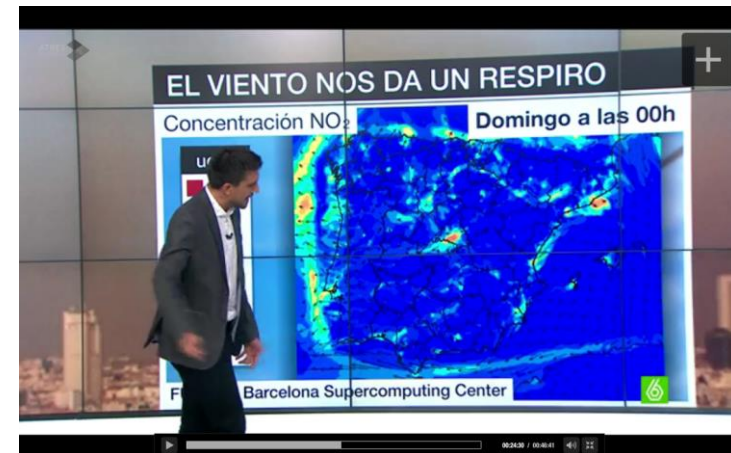
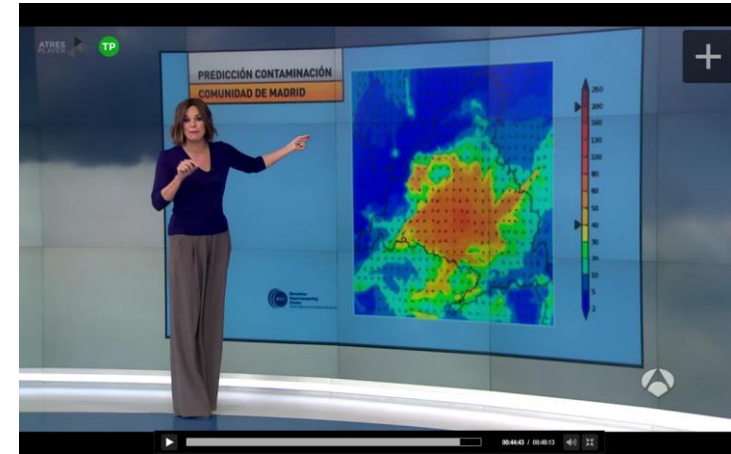


Mapa de pronóstico de Ozono por estaciones:



Benefits of the CDMX Forecasting System

- Knowing in advance the condition of air quality will allow citizens and authorities to take preventive action to protect health and apply actions to mitigate levels of air pollution before the pollution event occurs.
- The results of the meteorological model can also be used in the prevention of risks by intense winds, extreme rains or temperature.
- It is expected that the forecast system will be used by the media as a tool similar to the weather forecast, so that it is possible to alert the population to the risk of a high pollution event.
- It is intended that the model be used as a tool for the evaluation and design of policies for the improvement of air quality.



Presentation of Mexico City 2014 Emissions Inventory (Sep 2016)



It was presented by the CDMX mayor Miguel Angel Mancera and Environment Secretary Tanya Müller, and joined by C40 Cities Climate Leadership Group regional director for Latin America, Manuel Olivera.

This inventory responds to the program ProAire 2011-2020 that indicates its biannual update.

- The inventory contains 90 categories of emissions of pollutants that cause negative health effects, as well as toxics and GHGs, in the 16 delegations of the CDMX and 59 conurbated municipalities of the State of Mexico.
- First city to use the MOVES-Mexico model, which is the most recently developed by the United States EPA for the estimation of transport emissions.
- Inventory presents the quantification of toxic pollutants such as black carbon and greenhouse gases, as well as various methodologies to have better calculations on emissions in the capital.
- It is considered among the most complete in the country

Presentation of CDMX air quality forecasting system (February 2017)



The new forecasting system, Aire CDMX, is a collaboration between SEDEMA and Barcelona Supercomputing Center (BSC).

It was presented by the CDMX mayor Miguel Angel Mancera and Environment Secretary Tanya Müller, and joined by Marc Guevara of BSC.

- Aire CDMX model is based on BSC CALIOPE system to predict pollutants (ozone, nitrogen dioxide, sulfur dioxide and airborne particles) in the atmosphere with 24 hours in advance and in resolutions accurate to one square kilometer and to the hour.
- The data provided by this system will help to create knowledge base to contribute to the development of emergency plans, to decision making and to emission reduction programs.
- It will also make quantitative information on air pollution available to society, the health sector and environmental authorities.

SEDEMA activities: Health effects of air pollution

SEDEMA – Harvard School of Public Health Projects

2015-2016

- Historical analysis of the benefits of population health associated with air quality in Mexico City during 1990-2012: Phase I and II”.

2017

- Verification of health benefits by improvements in air quality in Mexico City (Epidemiological Analysis): Phase III
- Evaluation of public policies and economic valuation of health benefits for better air quality in Mexico City: Phase IV

SEDEMA-SEDESA Project (2017)

- Analysis of time series and endemic ranges for weekly surveillance at primary health care in Mexico City

BenMAP-CE Training Course

- SEDEMA hosted a BenMAP-CE Training Course on June 14-14, 2016. The training course was organized by the Molina Center for Energy and the Environment and conducted by US Environmental Protection Agency.
- The objective of the training course was to use EPA's BenMAP model to evaluate the public exposure to the pollutants and derive cost/benefit estimates to help in the prioritization of policy implementation options.



Attendees included officials from the Secretariats of Environment and Health from Mexico City, and from the states of Mexico, Puebla, Hidalgo, Morelos, Megalopolis Environment Commission, Institute of Ecology and Climate Change, and representatives from Colombia, Chile and Peru, who are involved in the Climate and Clean Air Coalition SNAP Institutional Strengthening initiative

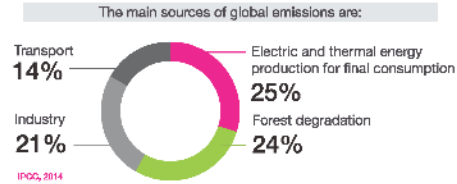
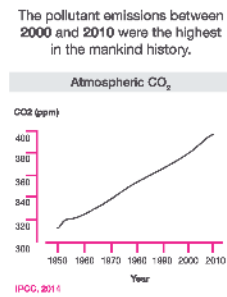
CDMX Climate Action Program Infographics

MAYORS
SUMMIT 2016

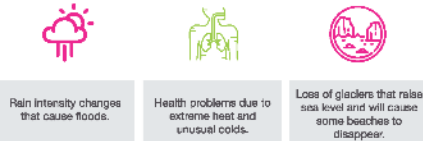
C40
CITIES

CDMX

GLOBAL CLIMATE CHANGE



The pollutant emissions trigger a temperature imbalance known as global warming that produces the climate change and the major consequences are:



COP21 AND C40

During the 21th Conference of the Parties of the United Nations Framework Convention on Climate Change (COP21), held in Paris in 2015, the countries accomplished a historic agreement with a clear target as respond to global climate challenges.

Therefore, in 2014 several cities networks:

C40 UCLG ICLEI → Signed the **COMPACT OF MAYORS**

Paris Agreement stated target



C40 cities are committed to:

- Monitor and report their emissions into the CDP international platform
- Signed the Declaration on Clean Buses to incorporate low emission bus fleets

The Compact has the goal to reduce: **3.7 gigatons** of greenhouse gases by 2030 C40



DR. MIGUEL A. MANCERA ESPINOSA

Mexico City's Mayor

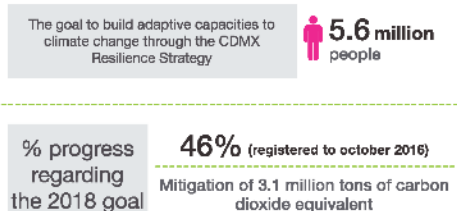
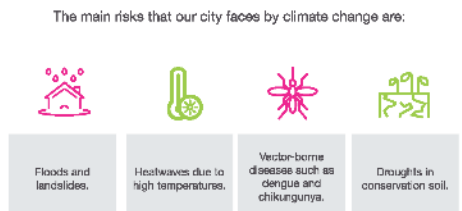


Mexico City's Climate Action Program (PACCM, in Spanish) for 2014-2020 is a planning tool that integrates, coordinates and promotes actions to reduce the environmental, social and economic risks posed by climate change while simultaneously promoting the welfare of the city's population, collective participation and gender equality.

In this context, and as part of acquired commitments by the Mexico City's government, the 2016 Progress Report of PACCM is presented after two years of its launch, which recognizes the need of promoting a transversal policy to create synergies that help diminish the impacts of climate change.



Mexico City (CDMX)



- The PACCM has: **7 strategic priorities** to tackle climate change
- Urban and Rural Energy Transition.
 - Containment of Urban Sprawl.
 - Environmental Improvement.
 - Sustainable Improvement of Natural Resources and Biodiversity
 - Building Resilience.
 - Education and Communication.
 - Research and Development.

TOTAL **102** actions

Low-cost medium precision CO₂ sensors for Mexico City

LOCATION 2017

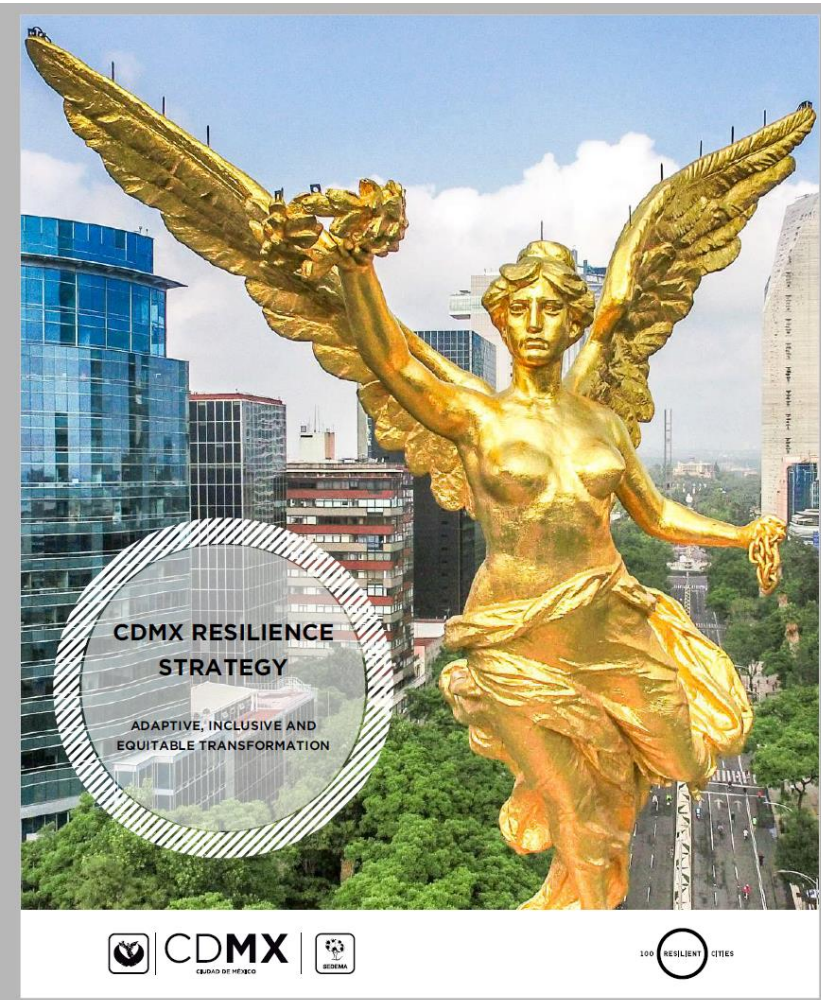
Collaboration between LSCE, ARIA technologies, and SEDEMA, MCE2 to setup a demonstration experiment for CO₂ emission monitoring in conjunction with AQ observations in CDMX, utilizing low-cost medium precision (LCMP) instruments developed by LSCE.

In the medium-term this activity should help provide insight into local CO₂/AQ emissions and also build the long-term basis to include other GHGs (e.g., CH₄).

- LCMP sensors will be used to characterise the CO₂/AQ emission ratios in different neighborhoods and their temporal trends as well as to help reduce uncertainties in GHG/AQ emission inventory of CDMX
- LCMP instrument will be deployed alongside existing AQ infrastructure and maintained by SEDEMA. The first deployment will be at the UNAM-CCA site (co-located with a Picarro instrument of UNAM). The second and third LCMP instrument will be deployed to measure in and outflowing airmasses at Xalostoc and Ajusco Media. After data analysis, instruments 4 and 5 are planned for deployment at other selected sites.
- Tests in climate chambers will be performed simulating the typical daily temperature and pressure variations in CDMX.

For a successful long-term project, external and co-funding needs to be identified.

CDMX Resilient Strategy: Adaptive, inclusive and equitable transformation



PILLAR 01.



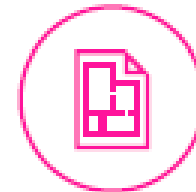
FOSTER REGIONAL COORDINATION

PILLAR 02.



PROMOTE WATER RESILIENCE AS A NEW PARADIGM TO MANAGE WATER IN THE MEXICO BASIN

PILLAR 03.



PLAN FOR URBAN AND REGIONAL RESILIENCE

PILLAR 04.



IMPROVE MOBILITY THROUGH AN INTEGRATED, SAFE, AND SUSTAINABLE SYSTEM

PILLAR 05.



DEVELOP INNOVATION AND ADAPTIVE CAPACITY

Mexico City: InFocus Report 2016



Mexico City

CDP Cities: InFocus Report | 2016



Sponsored by: **Bloomberg Philanthropies**

Report analysis and information design for CDP by:

AECOM

In partnership with:



Mitigation

Climate Action Plan

Programa de Acción Climática de la Ciudad de México 2014 - 2020 | 2014

Emissions protocol

Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC), (WRI, C40 and ICLEI)

Top 3 emissions reduction activities



Private transport

Transportation demand management



Mass transit

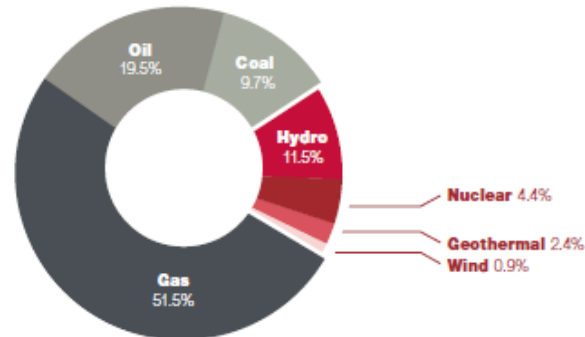
Improve bus, rail, metro, and tram infrastructure, services and operations



Outdoor lighting

LED / CFL / other luminaire technologies

Energy mix



Adaptation

Adaptation Plan

Estrategia Local de Acción Climática de la Ciudad de México 2014-2020 | 2014

Adaptation actions taken for the top climate hazards



Vector-borne disease

Testing/vaccination programs for vector-borne disease



Flash/surface flood

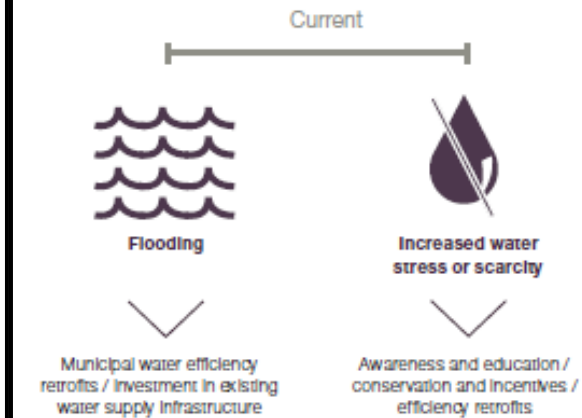
Crisis management including warning and evacuation systems



Forest fire

Hazard resistant infrastructure design and construction

Adaptation actions taken to reduce water supply risks, by timescale



CDP is a not-for-profit that provides the global platform for cities to measure, manage and disclose their environmental data. In 2016, five C40 cities were awarded with InFocus Reports for demonstrating leadership in their region by taking bold climate action: Cape Town, Mexico City, Paris, Sydney and Vancouver.