



**CDMX RESILIENCE
STRATEGY**

**ADAPTIVE, INCLUSIVE AND
EQUITABLE TRANSFORMATION**



CDMX
CIUDAD DE MÉXICO





DIRECTORY:

Dr. Miguel Ángel Mancera Espinosa
Mayor of Mexico City

M. en C. Tanya Müller García
Secretary of the Environment

Dr. Arnoldo Matus Kramer
CDMX Chief Resilience Officer

PREPARED BY:

CDMX Resilience Office

CDMX RESILIENCE OFFICE:

Arnoldo Matus Kramer
Adriana Chávez Sánchez
Daniela Torres Mendoza
Flavia Tudela Rivadeneyra

WITH THE COLLABORATION OF:

SEDEMA
100 Resilient Cities
AECOM
al911

EDITORIAL DESIGN:

Mónica Arzoz Canalizo
Adriana Chávez Sánchez
Annika Ussel Grimm

PHOTOGRAPHY:

Enrique Abe - SEDEMA
Joy Nuño

COVER:

SEDEMA

ENGLISH TRANSLATION:

Ana María Bautista

ENGLISH COPY EDITS:

(AECOM) Virginia Kean, Jay Plano

CONTACT:

cdmx.resiliente@gmail.com

FIRST EDITION:

September 2016



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DR. MIGUEL A. MANCERA ESPINOSA
Mayor of Mexico City



A Resiliency Strategy submitted by Mexico City was prepared under the 100 Resilient Cities initiative, of which our city has been a member since 2013. This Resilience Strategy is a response to a global commitment by CDMX to foster public policies that contribute to strengthening Mexico City's capacity to address various risks without without compromising our development.

As one of the greatest megacities in the world, Mexico City is an excellent center for the innovative proposals needed to improve its inhabitants' quality of life. Building resilience must be tackled on multiple fronts. For example, the Water Fund for Mexico City aims to strengthen the water supply system and increase environmental protection of water conservation areas. Other projects are also contributing to the creation of resilience. For example, the Comprehensive Mobility Program is giving pedestrians and bicycle riders priority over private cars. A bus replacement project is removing old, obsolete, unsafe buses from our roads and fostering investment in up-to-date and safe transportation technologies, including electric cabs, which will help reduce pollutant emissions. And the Vision Zero initiative is reducing the number of road accidents.

Building resilience is in everyone's interest. It is a short- and long-term endeavor that requires the participation and coordination of various stakeholders at the local and regional levels and from both the public and private sectors—from the outset and all through the implementation of the proposed actions. Public involvement is critical to building a community capable of facing the risks that all are exposed to, a community that can play an active role in responding to emergencies. Building resilience at all levels can help reduce social inequality and vulnerability, and produce a safer, fairer, and more equitable society.

TANYA MÜLLER GARCÍA
Secretary of the Environment



Mexico City faces great challenges, some of which are connected with climate change, such as a decrease in the quantity and quality of environmental services available and an increase in extreme weather events. An example is the scarcity of water, which has become one of the most serious issues faced by a population already affected by the impacts of drought and the loss of green areas, which are causing a lower aquifer recharge zone in Conservation Areas.

Environmental policy has planning instruments such as ecological realignment of areas, which regulate development activities in order to preserve natural resources, improve people's quality of life, and guarantee the water supply in the city. Nonetheless, the complexity of the challenges Mexico City faces requires the city to find new approaches to these challenges and to develop innovative solutions that result in multiple benefits and that support the CDMX sustainability agenda.

We have therefore developed a comprehensive public policy designed to counter the effects of climate change, as stated in the Mexico City Climate Action Program 2014-2010 (PACCM). This policy brings various stakeholders together and fosters the coordination of actions to reduce social, environmental, and economic risks. Resilience building is a specific strategic focus of the PACCM that aims to develop and improve the adaptive capacity of Mexico City.

Resilience is a concept that spans all environmental issues. It involves multiple sectors of society and requires the integration of specific actions that are needed for urban renewal and a revitalized infrastructure. Resilience building can strengthen civil society and ensure that citizens at all levels of society have the ability to act in an emergency or disaster situation.

Mexico City's Resilience Strategy represents an opportunity to join together to support the economic and social development of the city, in harmony with the environment and with a vision for the future and our long-term commitments.

MICHAEL BERKOWITZ
 President of 100 Resilient Cities,
 Pioneered by the Rockefeller Foundation.



100 Resilient Cities is honored to partner with Mexico City to support this important work and the release of this Resilience Strategy, which responds to the city's most pressing shocks and stresses, such as flooding, limited mobility, and social inequity, and the need for better integrated regional planning.

The support and leadership of Mayor Mancera was crucial to the development of this strategy, and we are thrilled that the team is now taking steps to institutionalize the Resilience Office and implement the outlined initiatives. I would like to thank Tanya Müller Garcia, the Secretary of the Environment, without whose leadership and support this would not have been possible. In addition, I would like to highlight the work of the city's Chief Resilience Officer, Arnolando Matus Kramer, and his team, which includes Daniela Torres, Adriana Chavez, and Flavia Tudela, who laid the groundwork for this forward-thinking Resilience Strategy and hosted the 2015 Chief Resilience Officer Global Summit, which offered the opportunity for high-level stakeholders to engage in resilience thinking.

The CDMX Resilience Strategy identifies five pillars and interrelated goals that are to guide the city-driven initiatives that will make the city stronger and more resilient. Featured in the strategy are initiatives that range from promoting better regional coordination to rethinking water management and flood protection.

Finally, we should remind ourselves that the release of this strategy only represents the beginning of a long road for Mexico City. The strategy outlines a set of opportunities that must now be delivered on.

We are thrilled to be continuing our work in Mexico City and to be supporting the work of the three other Mexican cities in our network. We look forward to seeing the implementation of this strategy's initiatives with the support of an important and diverse set of actors from city agencies, local organizations, and the 100RC Platform of Partners, who have all rallied together to help create this strategy.

Viva Mexico City!

ARNOLDO MATUS KRAMER
 CDMX Chief Resilience Officer



Given its geographic location and social and economic context, Mexico City has faced many challenges and environmental impacts throughout its history. Today the citizens of Mexico City face such dynamically changing risks that we must create an environment of continuous learning and innovation to face present and future threats.

Our city is a living laboratory for new initiatives and technologies to build resilience from local to regional levels. At the local level, community development is vital to getting the public involved in building resilience and to increasing the public's ability to face and respond to risks. At an urban level, successful, high-impact experiences must be shared and replicated in various areas, including at a regional level.

The Resilience Strategy is a living document, integrating best practices relating to key issues such as achieving aquifer sustainability or transforming the mobility system into city and regional planning. Issues such as these require the collaborative efforts of a coalition of stakeholders as well as the sustained, long-term support of human, technical, and financial resources. Therefore, the future creation of a Resilience Office for CDMX is an opportunity to strengthen this integration process and to track the projects and actions resulting from the Resilience Strategy.



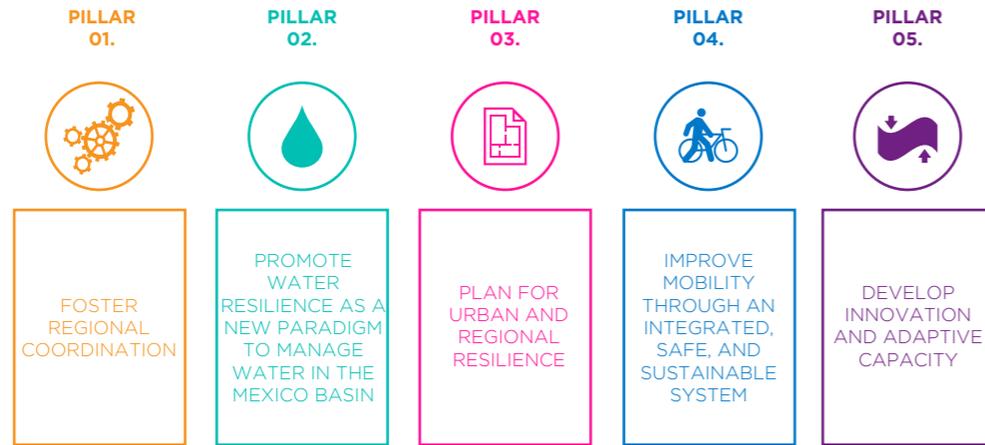
EXECUTIVE SUMMARY

The vision of Mexico City (CDMX) is to create an equitable society based on an all-embracing process in which various stakeholders, sectors, and vulnerable groups to survive the major challenges of the 21st century.

The city faces resilience challenges on environmental, social, and economic issues, given its geographic situation, history of great social-environmental transformation, and social context. Having once been a lake, the city has become a megacity, one of the most populous on Earth. Rapid urban expansion and soaring population growth in the last few decades have added to the problems resulting from insufficient long-term planning and weak metropolitan coordination, making it difficult to monitor and track important regional issues such as water management based on a long-term sustainability perspective.

CDMX is faced with multiple risks, both natural and man-made. Although some of the most frequent impacts have been of hydrometeorological origin, geological phenomena, such as the 1985 earthquake, have caused the greatest economic and human losses. On a basis, there are other stresses that weaken the city, such as the inequality that exists at both a social and economic level as well as in the use of public space. For example, across the city, there is inequality of access to urban amenities and public services. Aquifer overexploitation is not just one of the most pressing and chronic issues affecting the future water supply for this region's population, it is also a determining factor for seismic exposure, which can result in differential subsidence. Climate change may exacerbate risks and potentially increase the intensity of hydrometeorological events, causing historically unprecedented heat waves, extreme rainfall events, and long droughts.

In 2013, Mexico City was selected to be part of the 100 Resilient Cities initiative by The Rockefeller Foundation. This initiative is an opportunity for cities to bring together their urban resilience building efforts and capabilities. The CDMX Resilience Strategy is being developed as part of this initiative, and to address the challenges facing the city through five pillars, or guiding principles. These pillars will drive the implementation of actions to improve the adaptive capacity, disaster response, and infrastructure development of CDMX.



PILLAR 01
 **FOSTER REGIONAL COORDINATION**

Given the urban growth experienced by CDMX, resilience building must transcend political and administrative boundaries. Maintaining a regional view and coordination at all levels are key to building resilience, especially on priorities such as water and integrated mobility management. In the vision of this pillar, Megalopolis and the Metropolitan Area of the Valley of Mexico (ZMVM) work together under a regional institutional framework on key issues to drive a common agenda and ensure shared responsibility in building resilience. Infrastructure projects with a regional impact, such as the New International Airport of Mexico City (NAICM) currently under development, are an opportunity to work more closely on resilience efforts and move toward a collaborative regional agenda.

PILLAR 02
 **PROMOTE WATER RESILIENCE AS A NEW PARADIGM TO MANAGE WATER IN THE MEXICO BASIN**

A major resilience issue is linked to the future supply and management of water resources. The water management system has material inefficiencies; for example, there is a great loss of potable water due to leaks in the potable water distribution system. There is also great overexploitation of the aquifer. This overexploitation threatens the future supply of aquifer water for the metropolitan area, and it may be exacerbated by climate change, as there is a potential for a long drought. In the case of extreme rainfall events, ponding and floods may affect City operations, such as the mobility network. The vision for this pillar is that water in the Mexico Basin is handled under the Comprehensive Management of City Water Resources (GIRHU), which is responsible for the integrated management of urban water resources and the response to risks and impacts related to climate change and social and environmental pressures. The GIRHU must ensure equal access to the water supply and guarantee the water supply for the entire population.

PILLAR 03.
 **PLAN FOR URBAN AND REGIONAL RESILIENCE**

Urban and regional planning play a fundamental role in building resilience. The vision for this pillar is that CDMX citizens have equal access to urban amenities, housing, green areas, and public spaces, and that improvements in the environment and mitigation of risks occur through a sustainable management of natural resources. Planning is a fundamental tool for maintaining a long-term vision and for addressing current challenges on issues such as inequality, and for increasing resilience in the face of new challenges created by dynamic processes, such as climate change.

PILLAR 04.
 **IMPROVE MOBILITY THROUGH AN INTEGRATED, SAFE, AND SUSTAINABLE SYSTEM**

Mobility is one of the most pressing issues that must be addressed in order to improve quality of life in Mexico City. Today, the mobility system involves long commute times, loss of competitiveness, and impacts on health and social cohesion. Investment in public transportation is required in order to improve the quality and safety of the mobility system, as well as to create an integrated system that serves the entire population of the city. The vision of Pillar 04 is an integrated mobility system for CDMX and the ZMVM that gives priority to public transportation over private vehicles and provides a safe urban environment for pedestrians and bicyclists. In this vision, innovative transportation projects, technologies, and the smart use of data validate the benefits of improving mobility via an integrated, safe, and sustainable mobility system while discouraging the use of cars.

PILLAR 05.
 **DEVELOP INNOVATION AND ADAPTIVE CAPACITY**

This pillar has the goal of increasing the capacity of CDMX to respond to dynamic, changing risks of a natural or social origin without compromising economic competitiveness and sustainable development. To build resilience, innovative processes and tools must be developed that enable government and various social and economic sectors to be aware of and understand their vulnerabilities and reduce the risks they face, particularly with respect to climate change.

Finally, for a successful implementation of the Resilience Strategy, a Resilience Office for CDMX must be established, as cities such as Barcelona, New York City, and New Orleans, among others, have done. The Resilience Office must be all-embracing and flexible enough to coordinate the efforts of government stakeholders at various levels (city, region, and country), as well as stakeholders in civil society, the private sector, and the scientific community. The Resilience Office must also take charge of co-designing a tracking system that facilitates continuous learning and innovation to build resilience in CDMX.

MEXICO CITY RESILIENCE STRATEGY

PILLAR 04.



IMPROVE MOBILITY THROUGH AN INTEGRATED, SAFE, AND SUSTAINABLE SYSTEM

PILLAR 05.



DEVELOP INNOVATION AND ADAPTIVE CAPACITY



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

ACRONYMS

100RC	100 Resilient Cities
AECOM	Architecture, Engineering, Consulting, Operations, and Maintenance
AEP	Public Space Authority
AGE	Strategic Management Areas
AGEB	Basic Geostatistical Area
AICM	Mexico City International Airport
APP	Public-Private Partnerships
a911	Architecture 911
AZP	Authority of Patrimonial Zone
BID	Inter-American Development Bank
WB	World Bank
CAEPCCM	Mexico City Center for Emergency and Citizen Protection
CAF	Latin America Development Bank
CDMX	Mexico City
CENACED	National Center for Epidemic and Disaster Contingencies Support
CENAPRED	National Center for Disaster Prevention
CETRAM	Intermodal Transfer Centers
C40	Cities Climate Leadership Group
CI	Conservation International
CICCDF	Federal District Inter-Institutional Climate Change Commission
CMM	Mario Molina Center
COLMEX	Mexican Institute for Higher Education and Social Science and Humanities Investigation
COMETRAVI	Metropolitan Transportation and Roads Commission
CONAGUA	National Water Commission
CONAPO	National Population Council
CONAVI	National Housing Commission
CONEVAL	National Council to Assess Social Development Policy
COP 21	21st Conference of Parties to United Nations Framework Convention on Climate Change
CORENA	Federal District Natural Resources Commission
CRF	City Resilience Framework
CRO	Chief Resilience Officer
EAP	School of Public Administration
FICEDA	Trust for Construction and Operation of Mexico City Central Supply Station
FONADEN	Mexico City Natural Disasters Assistance Fund
GIRHU	Comprehensive Management of City Water Resources
GIZ	German International Cooperation Agency
IMTA	Mexican Institute of Water Technology
INECC	National Institute of Ecology and Climate Change
INEGI	National Institute of Statistics and Geography
INFONAVIT	Institute of the National Housing Fund for Workers
INVI	Federal District Housing Institute
IPCC	Intergovernment Panel on Climate Change
IPN	National Polytechnical Institute
ITDP	Institute of Policies for Transportation and Development

LANCIS UNAM	National Laboratory of Sustainability Science, Autonomous National University of Mexico
MB	Metrobus
MRV	System for measuring, reporting and verification
NAICM	New International Airport of Mexico City
NCD	Natural Capital Declaration
OCAVAM	Organization for Watershed Basins of the Valley of Mexico
OCDE	Organization for Economic Cooperation and Development
OR	Resilience Office
PACCM	Mexico City Climate Action Program 2014-2010
PAE	Expected Annual Loss
PAOT	Attorney General Office for the Environment and Regional Zoning
PGDU	Urban Development General Program
POZMVM	Metropolitan Area of the Valley of Mexico Zoning Program
PPGDU	General City Development Program Project
PROFACE	Support Fund for the Conservation and Restoration of Ecosystems program
PUEC	University Program on City Studies
RBD	Rebuild by Design
RMS	Risk Management Solutions
SAC	Cooperation-based Performance Systems
SACMEX	Mexico City Water System
SECITI	Secretariat of Science, Technology and Innovation
SEDATU	Secretariat of Agrarian, Regional and City Development
SEDECO	Secretariat of Economic Development
SEDEMA	Secretariat of the Environment
SEDEREC	Secretariat of Rural Development and Equality for Communities
SEDESA	Secretariat of Health
SEDESOL	Secretariat of Social Development
SEDUVI	Secretariat of Urban Development and Housing
SEFIN	Ministry of Finance
SEMARNAT	Ministry of the Environment and Natural Resources
SEMOVI	Secretariat of Mobility
SG	Ministry of the Interior
SINAPROC	National System of Civil Protection
ITS	Integrated Transportation System
SOBSE	Secretariat of Works and Services
SPC	Secretariat of Civil Protection
Sq ft	Square feet
SSP	Secretariat of Public Security
STCM	Collective Transportation Metro System
TOD	Transportat Oriented Urban Development
TNC	The Nature Conservancy
UAM	Autonomous Metropolitan University
UNAM	Autonomous National University of Mexico
UNISDR	United Nations Office for Disaster Risk Reduction
WHO	World Health Organization
ZMVM	Metropolitan Area of the Valley of Mexico



Resilience refers to the capacity of the individuals, communities, enterprises, and systems within a city to survive, adapt, and grow, notwithstanding the chronic stresses and acute impacts^[1] experienced.

In 2013, Mexico City (CDMX) was selected to be part of the 100 Resilient Cities (100RC) initiative, pioneered by The Rockefeller Foundation, which seeks to help prepare cities to build urban resilience around the social, economic, and physical challenges of the 21st century (Figure 1).^[2]

The 100RC initiative supports cities by financing and providing technical assistance, access to the services of global organizations, opportunities to exchange experiences and best practices among member cities, and access to tools for building resilience.

Figure 1: Map of cities in the 100 Resilient Cities Network



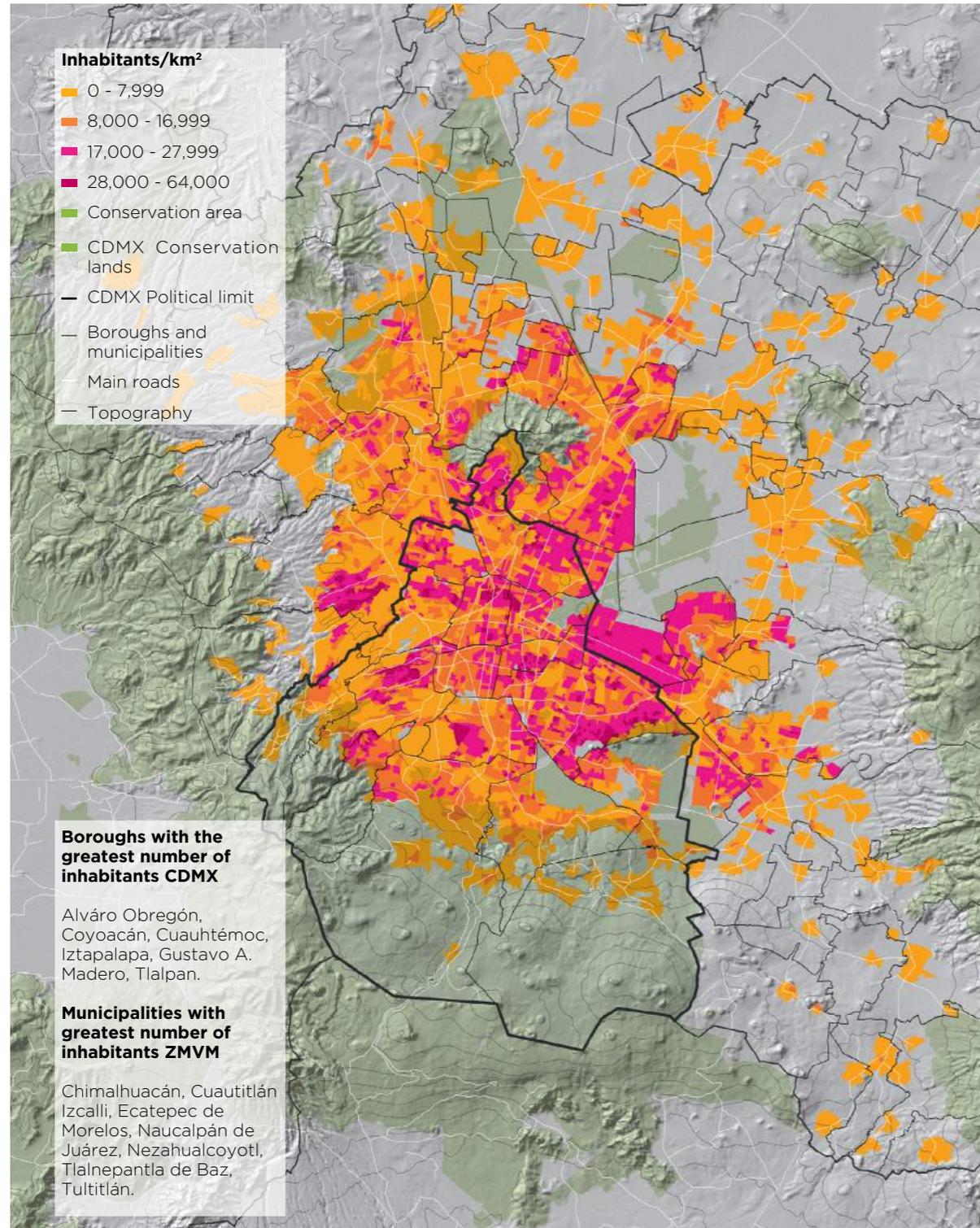
The Government of Mexico City views participation in the 100RC initiative as an opportunity to share experiences and learn from other cities in the global

community and to build resilience to the chronic stresses and acute impacts associated with climate change and natural and man-made disasters.

1. See glossary for definitions of stresses and impacts.

2. To see a full list of cities and a list of platform partners, please refer to: www.100resilientcities.org

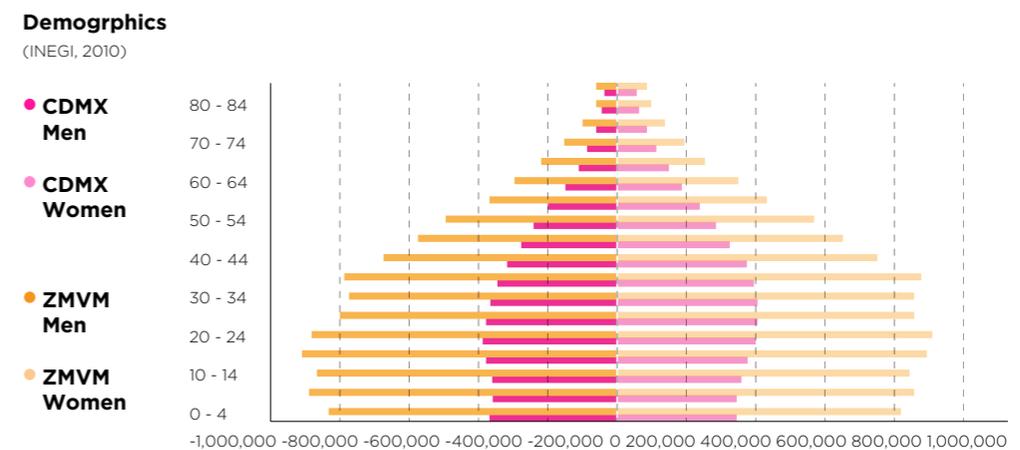
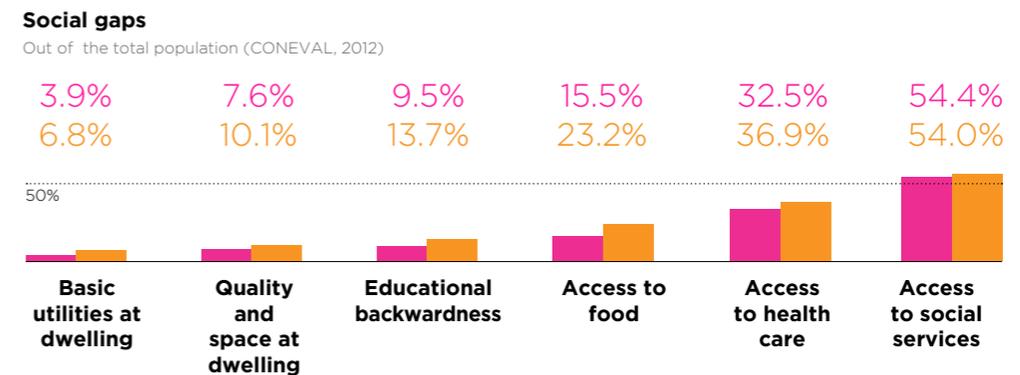
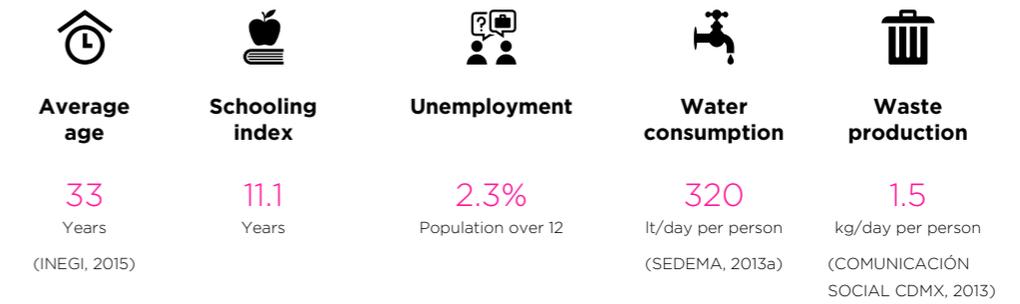
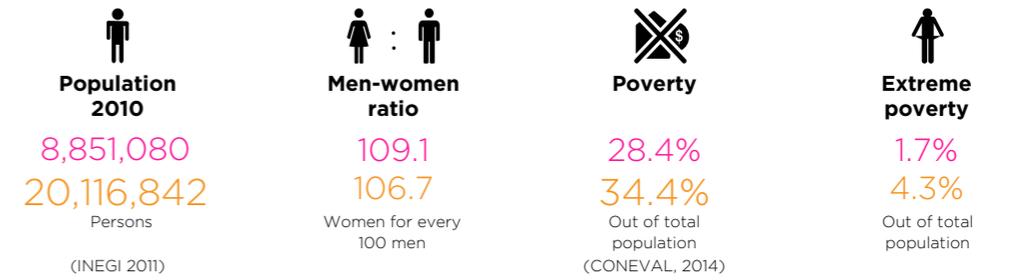
Figure 2. Population density



Source: INEGI, SCINCE 2010, variables created by a911.

CDMX X-RAY

● CDMX ● ZMVM





II RESILIENCE CHALLENGES IN CDMX

RESILIENCE CHALLENGES IN CDMX

Over time Mexico City has experienced a great social and environmental transformation, becoming the center of economic, political, and social-cultural activities in Mexico. A strong trend of population growth and expansion of its territory have given rise to pressing issues, such as intense demand for natural resources, inequality and social marginalization, informal settlements, waste generation, degradation of natural resources, and pollution.

These issues, however, have also generated a strong link between the Metropolitan Area of the Valley of Mexico (ZMVM)^[3] and the Megalópolis,^[4] due to

intense collaboration and integration at urban, socioeconomic, and environmental levels in the region.

To build resiliency, the past must be considered so that risks related with the city's history are better understood. For example, while the fact that most of the City is located on top of what used to be a lake must be considered, future scenarios must take into account the fact that social and environmental transformation continues to take place. Knowledge of both the past and the present is the foundation for a better understanding of the potential risks and unforeseen events that the City and its inhabitants may face.

2.1. THE GREAT TRANSFORMATION FROM LAKE TO MEGACITY

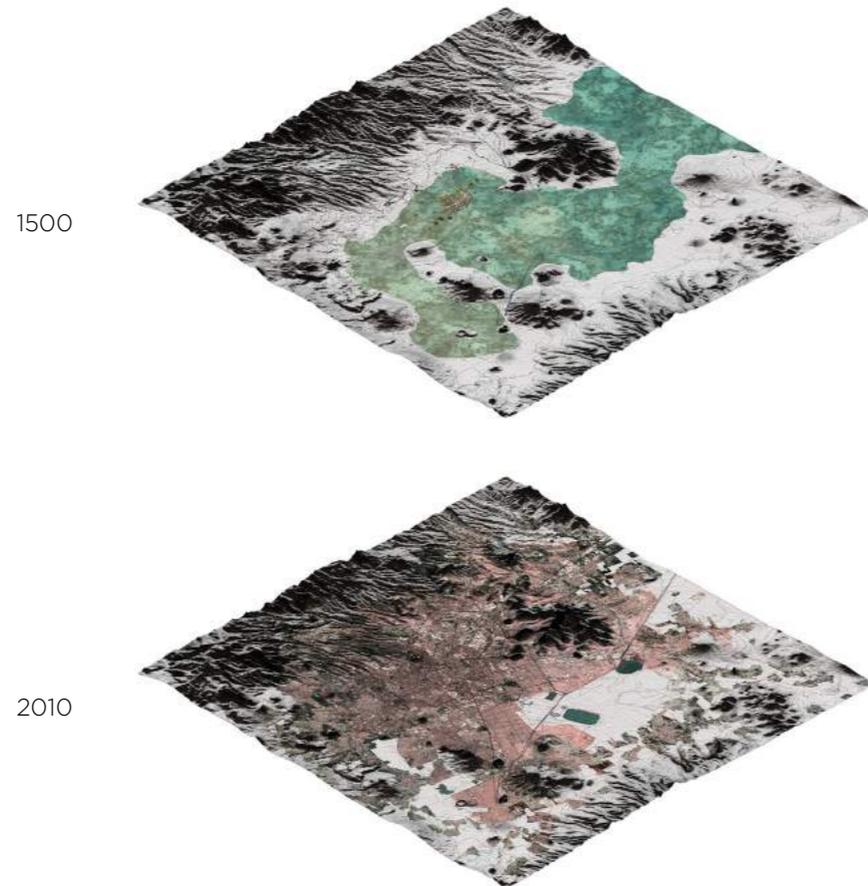
Mexico City is built on what used to be a lake, inside a drainless basin.^[5] From pre-Colombian times, hydraulic projects took place to manage and control the lake's water level during rainy seasons, mitigate floods, and avoid mixing the salty water of Texcoco Lake with fresh water from the surrounding lakes.

These projects enabled a steady supply of water to the city's inhabitants. Altering lake systems defined a new relationship with the basin and created an acute water stress due to pressure for water resources from one of the world's most populated megacities (Figure 3).

3. ZMVM includes 16 Boroughs of CDMX (42 percent of the population), 59 municipalities of the State of Mexico (53 percent of the population) and 21 municipalities of Hidalgo State (5 percent of the population) (PUEC, 2012).

4. CDMX is located in a megalopolitan area in the central part of the country, which includes: CDMX, the State of Mexico, Tlaxcala, Hidalgo, Morelos, and Puebla. The 16 boroughs of CDMX, 29 municipalities of Hidalgo State, 80 municipalities of the State of Mexico, 33 municipalities of Morelos State, 22 municipalities of Puebla State, and the 60 municipalities of Tlaxcala State are represented in Megalópolis (in total, 16 boroughs and 224 municipalities [DOF, 2013]). As of 2010, Megalópolis had 29 million inhabitants, representing 29 percent of the total population of the country, concentrated in 4.4 percent of Mexican territory (INEGI, 2010).

5. Drainless basin: area of rainwater drainage where water flows without an exit to the ocean (World Bank, 2013a).

Figure 3. From lakeside city to megacity: the historic evolution of Mexico City, 1500 to 2010^[6]

From the 16th to the 19th centuries, giant drains, pits, and tunnels were built as flood protection, draining the lakes and carrying excess rainfall water out of the Valley of Mexico Basin. This type of flood protection ended with the construction of the “Great Sewage Canal.”^[7] During the 1960s, 80 kilometers of rivers were covered and replaced with roads, a development that reflected the thinking of the times but resulted in a host of water-related issues.

Population growth increased demand for this vital resource, which is why new, huge hydraulic works were built at a regional level. Lerma System, which opened in 1952 and expanded in 1976 with the Cutzamala System, was built to import water from neighboring basins,^[8] while new projects, such as the deep sewage system that was completed by 1975,^[9] were built to drain gray water out of the Valley of Mexico Basin.

Despite these projects, the water system has limited capacity and its sustainability is a huge challenge. Water losses of about 41.4 percent due to leaks from the potable water system are estimated, and reuse and water treatment systems are limited.^[10]

To face these challenges, some important projects currently under construction are aiming to address the future functioning of the hydraulic system of the Valley of the Mexico Basin.^[11]

2.2. CITY EXPANSION

In the 20th century, economic and demographic growth, augmented by migration from rural areas to the City, have resulted in enormous changes to the urban environment and in physical conurbation with ZMVM. Urban sprawl has spread, mainly to the northern and eastern parts of the city.

Beginning in the 1990s, the greatest growth occurred in the northern part of the city, in the municipalities of the State of Mexico, in the central boroughs of CDMX, and in the Conservation Areas^[12] (Figure 4). This growth has caused serious degradation of the strategic environmental services that are meant to benefit people living and working in the city, such as aquifer recharge, biodiversity, and carbon uptake. In addition, population growth has resulted in informal settlements on hillsides with steep or unstable slopes, in flood prone areas, and in areas that are critical for aquifer recharge^[13] (Figure 5).

Starting in 1980, large investments in areas such as Santa Fe, which is west of the city, led to urban development.

Insufficient urban planning for these areas has created significant mobility issues. The lack of planning has not only made CDMX one of the cities with the greatest traffic congestion in the world,^[14] but has impacted the quality of life of thousands of inhabitants. Traffic issues are related to job distribution, and employment is concentrated in the central areas of ZMVM; only four of the city boroughs provide one-third of the employment at the metropolitan level^[15] (Figure 6).

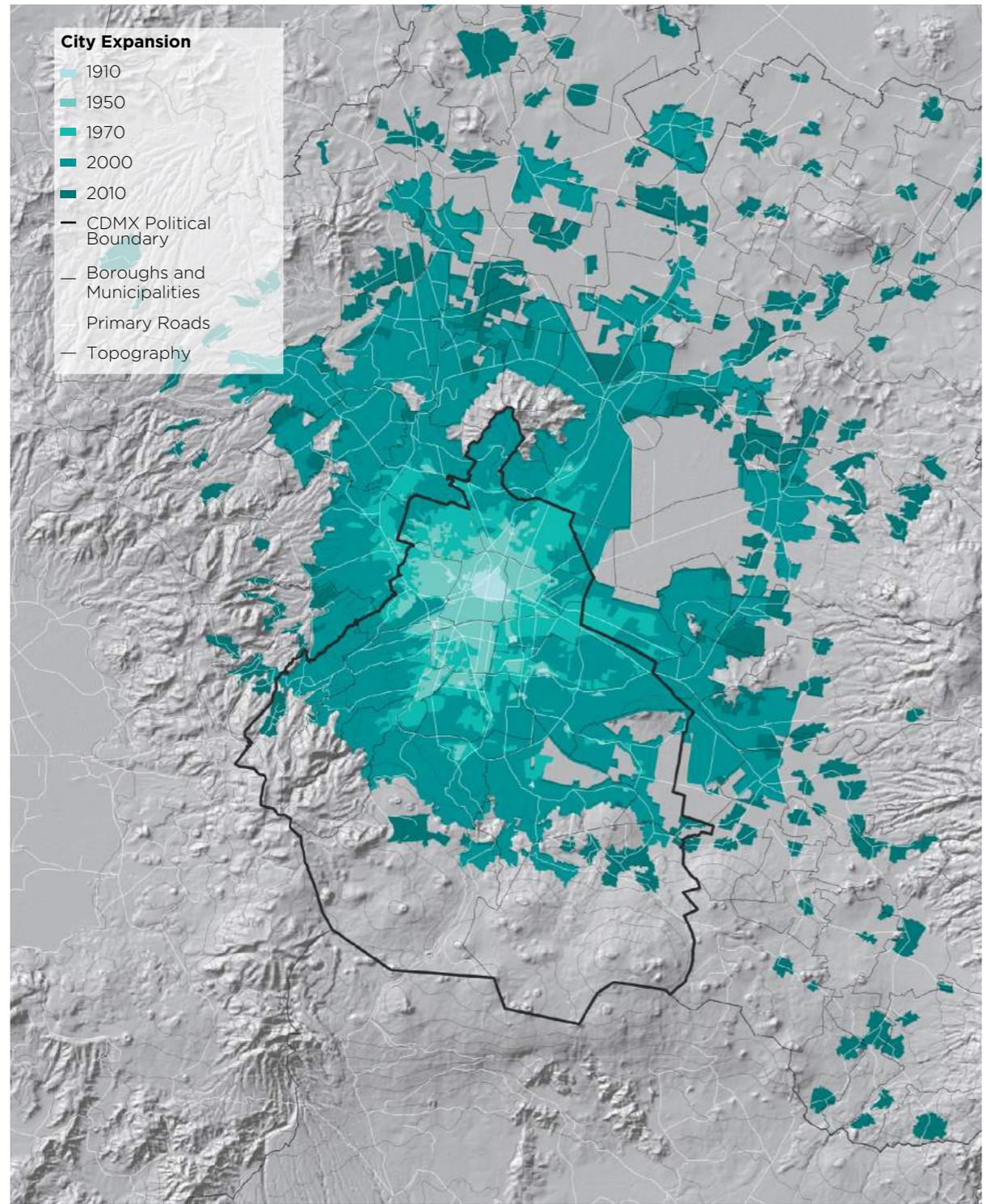
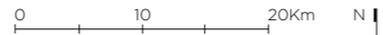
An estimated 4.5 million people commute daily to CDMX from the metropolitan area, primarily from the municipalities of the State of Mexico. This daily influx increases the demand on public transportation systems and traffic on the city’s road network.^[16] Reducing commute times between the places where people live and work by enhancing and expanding public transportation services is an enormous challenge.

6. Image: Rico, V. 2014
7. SACMEX, 2014.
8. SACMEX, 2012a.
9. CONAGUA, 2012a.

10. SACMEX, 2014.
11. SACMEX, 2012a.
12. SEMARNAT, 2003.
13. OCDE, 1999.
14. Tomtom, 2016.
15. OCDE, 2015.

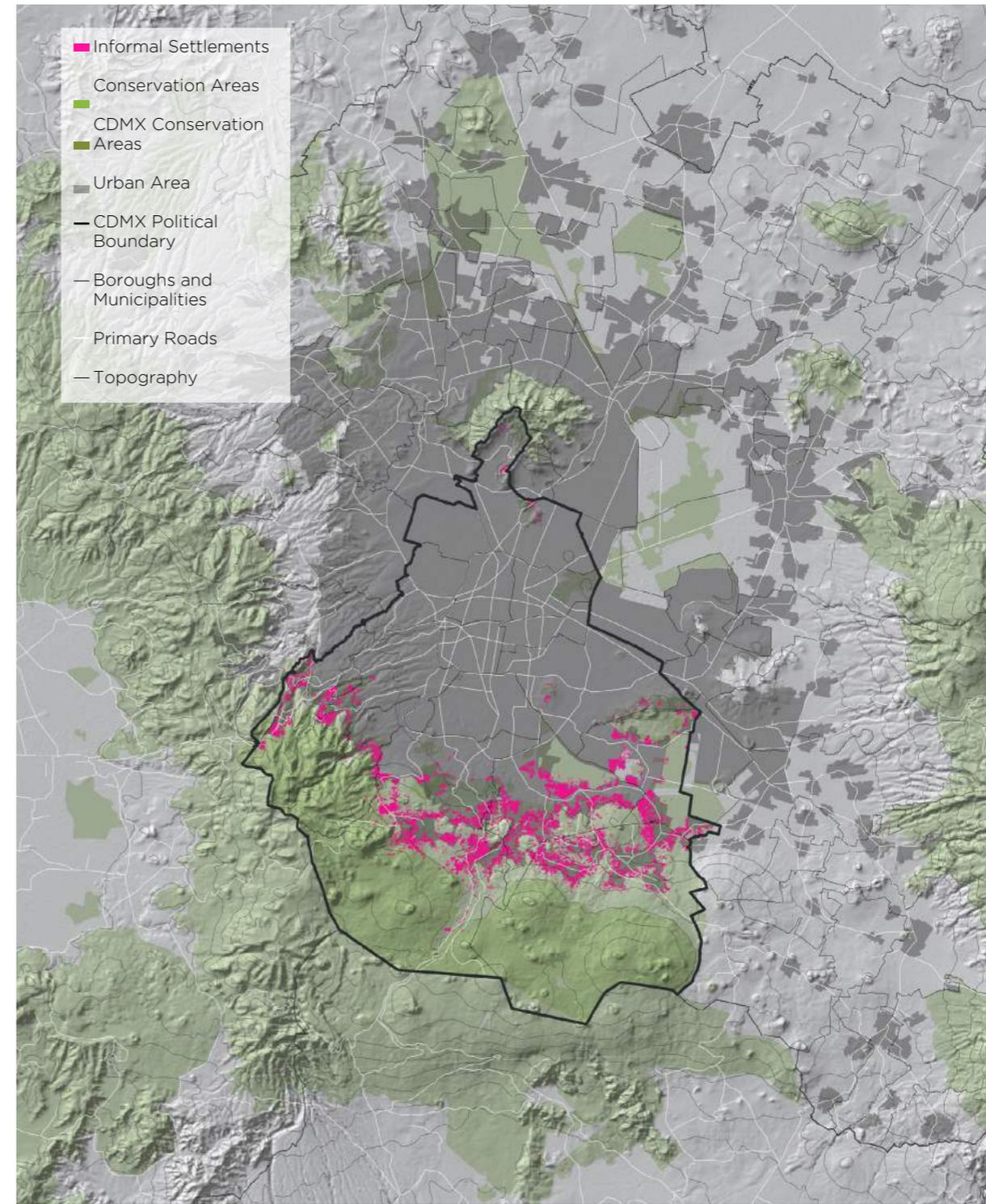
16. CDMX is estimated to provide transportation services to 13.4 million people daily (SEDUVI, 2015a).

Figure 4. City Expansion

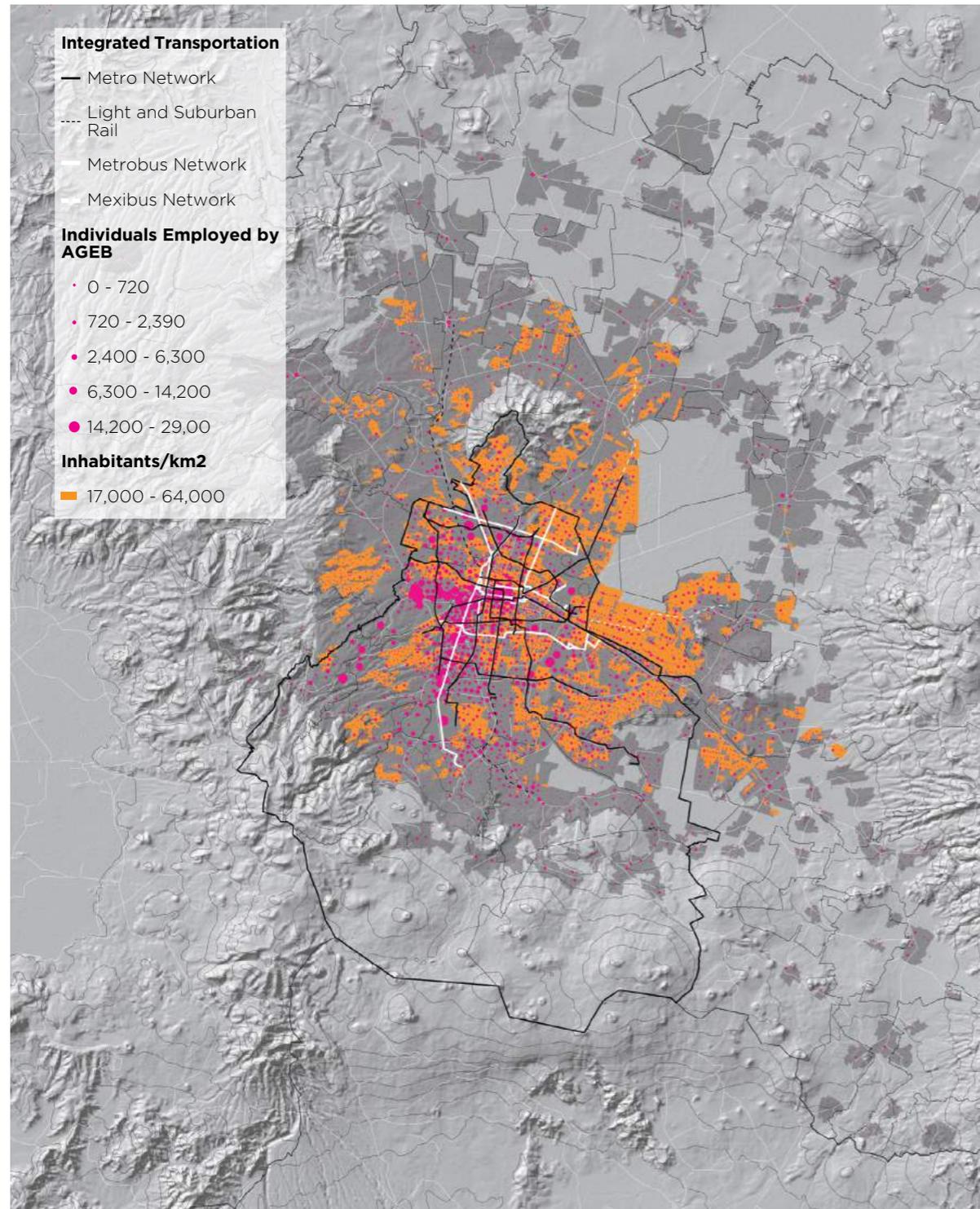


Source: INEGI, 2010.

Figure 5. Expansion to outlying areas and informal settlements in aquifer recharge areas and conservation areas (2010-2012)



Source: SEDEMA 2012.

Figure 6. Employment and transportation in CDMX

Source: INEGI, SCINCE 2010. Data created by a911 from DENUE, INEGI, 2010.

In addition, transportation is the greatest source of pollution in ZMVM, generating an estimated 46 percent of the polluting emissions (ozone precursors and particles) in ZMVM.^[17] Private transportation generates most of the ozone particulates,^[18] and after diesel, heavy transportation is the second-highest source of fine particulate emissions.^[19] ZMVM's 5 million vehicles, with an annual growth rate of 3.8 percent, are one of the main causes of the emissions that impact air quality^[20] in the city and the metropolitan area.

Megacities have ever-expanding needs for public services and amenities. These needs make city and regional planning more complex and demand greater coordination at the metropolitan and regional levels as well as require important financial, human, and technological resources to address a broad spectrum of present and future challenges.

2.3. SHOCKS AND STRESSES IN CDMX

Building resilience at city and regional levels depends heavily on assessing vulnerabilities and historical impacts, understanding and interpreting future risk scenarios (for example, climate change

scenarios), as well as understanding the socioeconomic and social-ecological processes that increase the vulnerabilities caused by the city's chronic stresses.

SHOCKS

CDMX is vulnerable to many risks of natural and human origin due to its geographic location and socioeconomic situation. In recent times, the city has been affected by various natural disasters, such as earthquakes, floods, and epidemics.

Figure 7 shows the impacts of three types of shocks in terms of population affected and direct economic costs during the period from 1980 to 2013.

17. Air Quality, consulted as of June 24, 2016.

18. Tropospheric ozone is at surface level, produced at urban areas when nitrogen oxides (NOX) and volatile organic compounds (VOC) react in the atmosphere in the presence of solar light. In high concentration, human health and vegetation may be at risk (Air Quality, consulted as of June 24, 2016).

19. Suspended particulates have diverse sources and compositions. Their size varies from 25 millimeter to some nanometer. They occur naturally or are caused by human activities; they may also be formed in the atmosphere due to chemical reactions (Air Quality, consulted as of June 24, 2016).

20. Centro Mario Molina, 2016.

Figure 7. Socioeconomic impacts of natural disasters in CDMX, with costs and affected population/ areas from 1980 to 2013^[24]

Type of Natural Disaster	Population/ Area affected	Economic impact *
 Hydrometeorologic Rains, floods, winds, hailstorms, sewage overflows	49,970	\$USD 32.4
 Geologic Landslides and earthquakes	6,338	\$USD 4,100
 Wildfires 8,657 fires	17,549 He affected	\$USD 2.7

* In millions of \$USD (average annual cost for 1980-2014)

The highest direct economic costs stem from damage during the 1985 earthquake. However, hydrometeorologic shocks have had more frequent impacts on the population; during the period from 1980 to 2013, more people were affected by hydrometeorologic shocks than were affected by the 1985 earthquake. Other shocks include heavy rains that can cause floods and destabilize hillsides; hail; heat waves; and strong winds that can damage infrastructure and cause buildings to collapse. Under climate change conditions, extreme hydrometeorologic events are expected to occur more frequently and with greater intensity in the city and the region,^[21] as detailed below.

Figure 8 summarizes the results from three exercises conducted during the strategy development portion of the Preliminary Resilience Assessment. The first exercise revealed how stakeholders from various sectors perceived the main asset impacts, shocks, and stresses identified during the workshop.^[22] The second and third exercises presented the main shocks to the city, which were based on the views of stakeholders in the construction and insurance sectors.^[23]

21. IPCC, 2014; SEDEMA, 2014.

22. Perceptions related to shocks and stresses are the result of a workshop held on May 26, 2015, during Phase 1 of the Resilience Strategy development. Workshop attendees were government officers and representatives from the private sector, non-governmental organizations (NGOs), and the scientific community.

23. Results of the study "Capability Creation and Public Policy to Build Resiliency on Urban and Real Estate Infrastructure of Mexico City," conducted by Kuradzo Ingenieria Con Valor Ambiental S.C., with funding from the British Embassy's Prosperity Fund during 2015.

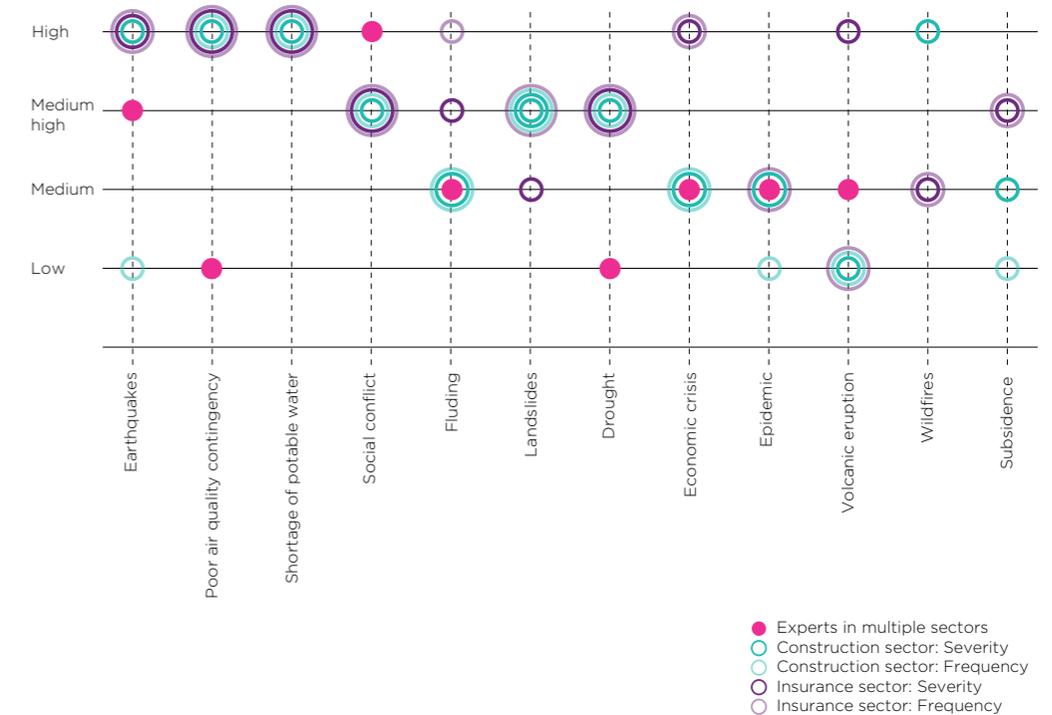
24. Affected population includes injured, evacuated, wounded, and victims (SEDEMA, 2015). Social-economic impact is the current dollars in the year corresponding to an event. Banco de Mexico provided the average annual dollar cost for the period from 1980 to 2014. Social-economic impacts represent only direct costs (SEDEMA, 2015). Information is from the series *Social-economic Impact of Disasters in Mexico*, published by CENAPRED. Data on impacts of the 1985 earthquake may be underestimated on Figure 8. See Figure 10 on the 1985 earthquake on page 33.

As previously stated, some of the identified shocks are related directly or indirectly with hydrometeorologic phenomena. On the other hand, social conflict is perceived as a high to medium-high risk given the frequency with which it occurs in the city; for example, in 2014, 97 demonstrations took place in the city, resulting in losses totaling 1,945.5 million pesos ^[25]. Similarly, a severe social conflict may put the provision of vital city services and the maintenance of strategic infrastructure, such as the public transportation system and the main network of roads, at great risk.

Earthquakes were also considered a high to medium-high risk in all three exercises. Potential catastrophic events, such as the 1985 earthquake that caused serious damage to the city, were rated according to severity.

Figure 9 shows a seismic risk map with Expected Annual Loss (PAE)^[26] per neighborhood of losses corresponding to a typical portfolio of properties insured in CDMX. However, earthquakes are only one of those geologic risks to which the city is exposed.

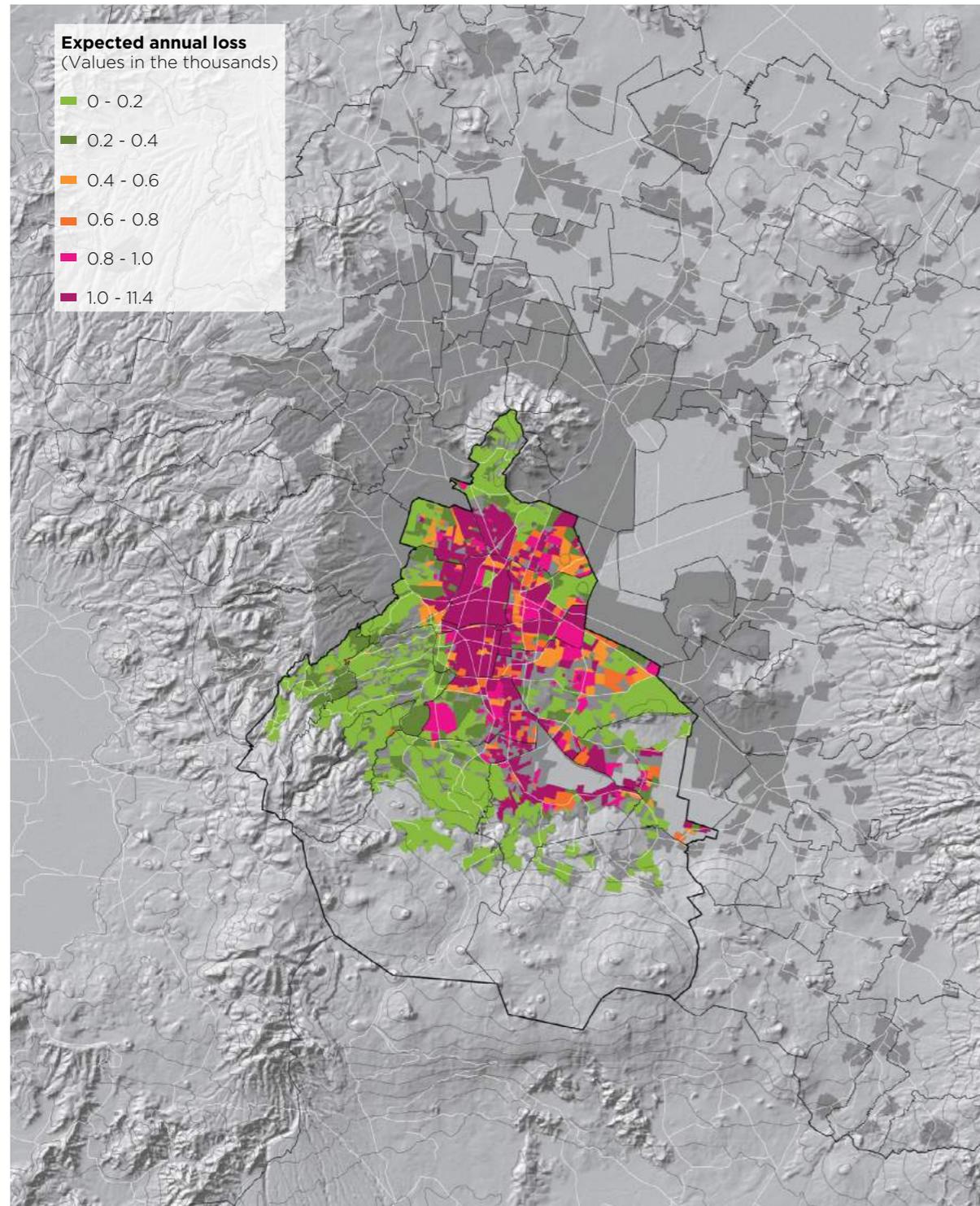
Figure 8. Summary of the perception of shocks in CDMX ^[24]



25. CANACO, 2014.

26. PAE is a mathematic average of annual loss for any probabilistic event, and it is calculated by adding the result between expected losses for a certain event and the probability of the occurrence of such event within 1 year. It is one of the risk estimation factors often used to define insurance premiums, for example, as it is easy to understand.

Figure 9. Seismic risks



Source: ERN, 2016

Figure 10. 1985 EARTHQUAKE

The 1985 earthquake, which caused heavy human and economic losses, was the most serious disaster in CDMX's recent history. The reconstruction costs were a great challenge for the city and the country^[27]. Estimates of damages from this earthquake vary significantly by source because most were created without a uniform methodology and were based on scattered, incomplete information:



HUMAN LOSSES

Official data on fatalities vary between 6,000 (CENAPRED, 2001) and 8,000 (CEPAL, 1985)^[28].



COSTS DUE TO DAMAGES AND LOSSES

Estimated costs range from **\$USD 4.1 million** (CENAPRED, 2001) to **\$USD 8.3 billion** (World Bank, 2012).

Affected over **2.7% of the national GDP** in 1985. (CENAPRED, 2001).



INFRASTRUCTURE DAMAGES (CENAPRED, 2001)

36,000 homes destroyed

65,000 homes with serious damage.

3,300 large buildings damaged.

1 out of **5** teaching facilities collapsed or damaged beyond repair.

50 hospitals and health care centers damaged.

Considerable damages to the water supply, power and telecommunications networks.



SOCIAL IMPACT

30,000 people injured (World Bank, 2012b).

250,000 people with lost their homes (World Bank, 2012b).

900,000 people with damage to their homes (World Bank, 2012b).

150,000 unemployed people (CENAPRED, 2001).

There could be another disaster if another large-magnitude earthquake occurs. Continuous resilience building is key to protecting human lives, housing, strategic infrastructure, basic services such as potable water and sewage networks, the food supply, and the city's transportation network.

27. CENAPRED, 2001; World Bank, 2012b; OCDE, 2013.

28. Some non-official estimates provided were much higher for human losses: Semanario Proceso (Proceso Weekly Magazine, 2015) published non-official figures of 25,000 to 30,000 fatalities; the *Excelsior* newspaper published figures based on data from the Mexico City Civil Registry Office stating that there were 12,843 victims (Paramo, September 15, 2015).

In addition to earthquakes, the exposure of CDMX to various geologic risks such as hillside movement, subsidence, and volcanic events is great.^[29] The city is located on what is known as the “Ring of Fire,” where 80 percent of the world’s seismic activity takes place, as well as on the country’s volcanic range, where nine active volcanoes are located. Features of

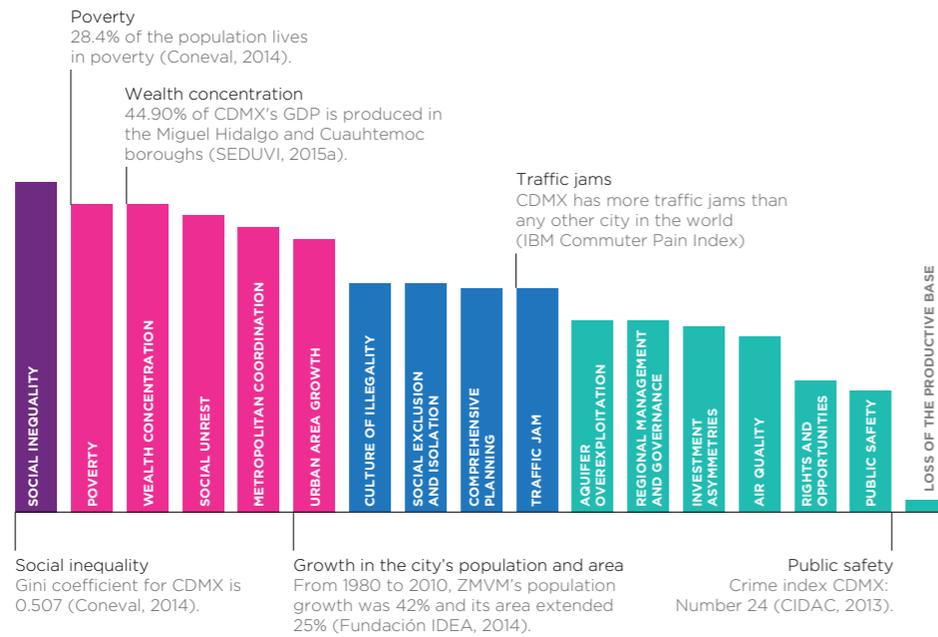
the basin’s soil types and overexploitation of the aquifer cause serious subsidence in the city, which affects infrastructure and housing, and also creates a dynamic vulnerability to a large-magnitude earthquake.^[30]

STRESSES

CDMX faces important stresses. Some of the most relevant were identified in a public outreach process with stakeholders from various sectors, and they were classified by their perceived level of risk (Figure 11).

Inequality, poverty, and wealth concentration are acknowledged as the main stresses, with a medium to high risk for the city. There is a high level of inequality in the city, which has a Gini coefficient of 0.507.^[31]

Figure 11. Stress perception chart (2015)



29. An example is ashfall from Popocatepetl volcanic activity, which has occurred several times in the last few decades.

30. SACMEX, 2012a; World Bank, 2012a.

31. The Gini coefficient measures the economic inequality of a society by exploring income distribution at different levels of the population. The Gini coefficient evaluates income distribution, assigning values between 0 and 1, with 0 representing perfect equality and 1 representing perfect inequality. (CONEVAL, 2014).

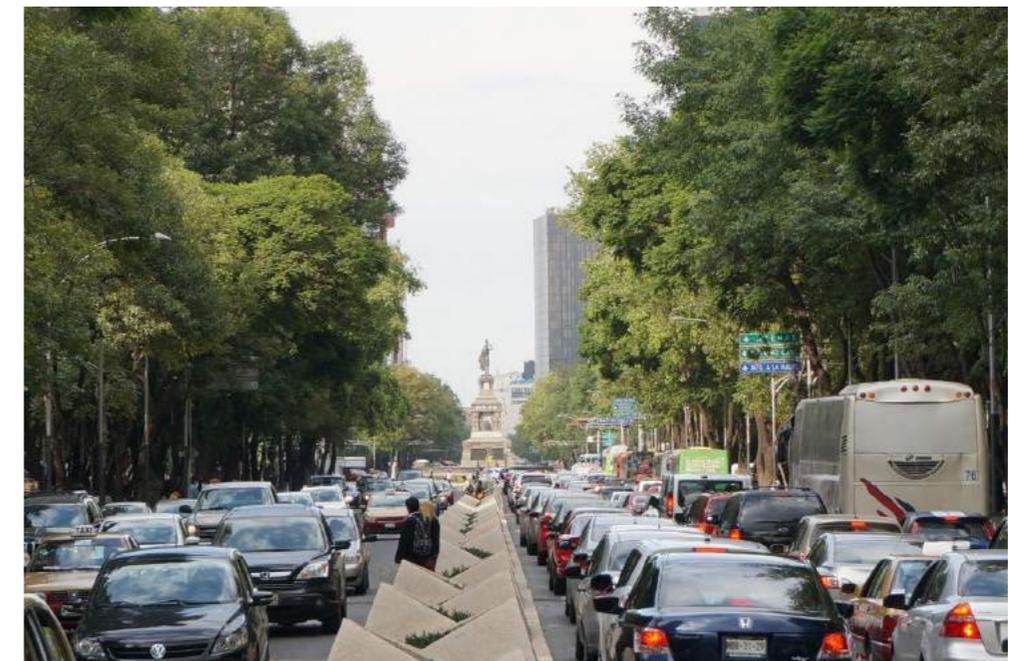
This is clearly reflected at a basic level, given that there is inequality in people’s access to services, urban amenities, and quality housing between the eastern and western areas of the city as well as the outer areas of ZMVM.

of intergovernmental agreements for regional coordination on key issues, such as mobility, protection of natural resources, and water management, result in negative impacts to the quality of life of those who live and work in ZMVM.

Vulnerability to specific impacts varies, given that the capacity of people to respond to severe shocks and acute stresses varies from district to district. Nevertheless, CDMX is the second area in the country with the lowest poverty rate, with 28.5 percent of the population living in poverty and 2.2 percent, in extreme poverty.^[32]

There are socioeconomic and social-ecological processes driving city and regional vulnerability. Among those are: 1) historic population growth and urban sprawl, 2) weak urban planning and regional coordination, 3) degradation of strategic environmental services for the city’s inhabitants, and 4) poverty and inequality clearly expressed in access to housing and urban amenities, and the status of vulnerable populations. All these stresses will be exacerbated by climate change. These processes must be understood if the city is to step up and adapt to the challenges they present.

Weak metropolitan coordination and the expansion of urban sprawl are stresses that strongly relate to metropolitan governance. The Organization for Economic Cooperation and Development (OECD)^[33] recognizes that the lack of a metropolitan view and the weakness



32. CONEVAL, 2014.

33. OCDE, 2015.

2.4. CLIMATE CHANGE

Climate change poses risks to both human and natural systems in the 21st century. The 2014 report of the Intergovernmental Panel on Climate Change (IPCC) provides conclusive evidence regarding potential shocks and their consequences for megacities such as CDMX. An increase in the intensity and frequency of extreme weather events is expected, and these events may include severe floods, droughts, heat waves, and landslides (Figures 12 and 13).^[34]

For CDMX, climate change scenarios show an increase of average temperatures within a range of 0.5 to 1.25 degrees Celsius (°C) for colder months (December to February) in the short term (2030) and up to 2°C in the medium term (2050). For warmer months (April to June), an

increase of 1.25 to 1.50°C in the short term is foreseen, and up to 2.25°C in the medium term.^[35]

Mexico City Climate Action Program (PACCM) 2014-2020^[36] states that about 5.6 million people in the city are vulnerable to climate change and describes their economic and educational status, gender distribution, degree of dependence, geographic location, and other factors. Figure 12 shows rainfall predictions for CDMX.

Figure 12. Rainfall predictions for CDMX^[37]

	DRIER MONTHS			MONTHS WITH GREATER HUMIDITY	
	Short term 2030	Long term 2050		Short term 2030	Long term 2050
DECEMBER	-30 -40%	Reduction of 50 - 75%	JUNE JULY	5 - 10% reduction	10% reduction
JANUARY	Minimum	Slight increase			
FEBRUARY	Minimum	25% increase	FEBRUARY	Minimal reduction	Minimal increase

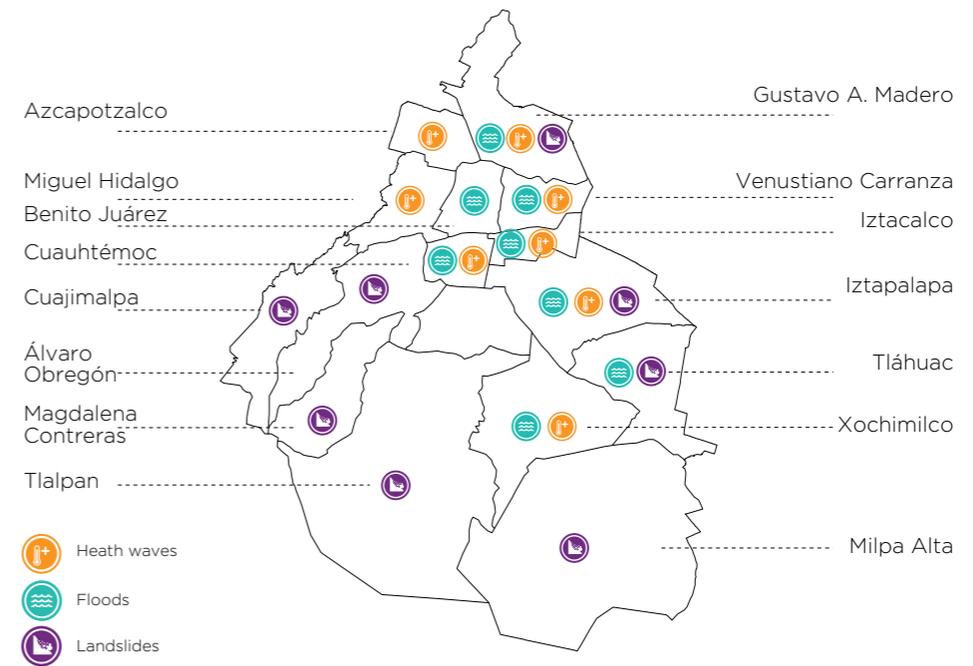
34. IPCC, 2014.

35. These are the temperature projections under scenario A2; data are from the Mexico City Virtual Center for Climate Change, 201 (SEDEMA, 2014).

36. SEDEMA, 2014.

37. Data from Mexico City Virtual Center for Climate Change, 201 (SEDEMA, 2014).

Figure 13. Climate change vulnerability



PHENOMENON	ACUTE SHOCKS OR CHRONIC STRESSES
Temperature increase 	Spread of vector-transmitted diseases such as dengue, chikungunya, and zika (transmitted by <i>Aedes aegypti</i> mosquitos) and malaria (transmitted by <i>Anopheles</i> sp. mosquitos). VULNERABLE AREAS: ENTIRE CITY.
Changes in rainfall parameters 	Reduction of recharge potential of aquifers. VULNERABLE AREAS: CONSERVATION AREAS Shortage of water resources, especially to the Toluca-Ixtlahuaca and Mexico Basin due to impacts on the Cutzamala system. VULNERABLE AREAS: MEXICO BASIN AND ZMVM. Y ZMVM.
Drought 	Wildfires: Forests and meadows in Conservation Areas. WATER SHORTAGES: ENTIRE CITY AND IZTAPALAPA, ALVARO OBREGON, TLALPAN, TLAHUAC, XOCHIMILCO, AND MILPA ALTA.
Extreme rainfall 	Floods: Affect road networks and transportation; create large traffic jams and economic losses. Landslides: Affect dwellings; result in economic and human losses.
Heat wave 	Increased death rate due to dehydration and heat strokes. Temperature on public transportation beyond comfort limits, mainly in the metro system. Shock to food conservation efforts and potable water due to an increase in pathogenic micro-organisms.

EXTREME RAINFALL AND FLOOD

One of the expected shocks associated with climate change is an increase in extreme rainfall that may result in an increased number of floods. Shocks to sewage systems are projected during intense rainfall seasons, and the frequency and extent of such shocks may increase significantly due to lack of infrastructure maintenance or as a result of future earthquakes, which may result in damaged infrastructure in the city.^[38]

Some of the most recurrent shocks in CDMX are the ponding of water and the floods that occur during the rainy season (May to August). Figure 14 shows areas in danger of flooding in CDMX. Although they only result in minor direct economic impacts, they severely affect mobility in the city and the entire metropolitan area

and in doing so result in significant indirect economic losses.

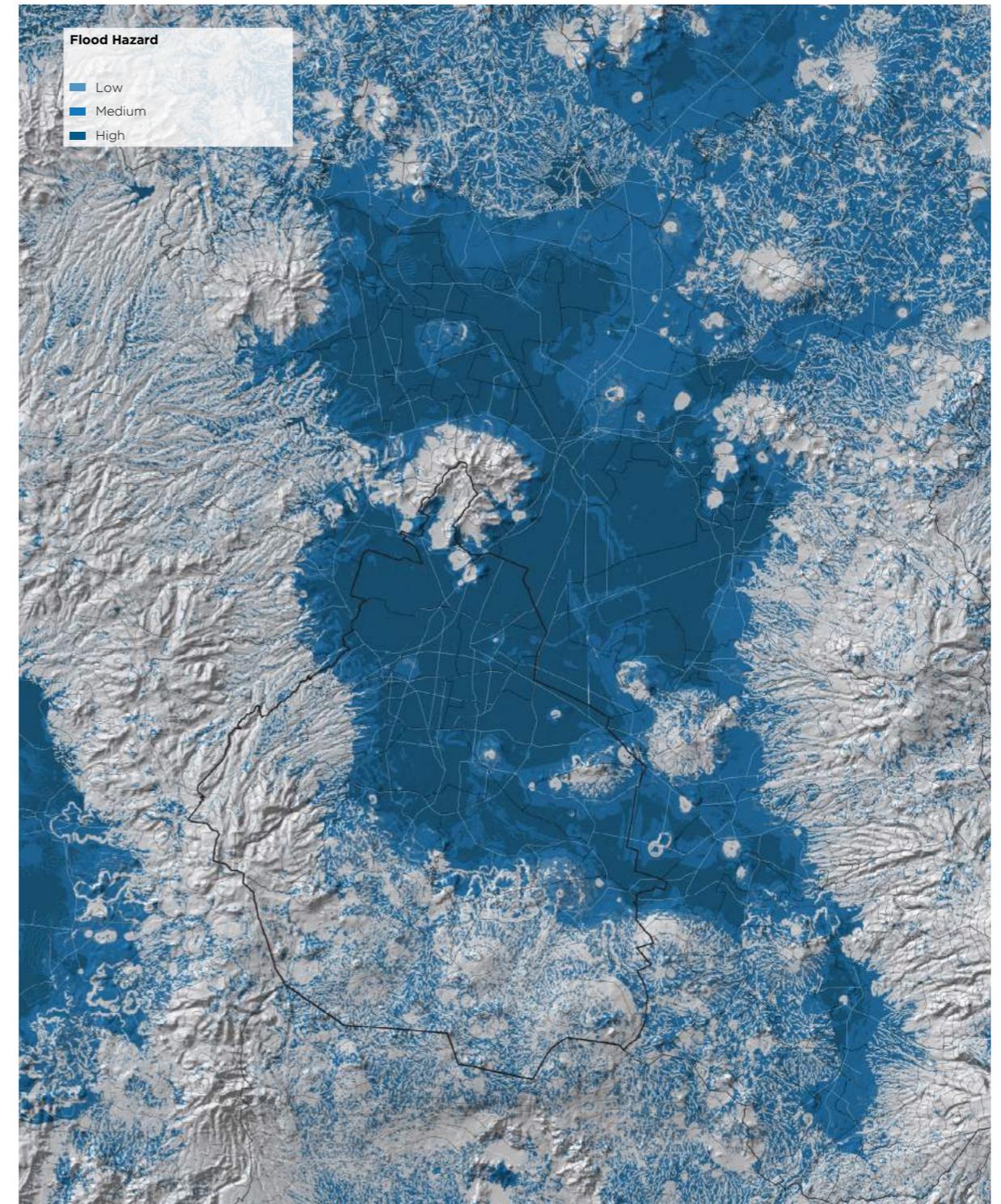
Flooding due to the collapse of the sewage system affects both the area near the current Mexico City International Airport (AICM) and the area where the New International Airport of Mexico City (NAICM) is being constructed.^[39] Therefore, to increase the resilience of both CDMX and ZMVM, actions that improve the use and management of water resources and address climate change scenarios involving extreme rainfall are needed.



38. León, 2010; SACMEX, 2012a.

39. Construction of NAICM started in 2015, and the first phase is expected to be completed by 2020. For further details, see <http://www.aeropuerto.gob.mx/>.

Figure 14. Flood hazards in CDMX.



Source: Centro Mario Molina, 2014.

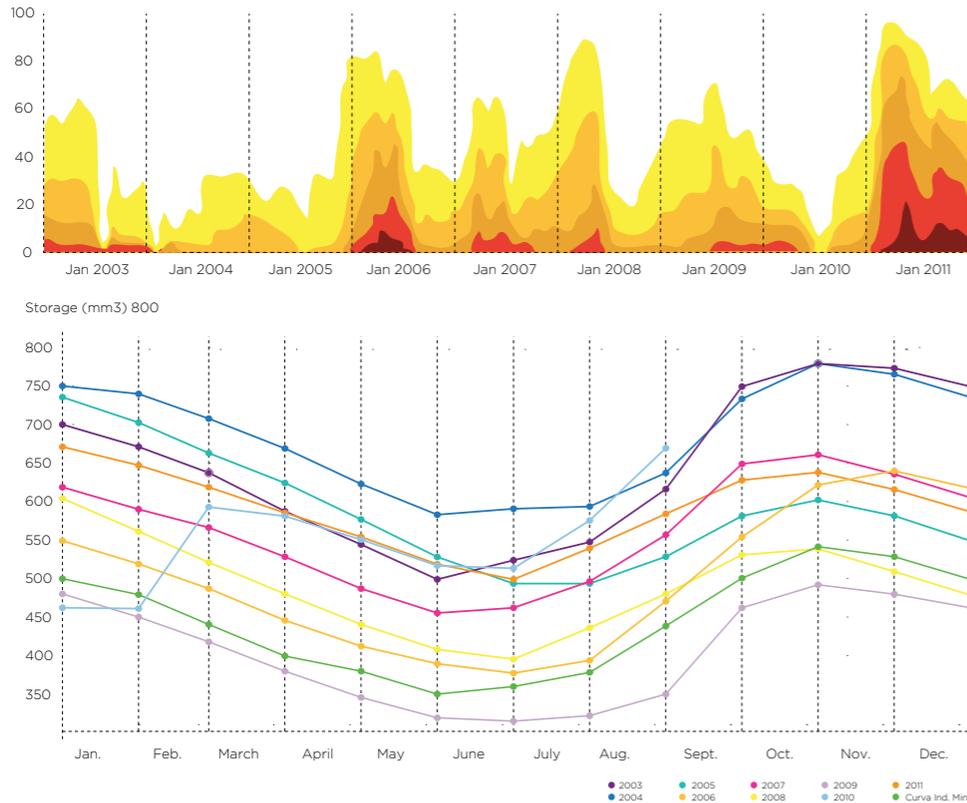
DROUGHT

Another potential shock for the city that may result from climate change is a prolonged drought in the region that affects the Cutzamala system and therefore the water supply to ZMVM. From 2009 to 2011, a drought in northern and central Mexico impacted the availability of potable water for some areas of the city (specifically, Iztapalapa and Tlahuac) (Figure 15). After a number of tropical storms, the effects of the drought receded and adequate water levels in the reservoirs supplying the city and the metropolitan area were reestablished.^[40]

of Mexico. Estimates are that in about 30 to 40 years the Mexico Basin will gradually become impaired and will cease to be the main water source for CDMX. If extended droughts like those in Sao Paulo, Brazil, or in California, United States, were to occur in northern and central Mexico, sustainable aquifer management will be critical for water supply and resilience for the megacity and the region.

Water extraction is currently substantially greater than aquifer recharge in the Valley

Figure 15. Effect of drought on Cutzamala System in Mexico (2003–2011)

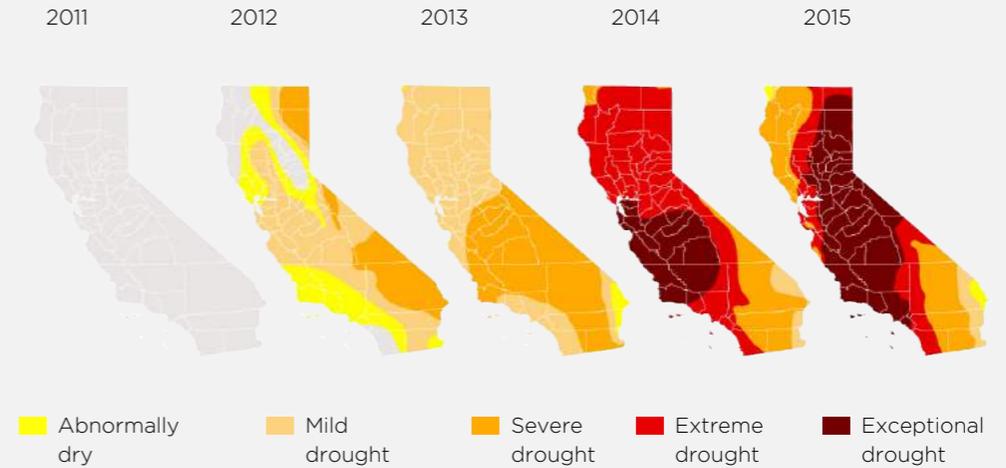


40. INECC, 2012; SACMEX, 2012b.

PROLONGED DROUGHT CASE STUDY: LOS ANGELES, CALIFORNIA, U.S.A.

Since 2012, California has experienced a historic drought (Figure 16). In January 2014, dams and rivers registered their lowest levels in history, and the state was declared to be in a state of emergency. The eastern Sierra Nevada, a region that supplies water to the city of Los Angeles, registered snow coverage that was 2 percent of normal, the lowest level in history.^[41] Although 2015–2016 was expected to be a year with much rainfall due to the presence of El Niño, drought conditions still prevailed in almost all the state.^[42]

Figure 16. Map of drought levels in California as of the second week of 2015 ^[43]



WATER CONSERVATION

In April 2015, California’s governor, Jerry Brown, issued an executive order to reduce use of potable water in urban areas by 25 percent, with specific reductions of 4 to 36 percent required for cities (relative to 2013 usage).^[44] The specific reduction required for the City of Los Angeles was 16 percent. However, water pressures in the city in previous years had forced local government to act. In October 2014, Eric Garcetti, mayor of Los Angeles, made a commitment to reduce water consumption per capita by 20 percent by 2017 and to realize a partial reduction of 10 percent by mid-2015. He also endeavored to reduce water imports by 50 percent by 2025 and replace this reduction by rainfall capture by 2035. ^[45] About 65 percent of the water in Los Angeles is used in homes. The Los Angeles Department of Water and Power (LADWP) explains that it achieved its water consumption reduction goal by July 2015 as the result of the stringent restrictions it imposed on the use of water for gardening.^[46]

INVESTMENT IN LOCAL WATER SOURCES

Los Angeles seeks to develop local water sources that are drought-resilient. Between 2011 and 2015, 80 percent of the water used in Los Angeles was imported from the Sierra Nevada and the Colorado River. Due to impacts of climate change on these sources, Los Angeles is seeking new projects to recycle water and capture rainfall. Alternatives are also being investigated to recharge the San Fernando Valley aquifer with treated recycled water.^[47]

ECONOMIC IMPACT

Droughts have a significant impact on the agricultural sector, and these impacts create economic losses.^[48] However, in the city the economic importance of the agricultural sector is relatively small,^[49] and the industrial and commercial sectors, which tend to predominate in cities, are not directly affected by drought.^[50] In Los Angeles, homeowners have experienced the greatest economic impacts of the drought because of rate increases.^[51] However, LADWP has also been affected: Restrictions on water consumption reduce revenues for LADWP even though the transaction costs of the water system have been fixed.

41. Garcetti, 2015.

42. Thompson, 2016.

43. *Los Angeles Times*, May 2015.

44. State of California, 2015.

45. Garcetti, 2014.

46. Ibid.

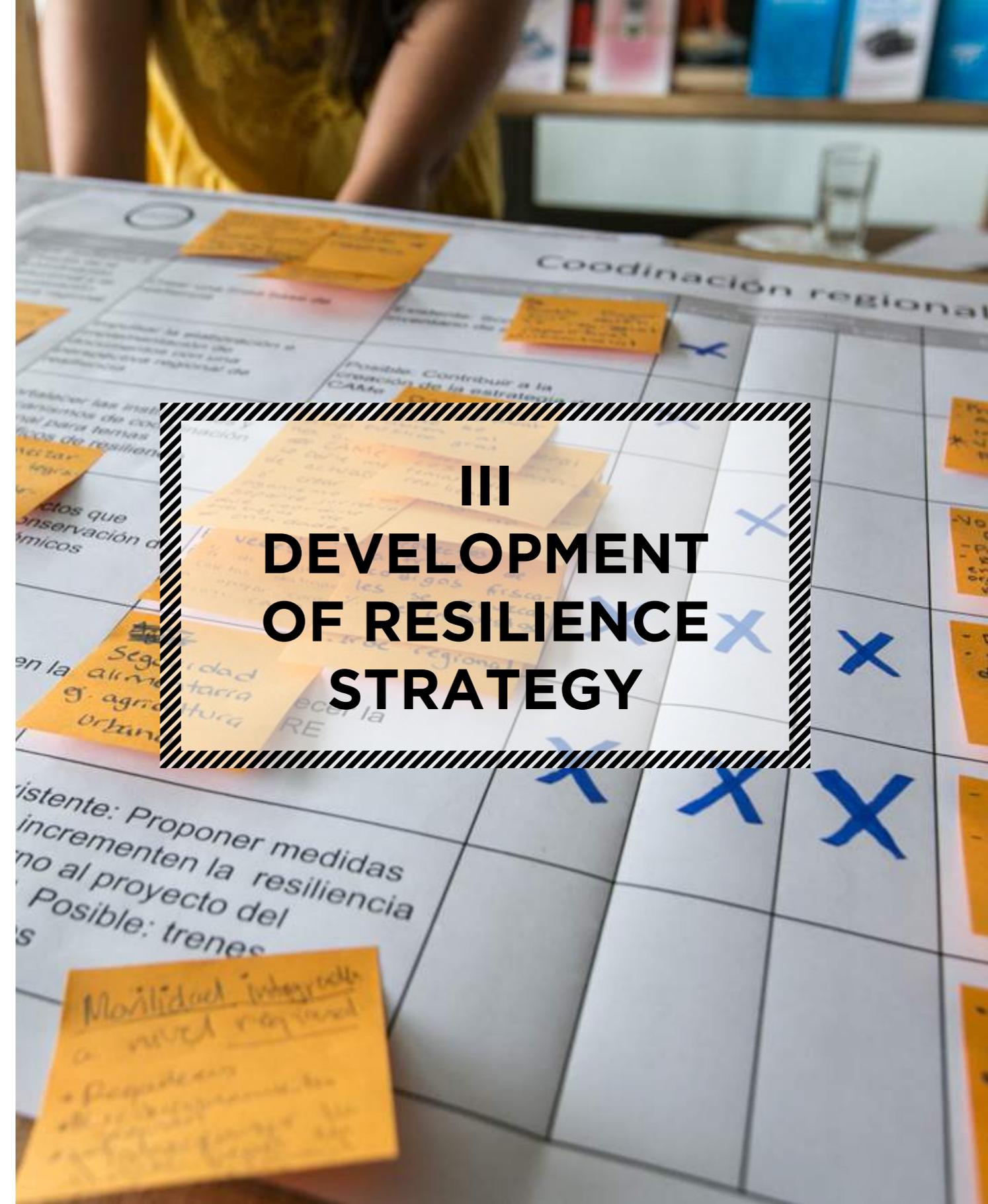
47. LADWP, 2016.

48. As of 2014, California endured economic losses of \$USD 810 million on agricultural production, \$USD 454 million due to additional pumping costs, and \$USD 203 million on losses in the livestock sector (LADWP, 2016).49. LAO, 2015.

50. Hanak, Ellen et al., 2012.

51. Reicher, 2015.

III DEVELOPMENT OF RESILIENCE STRATEGY

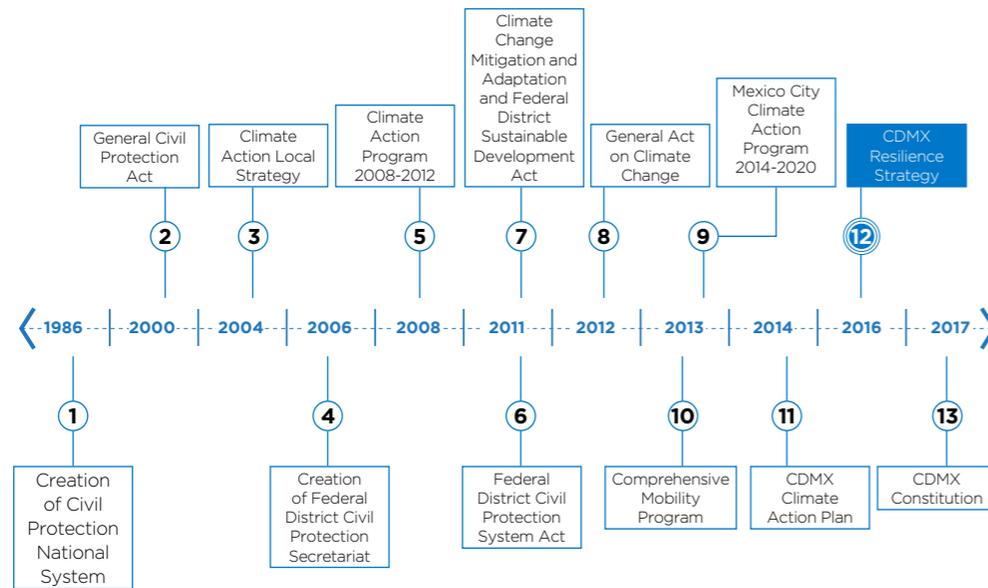


III. DEVELOPMENT OF RESILIENCE STRATEGY

In the last few years, the Mexico City Government has implemented strategies, programs, and projects to address resilience issues in various sectors (Figure 17). These actions have provided a basis for the implementing comprehensive risk management, development planning, and institutional responses to climate change as priorities to CDMX and have contributed to building resilience.

The Mexico City Climate Action Program 2014-2020 prioritizes building resilience at both the city and the societal level and focuses on reducing the vulnerability of people in poverty, as they are often the most vulnerable to these events, given the degree to which their quality of life and basic goods (home, health, education) are affected by such events. The Resilience Strategy seeks to strengthen city programs and projects designed to build resilience.

Figure 17. Timeline of government efforts to build a strategic approach to resilience



3.1 CONCEPTUAL FRAMEWORK FOR CITY RESILIENCE

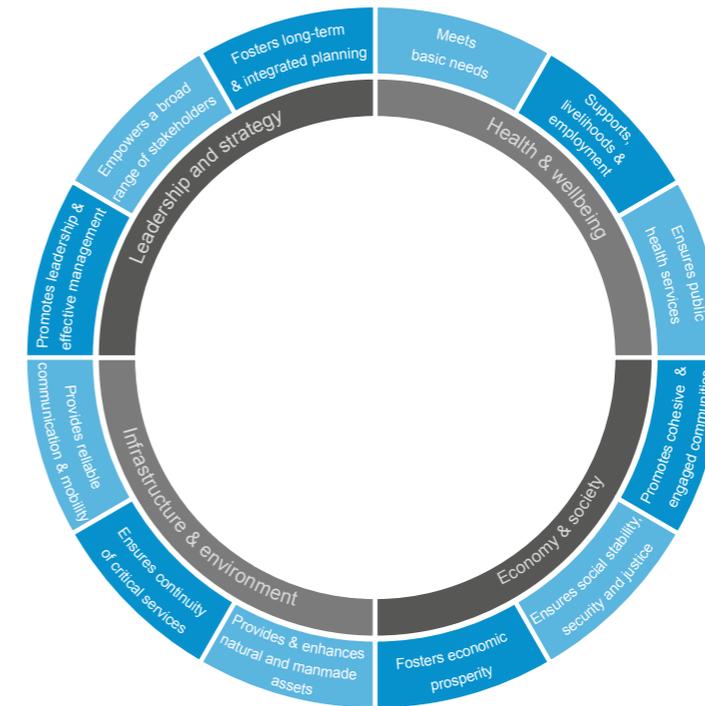
The CRF is a tool that the Rockefeller Foundation developed in collaboration with Arup^[52] to identify the features of a resilient city (Figure 18). The goal of the CRF is to identify the ways that cities around the world can assess and analyze resilience in a more uniform way. The CRF also helps compare and contrast resilience among the various cities involved in the 100RC initiative.

to inform the methodology for design and collection of data and perceptions from stakeholders. With this strategy, the main results for the shocks, stresses, strengths, and weaknesses of a city could be illustrated as they relate to resilience.

Also guiding the design of the Resilience Strategy are the seven qualities described in the table on the following page.

The CRF tool is made up of 4 dimensions, 12 drivers, and 50 sub-drivers that help to articulate the process that cities use to assess their capacities connected to resilience building (Figure 18). The CRF was used to develop a strategy

Figure 18. City Resilience Framework



52. Arup is an independent British company associated with the 100RC initiative that specializes in design, engineering, consulting, and methods. The company offers a large range of professional services (The Rockefeller Foundation and Arup, 2014).

RESILIENCE QUALITIES

INCLUSIVE



The Resilience Strategy process should attract a wide, diverse group of stakeholders, including those that are most vulnerable to shocks and stresses, to ensure transparency and collective responsibility. Methods to encourage commitment should reflect opportunities for collective cooperation to help ensure that the strategy results in an approach that considers and sets priorities for the resilience needs of various sectors and groups of stakeholders. The Resilience Strategy should also be clearly organized and documented to guarantee that all stakeholders understand and have access to it.

INTEGRATED



The Resilience Strategy process and results should be built on continuous supplemental efforts. Instead of creating additional work and conflict for stakeholders, the strategy should be developed to help cities to align with and make the best of existing and new initiatives and priorities. The strategy should also ensure management of the relationship between and interdependence of initiatives and the risks to be addressed.

ROBUST



The Resilience Strategy should be developed from a clear, rigorous process that brings together commonly accepted quantitative and qualitative approaches. 100RC should provide best practices to guide the development of the strategy.

RESOURCEFUL



The Resilience Strategy should take into account city resource restrictions and should seek innovative options to overcome them.

REFLECTIVE



The Resilience Strategy should be designed to capture lessons learned, new or updated information, reevaluations, and constant change. Mechanisms should allow for ongoing evolution; cities should be able to make decisions based on historical experiences and information and in real time.

REDUNDANT



The Resilience Strategy should have multiple initiatives to ensure that cities have redundant capacities to address the various needs of resilience.

FLEXIBLE



The Resilience Strategy should have the flexibility to adapt to events and unforeseen changes in context and new perils, situations, data and stakeholders. The strategy should provide an adaptive management cycle that takes into account successes and failures, best practices, experiences, and approaches, both internally and in other cities. Such inputs should be periodically reevaluated to reinforce strategic priorities and adjust implementation approaches.

3.2 STRATEGY DEVELOPMENT PROCESS

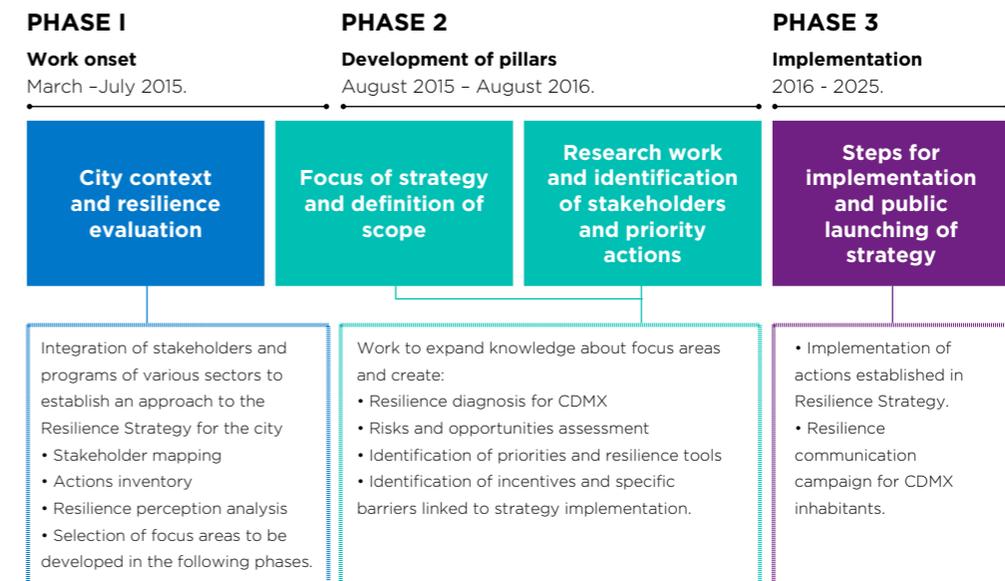
The preparation of a Resilience Strategy in the 100RC Network follows a consistent methodology through three phases of work that started in March 2015 (Figure 19). The strategy development process was a participatory process that approached and consulted with stakeholders in the public sector, the private sector, non-governmental organizations, and the scientific community to ensure inclusion of various perspectives, priorities, and information sources. All stakeholders provided valuable information that contributed to an exchange of local knowledge and the creation of resilience priorities that must be addressed.

During Phase I, participants reviewed government documents and literature and

conducted semi-structured interviews, surveys, workshops, and meetings with subject-matter experts to identify and understand the main stresses, shocks, and assets of the city^[53]. The information was presented in a Preliminary Resilience Evaluation, which identified six focal areas. These six areas were studied in more depth in Phase II.

During Phase II, work groups consisting of subject-matter experts from various sectors were established to develop the issues and areas of opportunity specific to the six focal areas.^[54]

Figure 19. Resilience Strategy development phases



53. During Phase I, 11 interviews, 17 surveys, and 2 workshops were conducted (a Perceptions workshop with 20 attendees and an Assets, Stresses, and Shocks workshop with 27 attendees); 146 individuals and 290 actions were identified as contributing to resilience development in CDMX.

54. During Phase II, three workshops were conducted and working sessions with the responsible parties for each work group were held.



By combining the results of Phases I and II, weaknesses, areas of opportunities, the relationship between shocks and stresses, and the actions that should be fostered to address the main resilience challenges faced by CDMX were identified. From this process, it was determined that five pillars needed to be considered:

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**

As part of the development process for the Resilience Strategy, there has been participation in international activities, including the following:

World Summit on Resilience	COP 21	Exchange of experience among Resilience Directors in Rotterdam	ARISE Initiative
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WORLD SUMMIT ON RESILIENCE

In November 2015, CDMX hosted the Second Global Summit of Resilience Directors. Participants included resilience directors from about 50 cities from around the world, 100RC global initiative staff, and 100RC Platform Partners members. The objective of the summit was to share experience about the initiatives taken, the barriers encountered, and the solutions that overcame the barriers in the cities in the 100RC Network. The summit also highlighted how resilience directors from around the world have come to lead construction efforts.

During the event, CDMX served as a living laboratory where participants experienced diverse resilience challenges and observed how the city has fostered innovative initiatives to address its challenges and needs. The Mayor, heads and officers of various CDMX government secretariats, Resilience Directors from various cities around the world, and representatives of international organizations took part in this event.

During the summit, participants discussed the resilience challenges posed by the current Mexico City International Airport and brought their diverse experience and points of view to the subject. Topics addressed included ways to incorporate resilience elements into the project in the context of the needs of the population and the city's chronic stresses and acute shocks. Participants also identified key topics that should be taken into account in the project, including social inclusion, comprehensive mobility, water management, seismic risk management, and opportunities to reduce social inequality.



COP 21

In December 2015, during the 21st Conference of Parties (COP 21) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris, France, the CDMX government presented a paper entitled The View of Mexico City on Climate Change to 2025 e^[55]. The paper discussed the progress that the city has made on climate policy and its vision for 2025 on mitigation, adaptation, and resilience. The paper also highlights a preliminary vision of a Resilience Strategy to reduce vulnerability in the face of social, economic, and environmental threats. The inclusion of resilience in this paper illustrated CDMX's commitment to strengthen city resilience and to be a global leader on this issue.

EXPERIENCE EXCHANGE AMONG RESILIENCE DIRECTORS IN ROTTERDAM

From October 5 to 9, 2015, an exchange of resilience ideas and experience took place under 100RC auspices in Rotterdam, the Netherlands. The exchange focused on identifying best practices by cities to manage water resources and build resilience. Resilience Directors and officers from Bangkok (Thailand); Berkeley, CA (USA); Mexico City (Mexico); New Orleans, LA (USA); Norfolk, VA (USA); Rome (Italy); Rotterdam; Surat (India); and Vejle (Denmark) attended the exchange. These cities face common challenges regarding water management. During the exchange, innovations implemented in Rotterdam for multidisciplinary infrastructure were explored. Among the innovations were water squares and underground parking lots that can retain and store water during intense rainfall events to mitigate the risk of floods while providing public space.^[56]



55. This document may be reviewed at: <http://www.sedema.cdmx.gob.mx/sedema/index.php/temas-ambientales/cambio-climatico>

56. For 3 days, more than 30 subject-matter experts worked on management of water resources. The subject-matter experts were from private organizations, NGOs, universities and colleges, and the 100RC Partners Platform. After the exchange, a document with recommendations was prepared. This document is available at: http://www.100resilientcities.org/blog/entry/rotterdam-exchange#/-/_/

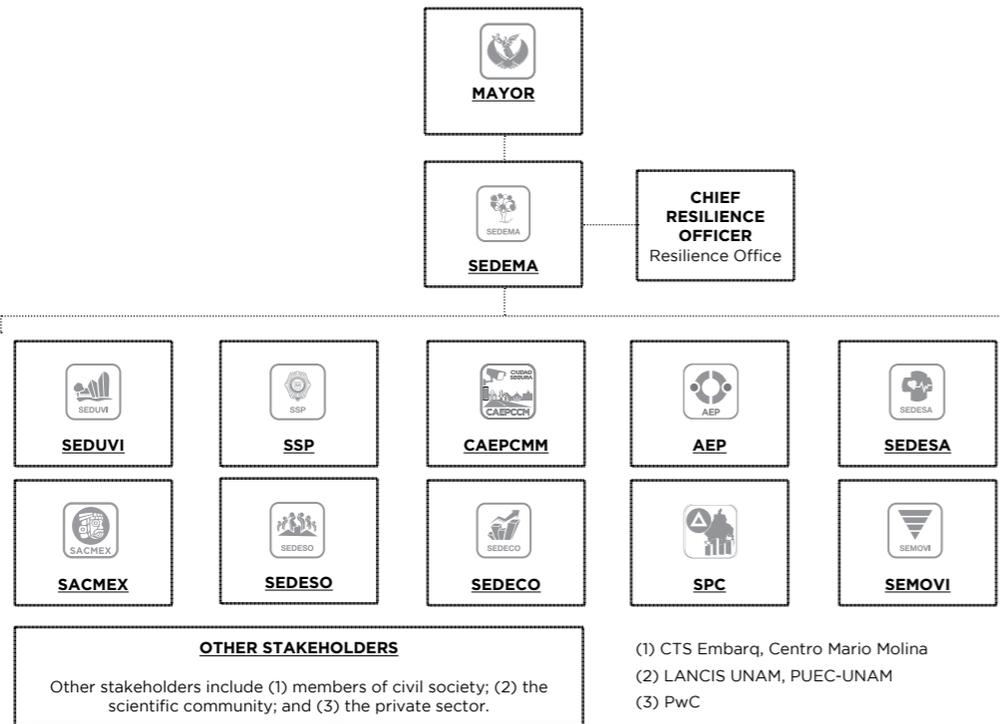
ARISE INITIATIVE

CDMX has been chosen to be part of the ARISE Initiative for Private-Sector Alliance for Resilient Societies before Disasters. This initiative, which is promoted by United Nations Office for Disaster Risk Reduction (UNISDR), is designed to foster collaboration with private-sector entities to build city resilience. ARISE initiative activities have been integrated into the CDMX Resilience Strategy.

3.3 INSTITUTIONALIZATION OF RESILIENCE

The development and implementation of the Resilience Strategy has been driven by the Resilience Steering Committee, which was created under the mandate of the Federal District Inter-Institutional Climate Change Commission (CICCCDF)⁵⁷, pursuant to Article 11, Fraction XIII of the Federal District Act for Climate Change Mitigation and Adaptation and Sustainable Development. The Resilience Steering Committee is made up of a group of stakeholders who represent various sectors (Figure 20) and have contributed to the development of the Resilience Strategy with review and validation of documents, activities, and strategy design in preparation for submittal to CICCCDF.

Figure 20. Structure of the Resilience Steering Committee



The CDMX commitment to implement actions to build a Resilience Strategy has been demonstrated by the signing of a 100RC commitment declaration that states that the city will allocate 10 percent of its annual budget to support resilience measures in the city. As a result of this commitment, 100RC ensured financing of up to \$USD 5 million for Platform Partners services until 2020 to support the city's efforts to build resilience.

The commitment declaration was signed by Dr. Miguel Angel Mancera, the Mayor of Mexico City, during the 100RC-sponsored Second Global Summit of Resilience Directors. With this agreement, the mayor requested that the activities that are developed as part of this initiative be monitored.



The following sections describe the proposals and recommendations that arose during the development of the Resilience Strategy for the implementation of present and future actions by the city and region.

57. Please refer to the following link for a CICCCDF members list: <http://www.ordenjuridico.gob.mx/Documentos/Estatal/Distrito%20Federal/wo103439.pdf>



**IV
A VISION
TO BUILD
RESILIENCE IN
CDMX**

Fuente: SEDEM

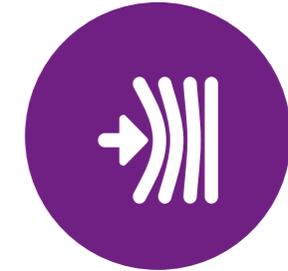
RESILIENT CDMX



EQUALITY



INCLUSION



**ADAPTIVE
TRANSFORMATION**

Mexico City creates an equitable society using an all-embracing adaptive process in which various stakeholders, sectors, and vulnerable groups foster a transformation to face the main social, economic, and environmental challenges of the 21st century.

IV. A VISION TO BUILD RESILIENCE IN CDMX

The CDMX Resilience Strategy is an opportunity to bring together a vision to build resilience and to guide government, the private sector, civil society, and the scientific community to respond to the main shocks and stresses that the city faces in a cross-functional, integrated, and multilevel approach (at the community, local, city, and regional levels).

The pillars and actions of the Resilience Strategy seek to contribute to the creation of a more equitable CDMX and to focus on the population that is most affected by the city's many present or potential perils. Inequality manifests in various ways in the city (for example, in unequal access to services, urban amenities, housing, and employment). Likewise, vulnerability and adaptive capacity to various risks are not the same for different parts of the population. For this reason, the Resilience Strategy acknowledges such differences and seeks to benefit vulnerable groups through the proposed goals and actions.

Resilience is built through an all-embracing process that considers the views of stakeholders from the various levels of government and members of the scientific

community, civil society, corporations, representatives of the private sector, and multilateral and bilateral cooperative organizations. It is important to foster cooperation among these stakeholders through coalitions of organizations with shared goals and actions to build resilience.

The Resilience Strategy drives an adaptive transformation by fostering a change of paradigm so that the development process transcends traditional frameworks to face complex problems and to design, modify, and implement public policies by cross-functional planning. To achieve this end, continuous learning and frequent review of plans and actions are required. The commitment to this type of learning and review is an acknowledgment of the seriousness of the city's social-environmental challenges and the opportunities the city has to make real progress on sustainable social and economic activities that can transform its future.



V. RESILIENCE STRATEGY

The goal of the Resilience Strategy for CDMX is to identify opportunities and define priorities for building city resilience. The strategy's vision must be broad and ambitious to respond to the city's existing challenges. To address the main challenges outlined in Chapter II, Resilience Challenges in CDMX, the Resilience Strategy incorporated five

pillars, each of which has distinct goals, actions, and activities.

To define the goals and actions for each pillar, certain overarching concepts were established.



BUILDING RESILIENCE IN SPECIFIC AREAS AT THE COMMUNITY LEVEL

The distribution of stresses and shocks in some communities is concentrated spatially. In the short and medium term, actions, innovations, and resource alignment are needed to increase resilience at the community level if such actions are to be replicated in other areas of the city and region. There is a great diversity of programs and actions that may, with some modifications, increase resilience at the community level.



VULNERABLE GROUPS

Shocks and stresses must be considered concurrently, as there is a close relationship between them. This close relationship is evident in the varying effects that result from the different adaptive capacities of different groups in the population. For example, poverty, marginalization, and gender differences limit the adaptive capacity of the population to face disasters, and this limited adaptive capacity increases their vulnerability. Therefore, actions must identify vulnerable groups and build resilience at the community level.



EDUCATION AND COMMUNICATION

The preparation of educational messages and the design of communication campaigns around resilience are designed as elements to increase understanding by key stakeholders and society and to foster citizen involvement in resilience building.



REGIONAL PERSPECTIVE

To build a culture of resilience at both the metropolitan and the megalopolitan level, input from a regional perspective must be sought and included.

ACTIONS

Three types of actions are included in this Resilience Strategy:

1. Actions and activities that are conducted by organizations or institutions of government, the private sector, civil society, or the scientific community that are identified by their value to building resilience in the city.

2. Actions and activities that are noted for their relevance because they bring cross-resilience principles or have a significant positive impact on city and regional development.

3. Actions and activities that have a resilience value. These actions are divided into two types:

- Actions and activities in the planning process** that require support to implement.
- Actions and activities that have not yet been implemented, but that are suggested for the future** because they represent an opportunity to build resilience.

The period in which an action is to take place is described as follows:

- 1. Short term (2016-2018):** Actions already under way or about to start, but that will be concluded during the current administration.
- 2. Medium term (2016-2025):** Actions that will need to be continued into the future to be effective despite political-administrative changes.
- 3. Long term (2016-2040):** Actions that will require longer planning and implementation processes that are responding to a vision of resilience related to transformation toward the sustainability of the city and the region.

Three types of stakeholders are involved in actions and activities:

- Responsible parties:** Government entities in charge of developing an action that have the task of reporting progress within the monitoring, reporting, and verifying (MRV) mechanism.
- Participants:** Other government entities involved in developing an action or a specific activity.
- Partners:** Members of private-sector, civil society, academic, or international organizations that contribute to the development of actions or activities.

The Resilience Strategy is an ever-changing document that requires ongoing assessment and that incorporates a learning process that allows for responses to a dynamic context. Due to the scope of a Resilience Strategy, this document could not include all the issues that might be relevant to building resilience.

Therefore, regular reviews must be conducted to ensure that goals and actions are evaluated and updated. An MRV system will be implemented to support regular evaluations, continuous learning, and reflection on building resilience, specifically for communities and vulnerable groups.

STRATEGIC PILLARS

Next, the strategic pillars are introduced with a selection of actions and some activities identified as examples of initiatives to be driven by the Resilience Strategy. All actions are shown in Appendix: Pillars, Vision, Goals, Actions, and Activities of the Resilience Strategy

PILLAR 01



FOSTER REGIONAL COORDINATION

VISION: The ZMVM and the wider megalopolis operate under a regional institutional framework on key topics to maintain a common agenda and ensure shared responsibility in building resilience



1.1: Create resilience through institutional coordination and regional strategic communication.



1.2: Guide and support regional projects that contribute to resilience.

PILLAR 02



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

VISION: To respond to the risks and shocks associated with climate change and social and environmental pressures, and to ensure equity in water access and water security for all who live and work in CDMX, the city manages water resources in the Mexico Basin based on the principles of the Comprehensive Management of City Water Resources (GIRHU) process.



2.1: Reduce water scarcity and access inequality.



2.2: Promote sustainable use of the aquifer and contribute to water security planning.



2.3: Foster a civic culture on the sustainability of water resources.



2.4: Integrate a water-sensitive approach to urban design through blue and green infrastructure.

PILLAR 03



PLAN FOR URBAN AND REGIONAL RESILIENCE

VISION: All CDMX citizens have equal access to urban amenities, housing, green areas and public spaces; the environment is improved; and risks are mitigated through sustainable management of natural resources.



3.1: Increase spatial social equality in CDMX through programs and projects.



3.2: Protect Conservation Areas.



3.3: Reduce risk through urban and regional planning.

PILLAR 04



IMPROVE MOBILITY THROUGH AN INTEGRATED, SAFE, AND SUSTAINABLE SYSTEM

VISION: CDMX and the metropolitan area have an integrated mobility system that prioritizes public transportation over private vehicles and provides a safe urban environment for pedestrians and cyclists.



4.1: Promote an integrated mobility system that connects and revitalizes CDMX and ZMVM.



4.2: Discourage the use of private vehicles.



4.3: Create a safe and accessible city for pedestrians and cyclists.



4.4: Prepare the mobility system for the potential risks and effects of climate change.



4.5: Promote the use of data to improve decision making on mobility.

PILLAR 05



DEVELOP INNOVATION AND ADAPTATIVE CAPACITY

VISION: CDMX adapts to the impacts of climate change and responds proactively and innovatively to dynamic risks of natural and social origin.



5.1: Integrate the principles of resilience in public facilities, investments, and new strategic projects, and promote private-sector participation in building resilience.



5.2: Promote community resilience through citizen participation, strategic communication, and education.



5.3: Review and adjust the regulatory framework to promote the implementation of adaptive measures.

An aerial photograph of a city, likely Mexico City, taken from a high vantage point. The city is densely packed with buildings, and the sky is a deep orange and yellow, suggesting a sunset or sunrise. In the distance, a range of mountains is visible under the hazy sky. A semi-transparent white box with a black and white striped border is positioned in the upper right quadrant of the image. Inside this box, the text "PILLAR 01. FOSTER REGIONAL COORDINATION" is written in a clean, white, sans-serif font.

PILLAR 01.
**FOSTER
REGIONAL
COORDINATION**

PILLAR 01.

FOSTER REGIONAL COORDINATION

VISION: The ZMVM and the wider megalopolis operate under a regional institutional framework on key topics to maintain a common agenda and ensure shared responsibility in building resilience.



GOAL 1.1
Create resilience through institutional coordination and regional strategic communication.

GOAL 1.2
Guide and support regional projects that contribute to resilience.

PROBLEM DESCRIPTION

The megalopolitan area at center of the country includes Mexico City, the States of Mexico, Tlaxcala, Hidalgo, Morelos, and Puebla (Figure 21). Historically, this area has been the dominant area in the country in economic, social, and political terms. This metropolitan area consists of the 16 boroughs that constitute Mexico City and 224 municipalities in other states.^[58]

CDMX maintains a dynamic relationship between the city and its megalopolitan region in terms of the movement of the population and movement within the transportation system. For example, 40 percent of metropolitan area inhabitants have to cross at least one municipal border to get to their workplace.^[59] The corridor Mexico–Puebla registers about 760,000 people traveling daily, and 24 percent of the goods bought and sold in the city come from other parts of the region.^[60]

This close relationship between CDMX and its surrounding metropolitan area means that many challenges must be addressed jointly to keep the city functioning.

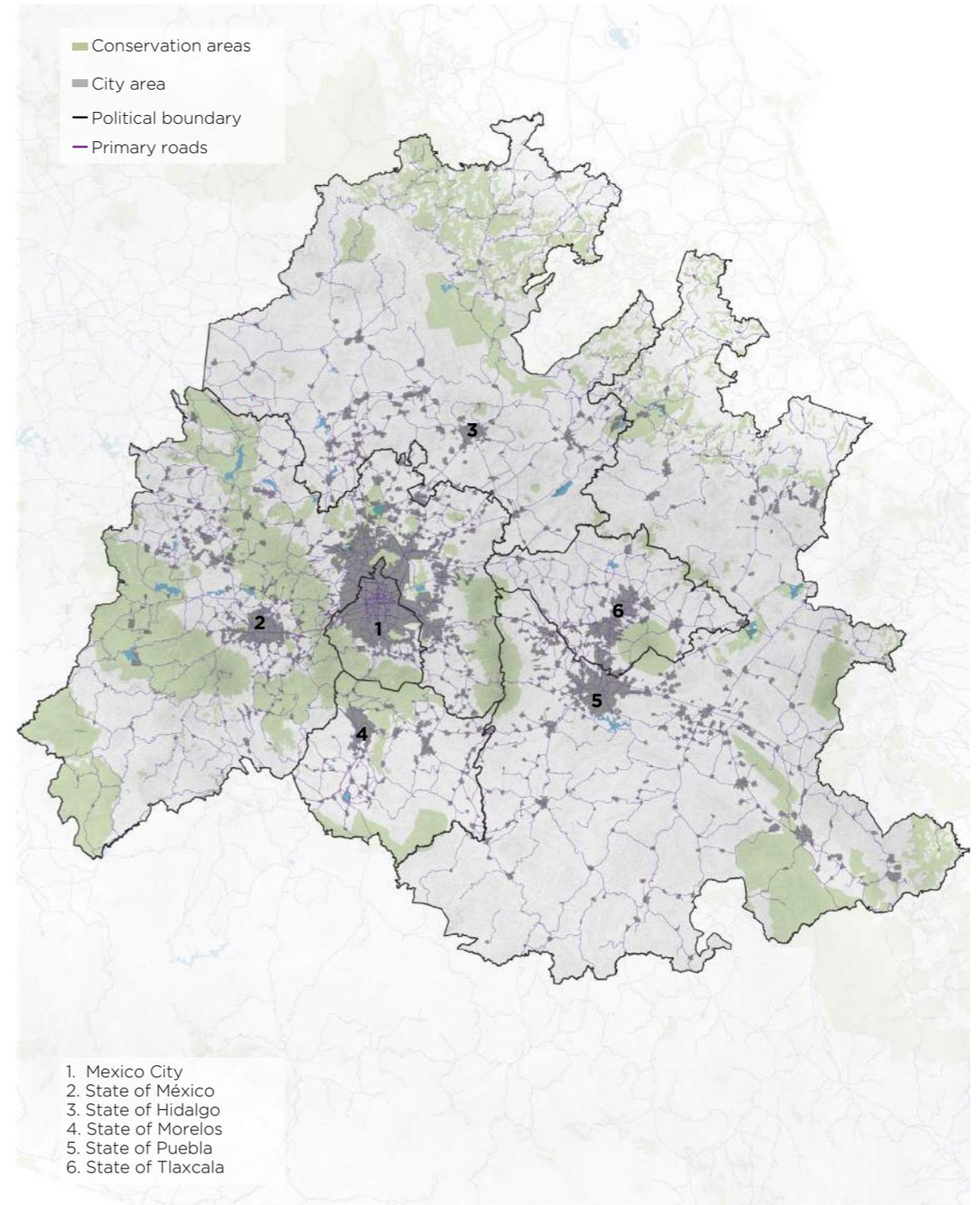
Strategic issues such as water resources management, mobility, territorial planning, conservation of natural resources, and biodiversity share a regional view. For example, the water used in CDMX metropolitan areas, Toluca, and Cuernavaca depends greatly on the Water Forest, an aquifer recharge area that is shared by three states.^[61]

Given that the rivers, aquifers, air, and commuters in ZMVM extend beyond political borders, the management of resources has to be organized at the metropolitan and megalopolitan levels,^[62] as such management would be limited in scope without a regional approach.

In addition, the large number of administrative stakeholders makes the design and implementation of public policies and regional planning difficult. As a result, the governance structure in the region is fragmented.^[63] The CDMX Resilience Strategy must be implemented at multiple levels, from local to regional.

Figure 21. Megalopolis

0 50 100km N



58. The 224 municipalities consist of the 29 municipalities in Hidalgo, 80 in the State of Mexico, 33 in Morelos, 22 in Puebla, and 60 in Tlaxcala (DOF, 2013).

59. OCDE, 2015.

60. Centro Mario Molina, 2012.

61. CDMX, Morelos and State of México (ECOBA, 2012).

62. PUEC, 2012.

63. OCDE, 2015.



GOAL 1.1.

Create resilience through institutional coordination and regional strategic communication.

ACTION 1.1.1.

▣ Foster resilience integration in regional programs.

Integrating resilience into regional programs allows for priority issues to be addressed in a way that strengthens projects and policies related to management and reduction of risks and social vulnerability in a cross-cutting manner that brings together multiple sectors. Examples of this type of integration are the reactivation of the COMETRAVI and integration of a potential guiding principle of resilience in the upcoming POZMVM.

Responsible Parties: OR
Partners: AECOM, Iniciativa ARISE
Period: 2016 - 2025

Resilience Value:
 By considering resilience principles from a regional view, this action would strengthen state capacities for risk prevention, attention to vulnerable groups, and reduction of inequality in access to basic services. Realization of these values would increase integration and social inclusion.



ACTION 1.1.2.

● Drive and support the creation of a national resilience agenda with Mexican cities belonging to 100RC Network.

Currently, four Mexican cities belong to the 100RC network: CDMX (2013), Ciudad Juarez (2014), Colima (2016), and the Guadalajara Metropolitan Area (2016). These four cities have an opportunity to share their experiences and best practices and to foster a national resilience agenda that could serve as a guide for the implementation of actions in other cities that are not members of the 100RC network. This sharing of resilience experiences and best practices could boost domestic capacity to prevent, identify, mitigate, adapt to, and manage climate shocks and stresses and in the process build national resilience.

Responsible Parties: OR,
Partners: 100RC, Embajada de Holanda
Period: 2016 - 2025

Resilience Value:
 The creation of a national resilience agenda would allow for consideration of resilience principles in sectoral plans. This approach would favor comprehensive planning in the long term. The implementation of projects and actions based on comprehensive planning would improve the quality of life in Mexican cities and provide cities with capacity to anticipate and respond to various shocks and stresses.

INSPIRATION: THE NATURAL DISASTER RESILIENCE COMPETITION (NDRC) - UNITED STATES.

In June 2015, 40 states and cities in the United States that had suffered from a natural disaster between 2011 and 2013 were invited to compete for \$USD 1 billion to finance disaster recovery and foster long-term community resilience. Among the winners were the states of California, Connecticut, New Jersey, and Virginia and the cities of New Orleans, Springfield, MA, and New York.

The process conducted for this competition was unique in that:

- A competition method was used to allocate federal funds.
- Multidisciplinary groups of subject-matter experts were organized to work directly with teams to develop their proposals.
- Proposed projects had to involve various organizations and prove that diverse financing sources were used to prepare the project.
- Philanthropic partners were included to provide resources to build capacity. These partners worked individually with the teams.
- Leadership was available at the federal level, as demonstrated by a commitment to change the manner that budgets for disasters are prepared.

Because four Mexican cities are currently part of the 100RC Network, this initiative offers an example of how collaboration can be fostered on a national scale to build resilience.



GOAL 1.2. Drive and support regional projects that contribute to resilience.

ACTION 1.2.1 Strengthen projects that foster conservation of ecosystems.

This action would protect natural areas and Conservation Areas by developing restoration, recovery, and maintenance projects to preserve the stability of ecosystems and provide ecosystem services in natural areas.

Responsible Parties: Federal District Inter-Institutional Climate Change Commission, Conservation International
Partners: LANCIS-UNAM
Period: 2016 - 2040

Resilience Value:
 Conservation of ecosystems reduces their vulnerability and physical exposure to extreme weather events and contributes to their basic needs by protecting and restoring critical environmental assets.

ACTIVITY 1.2.1.1. Implement Water Forest Initiative.

This initiative seeks to develop and implement a regional conservation strategy for a Water Forest that would provide water and ecosystem services to Mexico City, the State of Mexico, and Morelos. Specifically, this initiative seeks to identify common objectives that encourage participation, integration, and coordination and strengthen water resilience for metropolitan and megalopolitan regions.

Participants: SEDEMA, SEMARNAT
Partners: Fundación Gonzalo Río Arronte, LANCIS-UNAM
Period: 2016 - 2040



INSPIRATION FROM MELBOURNE, AUSTRALIA: METROPOLITAN FOREST.

The Melbourne Resilience Strategy fosters the creation of a metropolitan forest using conservation and reforestation projects that involve all municipalities in the region under a common framework. The strategy seeks to capitalize on the benefits realized by keeping green areas at a metropolitan scale.



ACTION 1.2.2. Reduce pollution in the region (air, water, solid waste, and chemical waste, among others).

Measures to counter air pollution will be continued through initiatives such as Program to Improve the Valley of Mexico Metropolitan Zone Air Quality (PROAIRE) 2011-2020. Other regional programs that will be championed will help reduce pollutants in water and soil and conduct appropriate waste management activities.

Responsible Parties: Autoridades ambientales estatales
Partners: LANCIS- UNAM
Period: 2016 - 2040

Resilience Value:
 By reducing pollution at the regional level, the quality of life, the health of inhabitants in the megalopolis, and ecosystems are improved; opportunities for clean development are also created.



ACTION 1.2.3.

□ Foster resilient infrastructure projects that contribute to the development of the region.

As part of this action, measures that increase resilience with regard to regional infrastructure projects will be implemented. An example of this type of resilient infrastructure project is the New International Airport of Mexico City and the adaptive use of the current Mexico City International Airport (see Figure 22).

Resilience Value:

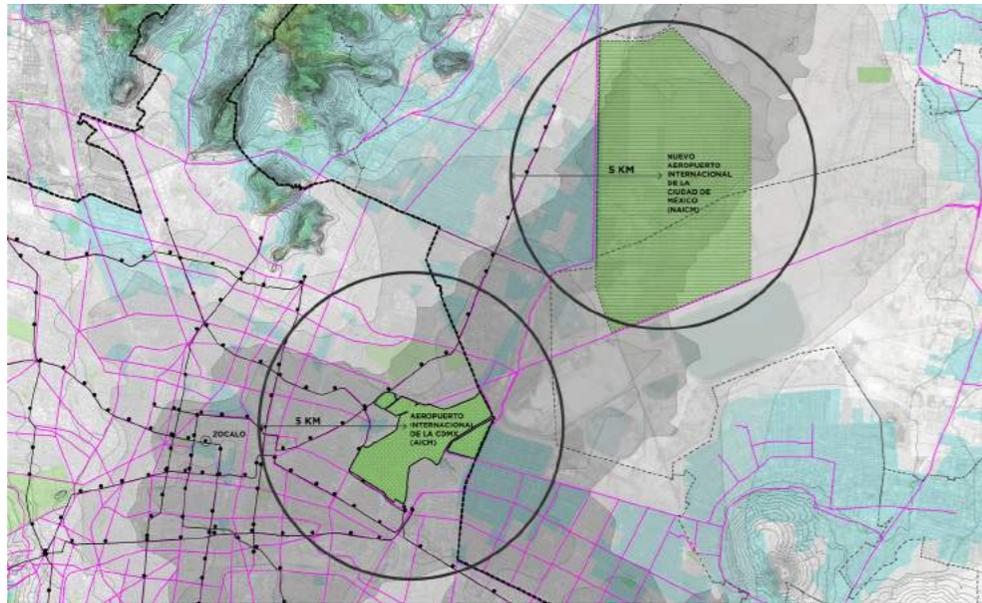
The development of this action would encourage the implementation of large infrastructure projects that generate multiple design benefits, drive sustainable transformation in the region, and foster social and economic development.

Responsible Parties: OR

Partners: 100RC

Period: 2016 - 2018

Figure 22. Location Map for AICM and NAICM .



FEATURED ACTIVITY 1.2.3.1. **Contribute to resilience by creating a resilience agenda for the New International Airport of Mexico City and the fate of the current Mexico City International Airport.**

Airports play an important role in the development of cities. Due to their size, location, and social characteristic, NAICM and the future of the current AICM represent a great opportunity to catalyze urban and economic transformation in CDMX, ZMVM, and the megalopolis.

A project with resilient features would foster greater social cohesion and create opportunities to leverage the potential of the eastern end of city through mobility improvement,^[64] urban parks, housing developments, new amenities, public spaces, and the development of educational facilities.

Such a project would offer opportunities to achieve several resilience benefits by:

- Building resilience and an adaptation process in the face of extreme events resulting from climate change, especially with regard to security and water resilience.
- Encouraging environmental renewal by building a large park to achieve multiple benefits and environmental services, all of which would lead to a more sustainable and equitable city.
- Innovating to develop urban amenities with environmental and mobility benefits.

The 761.1 hectares on which the current Mexico City International Airport is situated represent an opportunity for Mexico City to reconfigure its urban infrastructure, develop a strategic view, and foster more resilient development.

In addition, the NAICM project may serve to encourage improved coordination of specific initiatives at ZMVM by designing a master plan with a megalopolitan view. This moment in time is unique; it is an opportunity to innovate using a participatory, comprehensive, and transparent process that leads to and fosters a resilient, sustainable future for the city.

In April 2016, a Resilience Garage (a participatory planning and design workshop) was conducted, with support from 100RC, on the NAICM project. By bringing together an interdisciplinary group of subject-matter experts this workshop sought ways to integrate resilience principles into city planning and large infrastructure projects. Specific proposals were developed for the NAICM project to increase its resilience and the resilience of the entire region.

Participants: Grupo Aeroportuario de la Ciudad de México, SEDATU, SEDECO, SEDUVI.
Period 2016-2025.

64. The eastern area of CDMX lags behind other areas on infrastructure such as hospitals, universities, museums, and movie theaters; the value of the land in all areas adjacent to the airport is less than the average values in the city (SEDECO, ND).



PILLAR 02.
PROMOTE
WATER
RESILIENCE AS
A NEW
PARADIGM TO
MANAGE
WATER IN THE
MEXICO BASIN

PILLAR 02.

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

VISION: To respond to the risks and shocks associated with climate change and social and environmental pressures, and to ensure equity in water access and water security,^[65] for all who live and work in CDMX, the city manages water resources in the Mexico Basin based on the principles of the Comprehensive Management of City Water Resources (GIRHU)^[66] process.

65. Water security refers to the ability of a society to safeguard access to water, in the quantity needed and the quality required, to enable social welfare, lifestyle and socioeconomic development; to ensure protection against water pollution and water disasters; and to preserve ecosystems in an atmosphere of social peace and political stability (UN-Water, 2013).

66. GIRHU is a flexible, participatory and iterative process that integrates all elements of the urban water cycle (water supply, sanitation, stormwater management, and waste management) with the city's urban development and watershed management—and its natural resources and ecosystem services—to maximize the economic, social, and environmental benefits in an equitable and inclusive manner. It involves the participation of different stakeholders in developing the short- and long-term actions, synergies, and investments required in traditional infrastructure, green infrastructure, institutional development, financing, and capacity building, among others (World Bank, 2012).



PROBLEM STATEMENT

Despite significant efforts by government departments and agencies at both the local and federal levels, water security of CDMX and ZMVM is at risk due to the severe degradation of water resources, including the groundwater, in the Mexico Basin. Currently, the drinking water supply for all the city's inhabitants and for the development of socioeconomic activities is at risk because, over time, complex and interdependent factors have created a crisis.

Among the factors that have contributed to increasing water demand in the ZMVM are the following: loss of 41.4 percent of water in leaks from the drinking water distribution system;^[67] population growth in the city and the expansion of urban sprawl;^[68] population growth in the city and the expansion of urban sprawl, and the lack of awareness of the impacts of excessive consumption by some sectors of the population.^[69]

While the average water capacity per capita in the country is 140,623 ft³/person/year, it is only 5,367 ft³/person/year in CDMX. The disparity in per capita capacity is an indicator of the great stress that the city's water system is experiencing.^[70]

Disparities by area exist because water scarcity is reflected in service rotation and poor water quality, particularly in low-income areas in the eastern portion of the city (Tláhuac and Iztapalapa) and elevated areas on the hillsides and surrounding mountains.^[71]

The city has met the ever-growing need for water through overexploitation of the city's shallow aquifer. The overexploitation has upset the water balance, as the extraction from the aquifer has exceeded the aquifer's ability to recharge by infiltration, and this has caused a significant differential subsidence in CDMX and ZMVM.

Such subsidence can vary from 4 to 36 cm/year^[72] in different areas. It is estimated that the center of CDMX has experienced up to 10 meters of subsidence over the past 6 decades,^[73] subsidence which has damaged infrastructure and buildings and resulted in high repair costs.^[74]

Differential subsidence and inadequate solid waste management have caused drainage infrastructure to lose the ability to evacuate rainwater.^[75] To address these problems, complex and costly infrastructure projects such as the East

Similarly, the use of large volumes of water, and the inability to recycle and reuse that water, generates a large volume wastewater, most of which does not receive adequate treatment. Consequently, wastewater strongly affects environmental quality at the discharge zones.^[76] The Atotonilco treatment plant is being built to address this problem.

In general, the challenge of water security in CDMX, both in terms of supply as well as drainage and treatment, has required large infrastructure projects and major political, institutional, financial, and technical efforts. To address the challenge, CDMX

has developed a set of guidelines and strategies for different integrated projects, such as the Program of Integrated Water Resources (2012) and the Water Plan for the Future of CDMX (2014).

Given the complexity of the situation, efforts must continue to develop a GIRHU strategy that achieves water security for CDMX through a stable and systematic process. To achieve this, the Resilience Strategy aims to identify a set of goals that promote actions that will build the resilience necessary to achieve each goal, despite significant risks and unknown obstacles.



76. CONAGUA, 2012b.

67. SACMEX, 2014.

68. Urban sprawl has increased the area of CDMX 5.4 times between 1950 and 2000, and population has increased by 5.6 times between 1950 and 2005 (World Bank, 2013).

69. The average consumption per capita in CDMX is 320 liters per day, but per capita consumption varies according to the distribution each city borough receives: Tlalpan receives 500 liters, Magdalena Contreras receives 200 liters, and other areas receive less than 20 liters per day (SEDEMA, 2013a).

70. SACMEX, 2016.

71. Water is delivered daily to 82% of the population; to 10%, every third day; to 5%, twice a week; to 1%, once a week; and to 2%, occasionally (SACMEX, 2014).

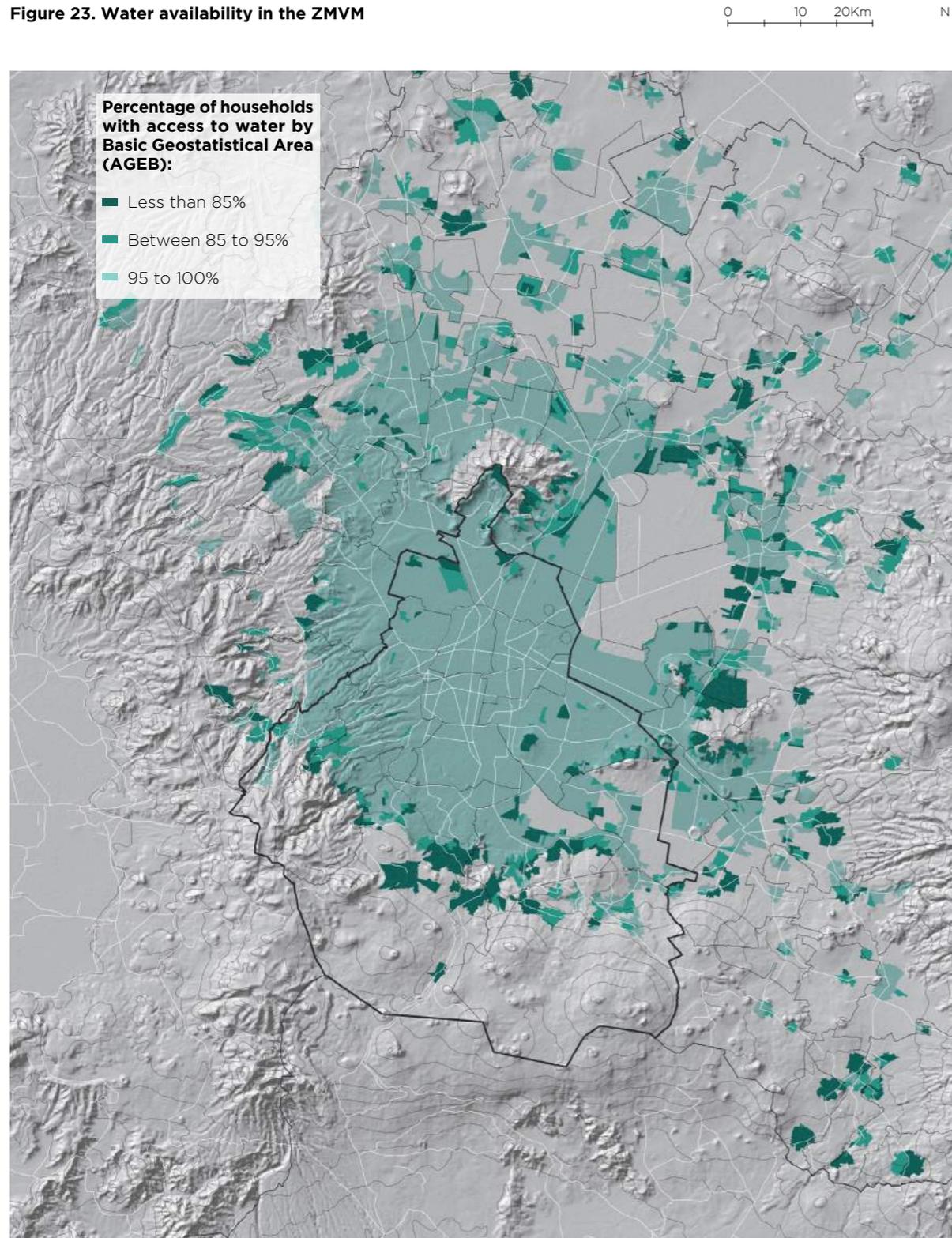
72. SACMEX, 2013.

73. SACMEX, 2012a.

74. SACMEX, 2012b.

75. CONAGUA, 2012b.

Figure 23. Water availability in the ZMVM



Source: SONCE 2010, INEGI

**GOAL 2.1.**

Reduce water scarcity and access inequality.

ACTION 2.1.1.

- Integrate the majority of the population without regular and continuous water service to the water supply system.

Through the expansion of the primary drinking water network, the supply to peri-urban communities and difficult-to-reach areas will be increased.

Responsible Parties: SACMEX

Partners: BM, BID

Period: 2016 - 2025

Resilience Value:

Through this action, the unequal distribution of water resources is reduced.



ACTION 2.1.2.

- Promote public, economic, regulatory, and political instruments to reduce water scarcity and inequality.

Adjust fees to the amount of water consumed in households, so that the costs of operation, maintenance, and rehabilitation of infrastructure are covered, the quality of service improves, and user awareness of excessive water use increases. Fees will reflect the cost of service, which will be accessible to all.

Resilience Value:

This action helps raise awareness of the true value of water and helps regulate its daily consumption. It also ensures maintenance of critical water infrastructure and reduces pressure on the scarce resource.

Responsible Parties: SACMEX

Partners: BID

Period: 2016 - 2025

ACTION 2.1.3.

Promote the establishment of temporary rainwater catchment systems and water “kiosks” in areas and houses with a scarcity of water.

The installation of rainwater catchment systems temporarily supplies water to households that do not yet have access to the water network.

Responsible Parties: SEDESO
Partners: Isla Urbana, CEMEX, CAF
Period: 2016 - 2018

Resilience Value:

This action guarantees access to basic water service in underserved areas through a flexible system and helps to ensure continuous service in areas with limited access.

ACTIVITY 2.1.3.1. Install rainwater catchment systems in houses with water scarcity.

In offering the Rainwater Catchment Systems program to community kitchens and households with limited access to water, the government of CDMX is helping build water resilience by reducing pressure on the aquifer and addressing the water needs of vulnerable households with a lack of access to water. In the first phase, 300 devices are expected to be installed in households.

Participants: IMTA
Partners: Isla Urbana
Period: 2016 - 2018

**GOAL 2.2.**

Promote sustainable use of the aquifer and contribute to water security planning.

ACTION 2.2.1.

Support the creation and consolidation of the CDMX Water Fund.

The international organization The Nature Conservancy (TNC), on behalf of the Latin American Water Funds Partnership, with support from the government of CDMX, and in partnership with other organizations, is structuring a Water Fund for CDMX.

Responsible Parties: TNC, on behalf of the Latin American Water Funds Partnership

Participants: SEDEMA, SACMEX

Partners: Fundación Kaluz, Banamex, Fundación FEMSA, Fundación Gonzalo Río Arronte, BID.

Period: 2016 - 2025

Resilience Value:

This initiative contributes to the city's capacity to adapt to climate change because it promotes the integrity of ecosystems and maximizes their hydrological functions. In addition, it helps make the city's drinking water supply system a more robust and redundant system that will protect the city during droughts and other disruptions of the Cutzamala System, and prepare the city for growth in demand.



FEATURED ACTIVITY 2.2.1.1. **Implementation of the Water Fund**

The development of the Water Fund for CDMX began in early 2015 and is expected to be completed during 2017. The conservation plan, definition of the basis for the monitoring protocol, creation of legal and financial entities, and kick-off of pilot projects in aquifer recharge areas will be outlined in 2016. These activities are vitally important for building resilience and water security in the Mexico Basin.

TNC, on behalf of the Latin American Water Funds Partnership and in partnership with other organizations, is preparing a Water Fund for CDMX. Water funds are innovative conservation mechanisms to protect ecosystem features, with the aim of strengthening the water security of urban areas. Water funds attract funding in an organized and transparent manner from large water users and other donors, such as drinking water and sanitation operators, irrigation districts, hydroelectric plants, and foundations. Funds are used to support conservation actions in strategic land extensions for regulating the water cycle and enhancing regional ecosystem integrity.

Funds achieve economic sustainability through investment in financial markets, while returns on investment are invested and leveraged with other funding sources to protect extensions and land easements for conservation, develop technical support, and promote sustainable forms of life and community development in the regions of influence.

The Water Fund for CDMX aims to help reduce the imbalance of the aquifer and promote a positive long-term water balance. Conservation of aquifer recharge areas will contribute to making the city's water supply system more robust and redundant. At the same time, these actions will have a number of benefits, including lower subsidence, mitigation and adaptation to climate change (for example, in a scenario of regional drought), and protection of biologically significant sites.

Participants: SEDEMA, SACMEX

Partners: Fundación Kaluz, Banamex, Fundación FEMSA, Fundación Gonzalo Río Arronte, BID.

Period: 2016 - 2025

ACTION 2.2.2.

Innovate in the maintenance and renovation of the water network and drainage system as well as in water reuse and treatment.

Aging water infrastructure of CDMX calls for a structural maintenance and modernization program for the drinking water distribution network to ensure efficient and quality service to the entire population.

Responsible Parties: SACMEX

Partners: WB

Period: 2016 - 2025

Resilience Value:

Modernizing the management of the water distribution network will make it more robust and redundant, and will help CDMX advance water security for its inhabitants.

ACTIVITY 2.2.2.1. **Upgrade the drinking water distribution network associated with the loan granted by the World Bank to CDMX.**

Currently, details of a credit transaction by the World Bank to SACMEX are being finalized, which include the modernization of the management of drinking water in CDMX, including water treatment in all boroughs, water leak prevention and oversight, and division of the network into sectors for better measurement and control of infrastructure issues.

Some of the actions covered are: furnish 1,174 SACMEX facilities with telemetry systems and remote control; optimize the service from 320 wells, 16 springs, 16 bulk water deliveries, 26 pumping plants, 26 tanks, 90 transfer stations, 52 pressure stations, 13 conducting lines, 78 rain gauges, and 17 dams; and build 22 water treatment plants and rehabilitate 7 treatment plants.

These actions will help improve the efficiency of the drinking water distribution network. As part of this activity, unaccounted water loss is expected to be reduced from 42 percent to about 20 percent.

Participants: AGU

Partners: WB

Period: 2016 - 2025

ACTION 2.2.3.

Identify optimal investments for water resilience and develop public policy recommendations.

The World Bank implements the Decision Tree tool to support decision making under risk and uncertainty constraints. Using the tool, different agencies can improve the water resource planning process, prioritize capital investments, and improve project design. For example, this type of tool can more accurately track the progress of adaptive transformation in preparing for a drought by identifying optimal investments and necessary institutional changes.

Responsible Parties: SACMEX

Partners: WB

Period: 2016 - 2018

Resilience Value:

It contributes to the institutionalization of a thoughtful decision-making process to develop quantitative and qualitative scenarios; it is flexible because it generates different types of alternatives; innovative, as it offers options that may not have been contemplated before; and integrated, as it coordinates and prioritizes actions between different actors.

ACTION 2.2.4.

Improve the quality and quantity of water in the area of aquifer recharge.

Through conservation efforts and improvements in water management, such as forest maintenance, reforestation, and retention in recharge areas, the quality and quantity of the water supplied to CDMX and ZMVM will be improved.

Responsible Parties: Conservation International

Partners: TNC

Period: 2016 - 2025

Resilience Value:

This action fosters the recovery of watersheds that supply water to the city, which enhances ecosystem benefits and increases the water security of the Mexico Basin.



ACTION 2.2.5.

Prevent damages to the water infrastructure in the event of a major earthquake.

The vulnerability of water infrastructure in the event of a large-magnitude earthquake has been identified. Because the scale of damage that could occur is unknown, the most vulnerable areas must be identified, the drinking water network must be continuously monitored and maintained, and the resources to properly respond if an earthquake occurs must be available.

Responsible Parties: SACMEX

Period: 2016 - 2025

Resilience Value:

Identifying vulnerabilities in CDMX's hydraulic infrastructure in the event of an earthquake is a key element of a risk management plan, which also includes a preventive maintenance investment program. Both elements are critical to making the system more robust and redundant.

ACTIVITY 2.2.5.1. Identify areas of the city where water infrastructure is vulnerable to the effects of a major earthquake.

As was demonstrated by the 1985 earthquake, a major earthquake can have severe effects on water infrastructure, particularly on infrastructure components that have not been maintained. Therefore, the National Water Commission (CONAGUA), along with SACMEX and the Mexican Institute of Water Technology (IMTA) will develop a comprehensive assessment of the risk of earthquakes to the strategic infrastructure of CDMX's drinking water network.

Participants: IMTA, CONAGUA

Period: 2016 - 2025

ACTION 2.2.6.

Identify the opportunities and shocks of mega-infrastructure projects on water security.

The impacts of megaprojects in the region will be assessed, including the urban development in regional areas, which is not only increasing the demand for water but also increasing wastewater generation in the area. The impacts of megaprojects must be considered in the development of the GIRHU strategy for the region.

Resilience Value:

Understanding the increasing impacts of water demand and wastewater generation in areas affected by megaprojects and capitalizing on opportunities to build water resilience will help produce a more robust, redundant, and socially inclusive water resource management system.

Responsible Parties: SACMEX

Partners: Veolia y RMS

Period: 2016 - 2018



GOAL 2.3.

Foster a civic culture on the sustainability of water resources.

ACTION 2.3.1.

Increase education in schools on responsible water use.

The considerable subsidization of water consumption in some areas of the city and the lack of user awareness about the vulnerability of water resources are factors that contribute to excessive water usage. Educational programs in schools that teach children how to reduce their water consumption should be established, as children can set an example for their families.

Responsible Parties: SEDEMA

Partners: IDB

Period: 2016 - 2040

Resilience Value:

This action promotes community participation and helps citizens become more aware of the value of water resources, which can result in reduced waste and more appropriate and responsible water consumption in the future.



GOAL 2.4.

Integrate a water sensitive approach to urban design through blue and green infrastructure.

ACTION 2.4.1.

□ Promote the restoration of bodies of water and watersheds.

Regenerating and restoring natural water bodies and watersheds can prevent flooding and encourage adaptation to droughts caused by climate change.

Responsible Parties: SEDEMA

Partners: TNC, Lancis-UNAM, Dutch Embassy, Deltares

Period: 2016 - 2025

Resilience Value:

Environmental cleanup of watersheds and rivers and the production and management of green infrastructure have a number of environmental, economic, and social benefits that contribute to meeting the basic needs of the population, to enriching natural assets, and to strengthening adaptive capacities in the event of a decrease in the water supply.



ACTIVITY 2.4.1.1. Implement the comprehensive rescue program of the Magdalena and Eslava Rivers.

This program will clean up part of the Magdalena and Eslava river basins, increase their flows and runoffs, and conserve and manage the nearby forest, thereby contributing to the area's green infrastructure. Through a participatory approach, this program will also help increase environmental awareness and culture. In addition, the program will encourage the creation of public spaces within CDMX's urban area.

Participants: SACMEX, SEDUVI

Partners: LANCIS-UNAM

Period: 2016 - 2025



ACTION 2.4.2.

Develop rainwater catchment, retention, regulation and infiltration, and flood prevention alternatives.

Projects using various green and blue infrastructure methodologies and technologies can capture rainwater and retain it for later use, and infiltrate it into aquifers. Such projects also seek to build inclusive public spaces and at the same time promote education and awareness about water conservation in cities.

Responsible Parties: SEDEMA y AEP

Partners: Deltares, BID, Veolia, CAF, Isla Urbana

Period: 2016 - 2025

Resilience Value:

This action helps reduce the negative impacts of floods, especially in rainy seasons. Additionally, by creating more green spaces for recreation and public enjoyment, this action has social benefits that improve social cohesion.



ACTIVITY 2.4.2.1. Create strategic infrastructure for rainwater catchment and retention and flood mitigation, including: water conservation areas, green spaces, and multifunctional parking lots.

AEP is developing the green-blue infrastructure project “Parque de la Viga (La Viga Park),” which aims to design this public space as infrastructure to store and reuse water. The design allows rainwater catchment and storage, which will prevent flooding in other areas, encourage the absorption of rainwater into the soil, and help maintain the water balance in the area.

Participants: SPC, AGU

Partners: Deltares, BID, Veolia, CAF

Period: 2016 - 2018

**NEW ORLEANS INSPIRATION.**

Through green infrastructure projects, the city of New Orleans is demonstrating how unused space can be used to store rainwater and is transforming vacant lots into gardens that capture rainwater and remove contaminants. These projects offer other benefits, as they result in more attractive neighborhoods wherever they are developed.





PILLAR 03.

**PLAN FOR
URBAN AND
REGIONAL
RESILIENCE**

PILLAR 03.

PLAN FOR URBAN AND REGIONAL RESILIENCE

VISION: All CDMX citizens have equal access to urban amenities, housing, green areas, and public spaces; the environment is improved; and risks are mitigated through sustainable management of natural resources.



 GOAL 3.1
Increase spatial social equality in CDMX through programs and projects.

 GOAL 3.2
Protect Conservation Areas.

 GOAL 3.3
Reduce risk through urban and regional planning.

PROBLEM STATEMENT

The impacts associated with urban growth in recent decades have created major challenges for land use and urban planning in CDMX and ZMVM. Urban resilience is designed to promote an equitable, safe, and connected city through the design of programs, projects, and urban policies that use a comprehensive approach^[77] to promote a better quality of life despite the size and complexity of the territory.

The concentration of companies and work in the central city areas generates social inequality and hinders access to basic services for part of the population (Figure 24).^[78] Socioeconomic inequality is most evident in the areas north and east of the ZMVM, which have the highest number of people in poverty.^[79] In contrast, the central city has a higher number of services and jobs and a lower percentage of people in poverty.^[80]

CDMX has a shortage of green areas (e.g., urban forests, parks), which are important for the city and its inhabitants. Although international standards propose 96.8 to 172 square feet (sq ft) of green space per inhabitant, in CDMX there are 58.1 sq ft per inhabitant.^[81] Likewise, in marginalized areas access to public space and urban amenities is insufficient. The World Health Organization (WHO) recommends 107.6 to 161.4 sq ft of public space per inhabitant; but CDMX has only 55.9 sq ft per inhabitant.^[82]

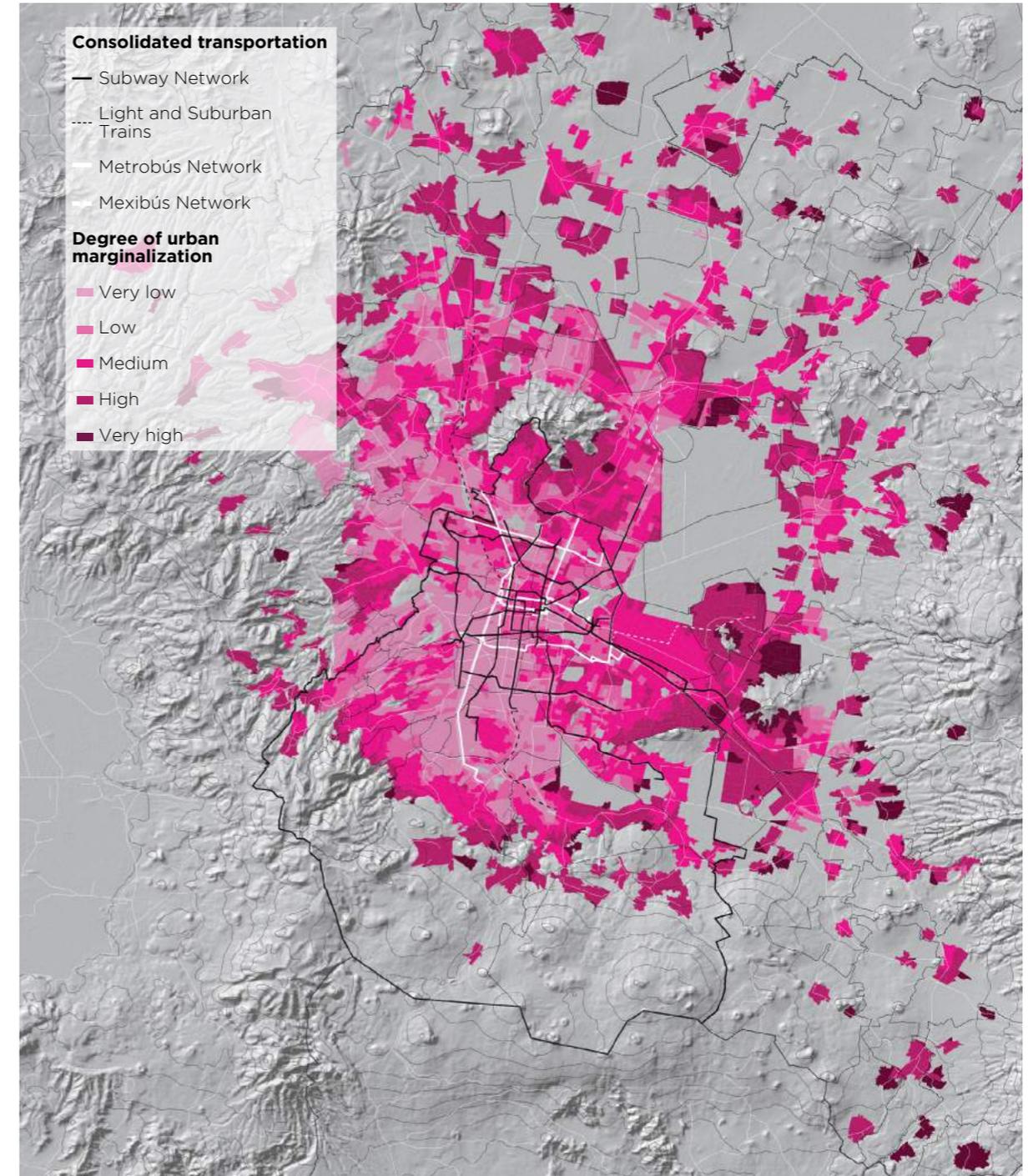
In CDMX, housing and employment are not balanced; this lack of balance has resulted in urban sprawl, which has led

to urban expansion into peripheral areas of the ZMVM. This growth pattern has created major challenges for mobility, as much of the population must travel long distances to access employment opportunities and other services.

In CDMX, most urban growth occurs in Conservation Areas, which puts pressure on the environmental services that these lands provide. In this context, SEDUVI is collaborating with SEDEMA to integrate protection policies for Conservation Areas into the new CDMX General Urban Development Program with the objective to align them with ecological planning principles.

Urban renewal projects—together with recovery, expansion, and creation of public space, green areas, urban amenities, and housing—can contribute to reducing risks, increasing socio-spatial equality, and achieving proper resource management, especially for water. Urban and regional planning, design, and policies should consider the possible impacts of climate change and take into account the vulnerabilities associated with the conditions of underdevelopment and social marginalization of certain groups and communities in the city.

Figure 24. Social inequality and transportation



Note: The rate of urban marginalization (CONAPO, 2010) was calculated using 10 underdevelopment variables to determine the degree of deprivation of the population in each AGEB (basic geostatistical area). The 10 variables are: Population: from 6 to 14 years old not attending school; greater than 15 years old without completed basic education; not entitled to health services; infant mortality from women aged 15 to 49; Private housing: without water; without a connection to a drain or septic tank; without a toilet; dirt floor; overcrowded; without a refrigerator.

77. The Organization for Economic Cooperation and Development (OECD) recommends a comprehensive approach that considers education, employment, culture, security, public services, and social cohesion.

78. World Bank, 2013b.

79. CONEVAL, 2010.

80. INEGI, 2014.

81. SEDEMA, 2015.

82. AEP, 2016.



GOAL 3.1.

Increase spatial social equality in CDMX through programs and projects.

ACTION 3.1.1

Preserve, expand, and recover green areas.

It is necessary to preserve, expand, and recover green areas within the city and promote investment in programs such as Green Roofs (Azoteas Verdes), the Urban Image Improvement Program (Programa de Mejora de Imagen Urbana), the Gullies Management Program (Programa de Manejo de Barrancas), and the Environmentally Valuable Areas Management Program (Programa de Manejo de las Áreas de Valor Ambiental). These efforts may be supplemented with environmental education initiatives (such as those of the Center for Environmental Education) that can reinforce the importance of green infrastructure for the city.

Responsible Parties: SEDEMA

Partners: Cemex

Period: 2016 - 2025

Resilience Value:

This action would help to reduce the deficit of green areas that exists in certain parts of the city. Realization of this goal would increase equality and social cohesion and provide ecosystem services that would improve the quality of life of city inhabitants.



ACTIVITY 3.1.1.2. Design and build model green infrastructure projects that promote hydrological restoration.

An opportunity for urban innovation is to implement multifunctional projects that focus on water resources management. These projects would incorporate water catchment, storage, and reuse systems. Some ongoing projects are Xochimilco Ecological Park, Laguna de Tláhuac Ecological Park, Quebradora Hydric Park in Iztapalapa, and Cuitlahuac Park in Iztapalapa. Also, the rescue and reactivation of potential rivers is proposed, as outlined in the Magdalena and Eslava Rivers Comprehensive Rescue Program.

Participants: SEDUVI, AEP, OR

Partners: Cemex

Period: 2016-2025

ACTION 3.1.2.

Enhance access to public space in working class and marginalized areas.

Public space is a strategic public good that drives the transformation of a city and improves the quality of life of the population. Building high-quality public space offers an opportunity to generate precedents for smart development, sustainability, and resilience practices and promotes access for the most vulnerable groups.

Resilience Value:

Investments in public space design can address multiple issues, including unequal access, economic development, and environmental pressures, and promote other benefits such as security and social cohesion.

Responsible Parties: AEP

Partners: BID, BM, CAF

Period: 2016-2025

ACTIVITY 3.1.2.1. Build and design pilot projects for emblematic public space. Case of La Viga Linear Park.

La Viga Linear Park is the first AEP project that combines water storage strategies with high-quality public space to create a new relationship with water. This innovative project would explore the link between public space and water management through design. La Viga shows the importance of the role of public space in mitigating big city problems such as water scarcity and aquifer overexploitation. The project would directly benefit the 30,000 people who live within 0.31 mile (i.e., approximately 5 minutes walking) from the park, and the many others who visit the site. The project would affect an area of 177,496.88 sq ft. The project would increase green areas in the vicinity by up to 22 percent and increase public space in the zone by 26 percent.

AEP conducted a workshop with the support of the Development Bank

for Latin America and the Dutch Embassy, with the participation of Dutch organizations De Urbanisten and Deltares, which led to preparation of the report Towards a CDMX Sensitive to Water [Hacia una CDMX Sensible al Agua]. This report incorporates recommendations and measures for water management in the CDMX public space.

Participants: Local City Government [Delegaciones Políticas]

Partners: CAF

Period: 2016-2025



ACTION 3.1.3.
Expand urban amenities to integrate resilience elements.

A consolidated strategy is needed to increase access to high-quality urban amenities for health, education, sports, and culture, because those spaces promote social integration, common identity, and community well-being.

To implement a strategy for better urban infrastructure distribution and access, CDMX has carried out a number of projects, including the Neighborhood Improvement Program (Programa de Mejoramiento Barrial) and the Public Markets Improvement Program (Programa de Mejoramiento de Mercados Públicos). CDMX has also established the Central-East Strategic Management Area (Área de Gestión Estratégica Centro Oriente) as an action PPGDU project and a PGDU.

In addition, the General Urban Development Program (Programa General de Desarrollo Urbano) and District Programs (Programas Delegacionales) are an opportunity to establish guidelines for better distribution of and access to quality urban amenities in the city. Such guidelines allow for the creation of neighborhood improvement strategies that integrate

public space elements, green areas, and urban amenities.

Responsible Parties: SEDUVI
Period: 2016-2025

Resilience Value:
 Through the design and construction of resilient and multifunctional urban amenities, CDMX can increase access to basic services; promote social cohesion; and increase the quality of health, education, sport, and cultural services.



ACTION 3.1.4.

Improve access to affordable and public housing in areas with access to public transportation and sources of employment.

Urban sprawl has led to the construction of housing facilities that are increasingly distant from services, employment opportunities, and public transportation. Optimization of social and public housing and the provision of new financing schemes are measures to transform the city by reducing marginalization in urban environments.

housing that is connected to the existing transportation network (the STC Metro and Metrobús corridors and around the CETRAMs), and propose a common long-term agenda to promote such housing.

Responsible Parties: INVI, SEDUVI

Partners: BID, BM

Period: 2016-2040

Current housing programs that have been flagged as priorities are the Multi-Family Housing Program (Programa de Vivienda en Conjunto), the Housing Improvement Program (Programa de Mejoramiento a la Vivienda), and the Emergent Affordable Housing Program (Programa de Vivienda Emergente de Interés Social). The goals of these programs will be to create a more accessible city, develop social and public

Resilience Value:
 Housing that is connected to the transportation network and the locations of employment contributes to economic and social development and improves accessibility to urban services and infrastructure as well as general mobility within the city.





GOAL 3.2. Protect Conservation Areas.

ACTION 3.2.1.

□ Implement the Borde Activo initiative to control the expansion of the urban areas into Conservation Areas.

The Borde Activo (Active Edge) initiative is part of the PPGDU as an area where pilot projects for environmental restoration and urban area containment will be implemented. The Borde Activo initiative, also called Critical Areas of Occupation of Conservation Areas, which was developed by SEDEMA, is a rural-urban interface that will limit urban growth and protect ecosystems by creating a productive link between socioeconomics and the environment.

Responsible Parties: SEDEMA

Partners: TNC

Period: 2016-2040

Resilience Value:

The Borde Activo initiative will help control urban growth through land conservation. The initiative will help stem progressive changes in land use and landscape fragmentation and improve the natural assets available to the city.



ACTIVITY 3.2.1.1. Promote and develop the Borde Activo initiative.

Currently, there is strong pressure on Conservation Areas due to the continued expansion of urban areas. This project promotes sustainable urban development by limiting urban growth and encouraging the preservation and renewal of ecosystems. One of the main components of the initiative refers to the potential for aquifer recharge and the recovery of areas with high environmental value. For the initiative, the participation of multiple actors that influence land management and project consolidation is essential. This participation will involve technical input and a long-term strategy. This initiative will potentially be integrated as a guiding

principle in the Master Plan for the AGE of the Xochimilco, Tlahuac, and Milpa Alta Heritage Area (Zona Patrimonial de Xochimilco, Tláhuac y Milpa Alta).

Participants: SEDUVI, SEDEREC, Native Towns and Neighborhoods Council (Consejo de Pueblos y Barrios Originarios), PAOT, OR, Local City Government

Partners: TNC

Period: 2016-2040

ACTION 3.2.2.

Strengthen protection of Conservation Areas.

To strengthen protection of Conservation Areas in CDMX and its surrounding jurisdictions within Conservation Areas, the following projects and programs will be implemented: Payment for Environmental Services (Pago por Servicios Ambientales), the Water Forest Initiative (Iniciativa Bosque de Agua), the Conservation Areas and Natural Protected Areas Inspection and Monitoring Program (Programa de Inspección y Vigilancia en Suelo de Conservación y Áreas Naturales Protegida), the Forest Fire Prevention and Fighting Program (Programa de Prevención y Combate de Incendios Forestales), the Ecosystem Conservation and Restoration Founding Program (Programa de Fondos de Apoyo para la Conservación y Restauración de los Ecosistemas [PROFACE]), Forest Sanitation Program (Programa de Sanidad Forestal), and Water Found (Fondo de Agua) (see Action 2.2.1).

Responsible Parties: SEDEMA

Partners: TNC, CI

Period: 2016 - 2040

Resilience Value:

The implementation of this action would contribute to the preservation of the environmental services generated on Conservation Areas that are essential for maintaining the quality of life for CDMX inhabitants.



GOAL 3.3.

Reduce risk through urban and regional planning.

ACTION 3.3.1.

Promote institutional synergy and incorporate the principles of resilience at various levels of planning.

Urban policies that incorporate the principles of resilience at different levels of planning should be created from the PPGDU and Partial and District Urban Development Programs (Programas Delegacionales y Parciales de Desarrollo Urbano) and, at federal level, links should be established with the POZMVM.

Efforts at the institutional level to consolidate policies that focus on reducing various risks and stresses present in the city and the region must be approved and coordinated. One essential activity is the linking of information from the CDMX Atlas of Risks and Hazards (Atlas de Riesgos y Peligros) with different planning instruments to inform decision making at the city level.

Responsible Parties: SEDUVI

Period: 2016-2018

Resilience Value:

Consideration of resilience principles in planning gives a comprehensive long-term vision and strengthens urban projects and policies related to risk reduction and long-term vulnerability management.



ACTIVITY 3.3.1.1 Embed Resilience into the General Urban Development Program and in the POZMVM.

CDMX, through SEDUVI and in collaboration with SEDEMA, will develop the new PGDU to incorporate a “cross-cutting pillar” of resilience. This pillar will promote safe environments that generate a better quality of life and sustainable management of environmental resources. In addition, strategic issues will be identified, such as reducing social inequality by means of access to public space, green areas, urban amenities, and housing.

In addition, transportation-oriented urban development will be promoted that prioritizes the mobility of pedestrians and cyclists to integrate

a sustainable vision of resource management, such as responsible water management. A crucial issue is the inclusion of information from the Hazards Risk Atlas (Atlas de Riesgos y Peligros) to strengthen urban planning concerning the risks and stresses that the city faces.

Responsible Parties: SEDUVI, OR

Participants: SPC, SG, Metropolitan Coordination Sub secretariat (Subsecretaría de Coordinación Metropolitana), México State, Hidalgo State, SEDATU, CENAPRED

Period: 2016-2018

ACTION 3.3.2.

Invest in areas and urban renewal projects that reduce risk and promote sustainable management of economic, environmental, and social resources.

This action will identify strategies that promote resilience through interventions at the urban level. SEDUVI develops projects for urban renewal in some areas of CDMX that are an opportunity to integrate resilience principles. These areas are classified in two planning instruments called Cooperation-based Performance Systems (Sistemas de Actuación por Cooperación [SAC])^[83] and Strategic Management Areas (i.e., AGE).^[84] Both instruments will be used to achieve conformity of policies and specific projects to encourage environmental renewal and promote topics such as public space, urban amenities, sustainable mobility, green and blue infrastructure, and housing.

Urban renewal projects can reduce risk and encourage responsible management of environmental resources.

Responsible Parties: SEDUVI

Partners: Rebuild by Design, Deltares, TNC, Fundación ICA, Veolia

Period: 2016-2025

Resilience Value:

The achievement of renewal and revitalization of urban areas through a comprehensive view is a mechanism to reduce risk and generate replicable strategies for proper management of natural resources. These revitalized areas have potential for innovation in socioeconomic and environmental development and integration of the community in that process.

83. The SAC include: Alameda Reforma (317 ha), La Mexicana (41 ha), Tacubaya (140 ha), Doctores - Buenos Aires (250 ha), Distrito San Pablo (100 ha), Atlampa (288 ha) and Granadas (367 ha).

84. Among AGE areas such as Xochimilco, Tláhuac y Milpa Alta. Heritage have been identified.

FEATURED ACTIVITY 3.3.2.1. **Recovery of the Xochimilco, Tlahuac, and Milpa Alta Heritage Area through the creation of the Water Resilience Strategy in the Xochimilco-Tlahuac-Milpa Alta and Resilience Integration in AGE Design Master Plan for the area.**

One of the main initiatives for the Resilience Strategy is the Tlahuac-Xochimilco-Milpa Alta Heritage Area recovery project.^[85] This area of great cultural, historical, and environmental value is subject to strong urban pressures from informal settlements. As a result, environmental degradation affects both the protected natural area and the productive agricultural areas.

In 2012, the Xochimilco, Tlahuac, and Milpa Alta Heritage Area Authority was created to structure and coordinate the recovery project for the area. Despite efforts to agree on a strategy to rescue the area, it is still necessary to generate adequate planning tools to unify the various efforts to achieve comprehensive land use planning.

Currently, SEDUVI, SEDEMA, and AZP are collaborating to create a Master Plan for the Xochimilco, Tlahuac, and Milpa Alta AGE. This collaboration is an opportunity to build a comprehensive long-term vision between urban development and land use planning through an approach that focuses on water management.



85. . In 1987 UNESCO named it "Natural and Cultural Heritage of Humanity" since it is part of the old lake system consisting of channels and chinampas with unique agricultural practices in the world and key environmental services for the city.

The Heritage Area requires a vision that integrates resilience with water as the development backbone of the area, because both the quality and the quantity of water is vital to the landscape and productive activities. Because of the complexity of the project, it must be approached from multiple angles to incorporate the principles of resilience in the different project areas while allowing for the alignment of technical knowledge with financial and human resources from various local, national, and international institutions. The challenge is to build a new relationship with urban settlements in the area through innovative landscape and water resources management.

Agricultural productivity and other economic activities such as tourism should be revitalized, making community co-design and citizen participation fundamental. Thus, a process such as Rebuild by Design^[86] can be a valuable contribution. In addition, the consortium formed between UAM and Deltares group^[87] will develop a Water Resilience Plan for the Heritage Zone and will identify a portfolio of measures to protect and restore the Xochimilco water system, making it possible to address climate change and other socioeconomic and socioecological stresses. The Resilience Office will provide support in technical collaborations to integrate the resilience principles in the Master Plan for Xochimilco, Tlahuac and Milpa Alta.

Participants: SEDEMA, AZP, OR, SEDEREC, CDMX Native Towns and Neighborhoods Council (CDMX Consejo de Pueblos y Barrios Originarios)

Partners: Rebuild by Design, Deltares, TNC

Period: 2016 - 2025



86. Rebuild by Design is an initiative supported by the Rockefeller Foundation to connect design, financing, and implementation strategies toward the creation of a resilient future. Using an innovative process, the initiative promotes working with communities and leaders under a robust, interdisciplinary and creative process to produce urban resilience solutions.

87. Deltares is an independent Dutch institute for applied research in water management, surface water, and infrastructure. Deltares provides tools and technical support to help cities in developing strategies and accommodation measures, apart from being one of the 100RC platform partners.

ACTION 3.3.3.

Implement adaptation, mitigation, and resilience actions for communities and housing facilities in high-risk and marginalized areas.

Housing facilities in risk areas should be identified for possible relocation, and those for which actions should be promoted to address the main impacts and stresses should be prioritized. Existing programs should also be expanded and strengthened to assist communities in high-risk areas (for example, the Gullies Improvement Program [Programa de Mejoramiento de Barrancas] and the Risk Areas Housing Improvement Program [Programa de Mejoramiento de Vivienda en Zonas de Riesgo]). Likewise, there are also pilot projects that incorporate the principles of resilience at the community level such as Safe Neighborhood (Barrio Seguro) and the Retrieving Life Spaces in the Santa Fe Gullies (Recuperando

espacios para la vida en las barrancas de Santa Fe).

Responsible Parties: SPC

Partners: CEMEX, Fundación Carlos Slim, IDB, Habitat para la Humanidad, UNAM, COLMEX, La Cuadra A.C.

Period: 2016-2025

Resilience Value:

This action will reduce urban growth in high-risk areas and encourage measures that improve the living conditions of people in marginalized areas through enhancement of their environment and promotion of social cohesion.



ACTIVITY 3.3.3.1. Develop projects that focus on developing resilient urban areas

Resilience-focused building has the potential to empower communities through projects that promote local well-being. This activity proposes to create the first resilient community in the city based on a pilot project that incorporates design proposals and urban interventions. This activity would also integrate co-design and citizen participation mechanisms and tools.

The Iztapalapa District has been identified as a pilot area for risk reduction and climate change adaptation that reduces social inequality. This action can be achieved through the need for accessibility to public space, urban amenities, and transportation.

Specifically, the Cerro del Peñon is considered to be a site with potential to incorporate sustainable and resilient urban design guidelines. Some of the risks identified in this area are floods, landslides, subsidence, earthquakes, and the stresses related to water scarcity, lack of public transportation and urban amenities, and social underdevelopment, among others. The project will be an opportunity to generate methodologies and measures that may be replicated in other communities in the city.

Participants: SEDUVI, SEDECO, SEDEMA, SPC, Iztapalapa District, OR

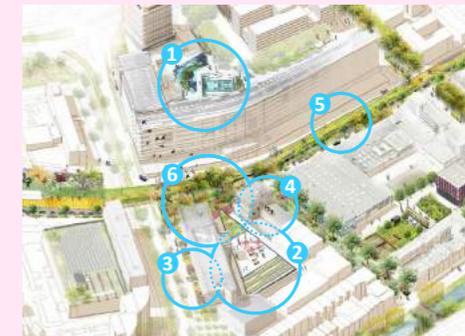
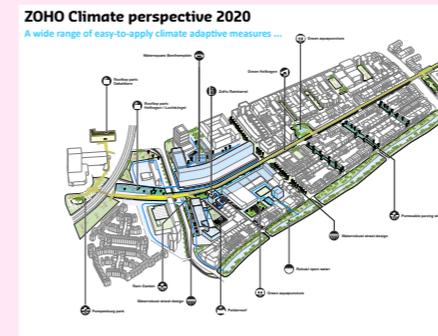
Partners: La Cuadra AC, Cemex

Period: 2016-2025

INSPIRATION FROM ROTTERDAM: CLIMATE RESILIENT DISTRICT.

The city of Rotterdam is implementing the project “Climate Resilient District, ZOHO” (ClimateProof ZOHO District), which integrates water management measures through public space improvements and interventions with physical structures affected by the environment. The project is part of the Rotterdam Strategy for Adaptation to Climate Change and part of Rotterdam’s Resilience Strategy. The ZOHO area is a strategic site because it incorporates replicable urban conditions and the potential key impacts of climate change such as floods, torrential rains, droughts, and heat waves.

The Climate Resilient District incorporates spaces that include adaptation and resilience measures in their design, such as the Water Plaza for water storage, restoration of water balance, and reduction of the effects of heat waves. The project includes the participation of key stakeholders, funding sources, and shared responsibilities for the maintenance of the spaces.





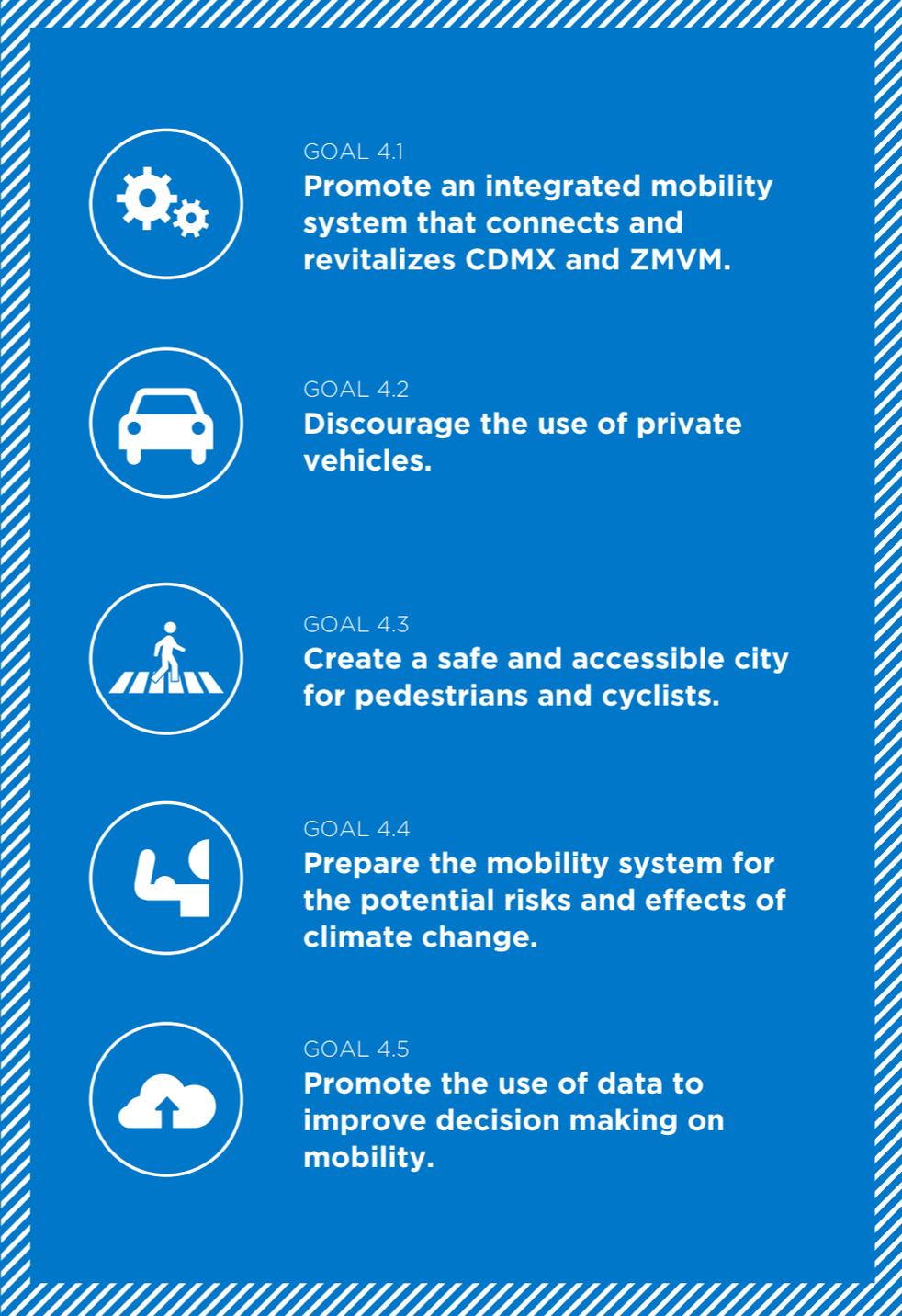
PILLAR 04.
**IMPROVE
MOBILITY
THROUGH AN
INTEGRATED,
SAFE, AND
SUSTAINABLE
SYSTEM**

ECOBICIA
CDMX

PILLAR 04.

IMPROVE MOBILITY THROUGH AN INTEGRATED, SAFE, AND SUSTAINABLE SYSTEM

VISION: **CDMX and the metropolitan area have an integrated mobility system that prioritizes public transportation over private vehicles and provides a safe urban environment for pedestrians and cyclists.**



- 

GOAL 4.1
Promote an integrated mobility system that connects and revitalizes CDMX and ZMVM.
- 

GOAL 4.2
Discourage the use of private vehicles.
- 

GOAL 4.3
Create a safe and accessible city for pedestrians and cyclists.
- 

GOAL 4.4
Prepare the mobility system for the potential risks and effects of climate change.
- 

GOAL 4.5
Promote the use of data to improve decision making on mobility.

PROBLEM STATEMENT

Mobility is considered one of the main issues at a local and metropolitan level because of the impact it has on competitiveness, productivity, and the environment. In recent decades, major public investments were allocated for large infrastructure projects that encouraged the use of private transportation. Although only 30 percent of commutes are made by private car, 85 percent of the road space is used by this means of transportation. As a result, CDMX is one of the cities in the world with the highest number of traffic jams, which have a major impact on quality of life and public health.

Traffic jams add to commute time and, therefore the city's productivity and competitiveness are affected; it is estimated that traffic generated losses of up to 33 billion pesos per year.^[88] In addition, traffic has a strong impact on air quality. Recently, high pollution levels have made clear the need for a profound transformation in the regional public transportation system, for which comprehensive policies and large investments are required.

Although 70 percent of daily trips are made by public transportation, service is exceeded by demand because, despite

the great efforts made in recent years, public transportation service is not yet homogeneously and equitable distributed.^[89] To discourage the use of private cars, CDMX's public transportation system needs to offer commutes with high standards of quality, efficiency, and safety.

Any traffic transformation requires the city to focus on sustainable models that benefit mobility. Currently, CDMX has made progress in that direction. One example is the CDMX New Mobility Model, which is based on 10 principles^[90] that prioritize the most vulnerable users, such as pedestrians and cyclists. Bicycle usage has increased as bicycles are increasingly recognized as an efficient means of transportation. Bicycles have an average travel speed of 10.19 miles per hour compared to the 9.3 miles per hour of cars,^[91] and they do not emit pollution.

Road safety for pedestrians and cyclists has become worrisome, as traffic accidents have become the leading cause of death for people between the ages of 5 and 30.^[92]

There are no sidewalks on 21.3 percent of city roads, and 89 percent of the roads are not accessible for people with disabilities. Road safety is considered a priority for the integration of CDMX with the Vision Zero Strategy for CDMX,^[93] which is already in place.

Urban settings and their relationship to the location of jobs, services, and housing are other key issues for mobility.

Efforts at a metropolitan level to generate a more compact and connected city need to be coordinated between those responsible for urban development and the mobility system.

Finally, data availability and access to information are two of the barriers for developing integrated and innovative solutions for the city's mobility challenges. It is essential to integrate platforms and tools that can facilitate the use of data for decision making.



93. AGO, 2015.

88. CTS Embarq, 2012.

89. IMCO, 2012.

90. The new vision outlined in the Comprehensive Mobility Program 2013 - 2018 is based on the following 10 principles: safety, accessibility, efficiency, equality, quality, resilience, multimodality, sustainability, low carbon, and participation and social co-responsibility.

91. One of the main drivers for the use of the bicycle is the EcoBici program, which currently has 452 bike stations, 6,000 public bicycles, and 100,000 users in 43 neighborhoods in 43 city districts (EcoBici, 2016).

92. Between 2012 and 2015, 1,091 deaths were registered per year due to traffic accidents; 60 percent of the casualties were pedestrians (GDF, 2015).



GOAL 4.1.

Promote an integrated mobility system that connects and revitalizes CDMX and ZMVM.

ACTION 4.1.1.

Improve infrastructure to create an integrated, accessible public transportation system for CDMX and ZMVM that includes service for people with disabilities and vulnerable groups.

This action will promote the Integrated Transport System (ITS),^[94] which is a key tool for transforming mobility. This action includes upgrading public transportation units, improving the connections between different modes of transportation through building better infrastructure, unifying service standards, integrating rates and payment, as well as consolidating public transportation systems under a single authority to strengthen institutional coordination. A long-term vision for regulation and control of the transportation system is needed

Responsible Party: SEMOVI
Partners: ITDP, CTS Embarq
Period: 2016 - 2025

Resilience Value:

The ITS has the ability to transform mobility in CDMX and ZMVM, and to increase access to public transportation in response to the specific needs of different groups. Increasing access to public transportation will positively impact the city's competitiveness.



94. The ITS is an articulated set of transportation networks that provide a reliable, efficient, comfortable, and safe service. (PIM, 2014)

ACTION 4.1.2

Establish policies and pilot projects to promote transportation-oriented urban development.

Transit-oriented development (TOD) is a strategy to create dense neighborhoods with a mix of concentrated uses around mass public transportation.^[95] This strategy creates a compact, dynamic, and equitable city with accessible environments for cyclists and pedestrians—all connected to a public mass transportation network. CDMX is developing strategic projects, such as recovery and redesign for Intermodal Transfer Centers (CETRAM), and is integrating TOD strategies into the new Urban Development General Program (PGDU) for specific areas of the city, with a focus on the development of housing, services, urban amenities, and jobs related to public transportation.

Responsible Party: SEMOVI-SEDUVI
Partners: ITDP, CTS Embarq, RMS
Period: 2016 - 2025

Resilience Value:

The TOD strategy will allow CDMX to create a more compact city, with more jobs and a greater housing density, and to reduce commute times and the use of private cars. This strategy will have a positive impact on the quality of life of everyone in CDMX.



ACTIVITY 4.1.2.2. Integrate TOD principles in all urban development projects in cooperation-based action systems (SAC).

Urban renewal projects will be integrated into the PGDU under the auspices of SAC and AGE as the city's strategic areas for potential economic development and integration of urban infrastructure, housing, services, and employment connected to the transportation network. One or more of the following strategic areas will be selected for pilot studies on the integration of TOD and resilience principles: Heritage zone AGE Xochimilco - Tlahuac and Milpa Alta and Iztapalapa, SAC Alameda Reforma, La Mexicana, Tacubaya, Doctors Buenos Aires, Distrito San Pablo, Atlampa and Granadas.

Participants: AEP, SEDEMA, SOBSE, SPC
Partners: ITDP, CTS Embarq
Period: 2016 - 2025



95. ITDP, 2014.

ACTION 4.1.3.

Expand and innovate the consolidated public transportation network.

The development of the public transportation network and improvements to the existing infrastructure must be accelerated at the metropolitan level to expand access and connectivity. This can be achieved by applying innovative technologies to public transportation systems, such as aerial public transportation, electric transportation, and other clean transportation technologies.

Resilience Value:

This action contributes to a transformation of the CDMX mobility system to achieve a new metropolitan vision of a public transportation network that is more reliable, enhances access, reduces traffic jams and air pollution, and results in a paradigm shift through public transportation system innovations.

Responsible Parties: SEMOVI

Partners: ITDP, CTS Embarq, UNAM

Period: 2016 - 2025

FEATURED ACTIVITY 4.1.3.1. Widen the coverage of the consolidated public transportation network to areas in CDMX and the ZMVM with high demand and a lack of access.

Investments in the expansion of the structured public transportation system should be prioritized in a coordinated manner at a metropolitan level. Investments should be made in areas of CDMX with higher demand and marginalized populations to improve their quality of life and the air they breathe. In these areas of the city, multimodal commuting options should be increased to discourage the use of private cars.

Investments in public transportation in CDMX and the ZMVM continue to be insufficient. Structured transportation^[96] with exclusive lanes covers only 39 percent of the urban area.^[97] In the coming years it will be necessary to cover the infrastructure lag on a metropolitan scale with the expansion of the Metrobus system and the Collective Subway System Network (SCM)^[98] and its connection with the Mexibus (State of Mexico) system. In addition, with the construction of the NAICM, extension of the SCM line B (Buenavista - Airport) becomes possible.

Participants: SEFIN, SOBSE, Metrobus, Mexibus, STCM

Partners: ITDP, CTS Embarq

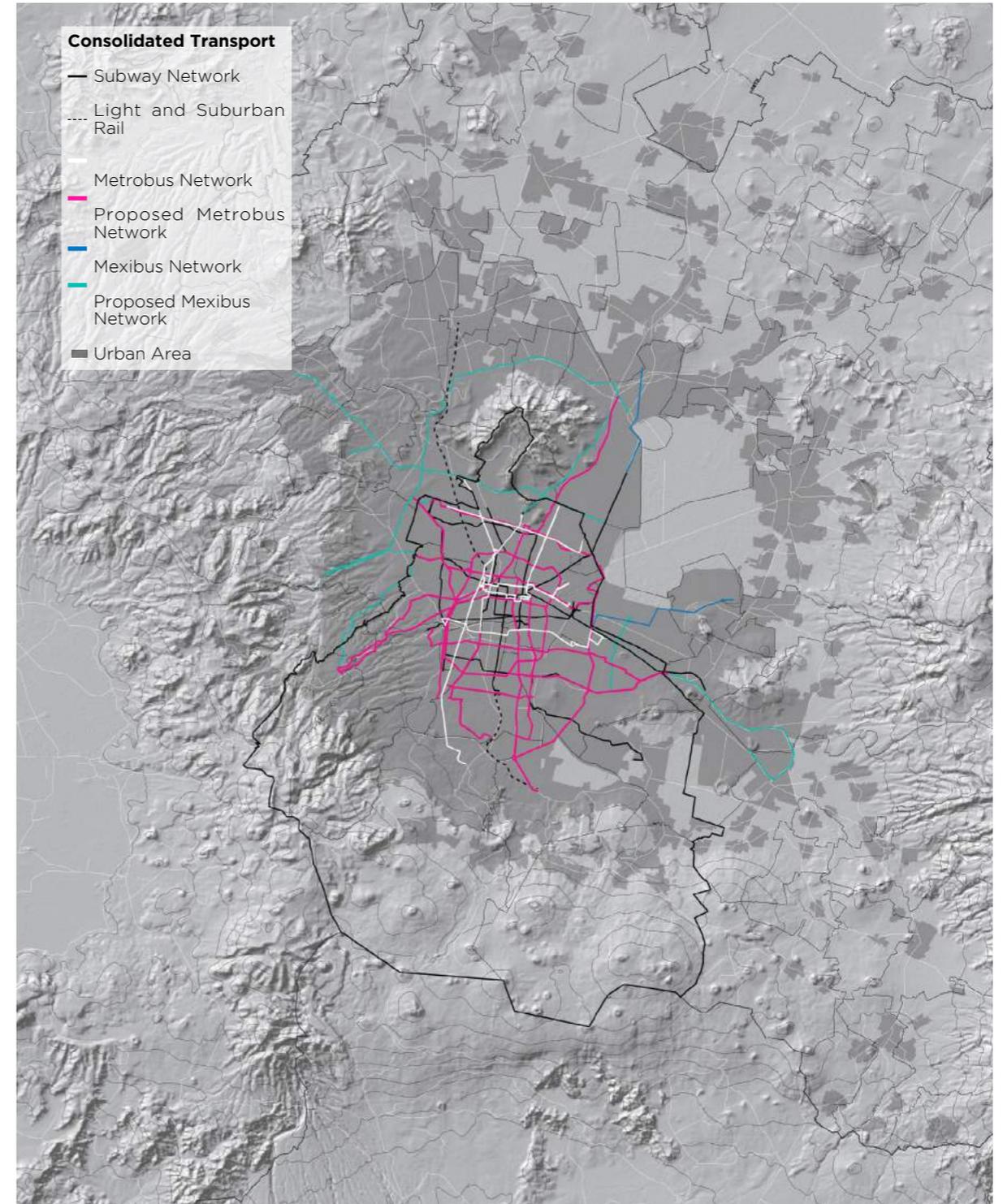
Period: 2016 - 2025

96. Structured transportation to STCM, Metrobus, and Mexibus is considered.

97. PIM, 2014.

98. Currently, the construction of line 7 of Metrobus on Reforma Avenue, the expansion of line 5 (San Lazaro- Gloriera de Vaqueritos), and the expansion of STCM line A (La Paz-Chalco), line 9 (Pantitlán-Centre), and line 12 (Mixcoac-Observatory) are contemplated.

Figure 25. Proposed lines for 2024 (ITDP, 2014)



Source: ITDP, 2014.



GOAL 4.2.

Discourage the use of private cars.

ACTION 4.2.1.

Promote pedestrian, cyclist, and public transportation mobility over private transportation mobility.

Currently, in CDMX projects such as Ecoparc and Hoy no circula (one day without a car), programs are in place that aim to discourage car use and, in contrast, promote resilience building through public transportation-oriented, comprehensive urban development. In addition, the possibility of creating Ecozonas (ecological areas) in places like the Historical City Center is being explored. Implementing exclusive lanes for cars with more than three passengers and enforcing the law of Minimum vs. Maximum^[99] in parking lots are also being considered.

Responsible Parties: SEMOVI

Partners: C40, Fundación Carlos Slim, ITDP, CTS Embarq

Period: 2016-2025

Resilience Value:

By modifying the hierarchy of mobility priorities, problems such as traffic jams and lack of access to public transportation are reduced, and improving the air and quality of life of CDMX inhabitants becomes possible.



99. The growth of parking spaces in CDMX encourages greater use of cars, and urban space is wasted. Regulations demand a minimum number of parking spaces for all new buildings depending on the constructed surface for all land uses. There is a proposal to eliminate the requirement for a minimum number of parking spaces for new constructions and replace it with a maximum number (IMCO-ITDP, 2016).



GOAL 4.3.

Create a safe and accessible city for pedestrians and cyclists.

ACTION 4.3.1.

Implement the Vision Zero initiative.

The government of CDMX, with the support of the Vision Zero Coalition,^[100] the Swedish Embassy, and the Inter-American Development Bank (IDB), is implementing Vision Zero CDMX with the aim of deterring the loss of human lives caused by traffic accidents. This initiative includes five elements: 1) road safety strategy, 2) road users training, 3) infrastructure that saves lives, 4) justice, and 5) creation of a single traffic control information system, the Vision Zero data system. Implementing the Vision Zero initiative has accelerated the implementation of other initiatives, such as Programa Integral de Seguridad Vial (Integrated Road Safety Program), Pasos Seguros (Safe Steps), Red por la Seguridad Vial (Network for Road Safety), and the pilot program Llega seguro (Safe arrival) in 13 schools.

Responsible Parties: SEMOVI

Partners: BID, Coalición Visión Cero

Period: 2016 - 2025

Resilience Value:

This goal of this initiative is to create a safer city for pedestrians and cyclists, to reduce the number of injuries and deaths caused by car accidents, and to encourage and support community participation in the development of a road etiquette.

100. The Vision Zero Coalition is comprised of civil society organizations such as Bicitekas, Brújula que orienta al Norte, Bici Gourmet, Biciverde, CTS Embarq, Cenfes AC, Ciudadano Atropellado, ITDP, Comisión de la Movilidad, Movilidad y Desarrollo México, México Previene, Peatonito, Reacciona por la Vida, Refleacciona, Rodadas Mx, RepuBikla, Tedeá, and Transita Seguro. www.coalicionvisioncero.org.



ACTIVITY 4.3.1.1. Create the Center for Road Safety.

CDMX builds the CDMX Vision Zero data system because the recording of deaths and serious injuries from traffic accidents is inconsistent. The SEMOVI works to create a system that allows information collecting as well as measuring and evaluating the results of the Vision Zero initiative. To enhance communication and information on mobility issues, the system will be accessible to the public. The Road Safety Center will serve as a focal point for consolidating data, strengthening decision making, and generating communication strategies and public involvement.

Participants: SSP, Oficialía Mayor, SEDEMA, OR.

Partners: BID, Coalición Visión Cero

Period: 2016 - 2025.

INSPIRATION: VISION ZERO NEW YORK CITY.

In 2014, the New York City Department of Transportation established the Vision Zero Strategy because, in the 10 years prior to 2014, nearly 1,500 pedestrians and 190 cyclists lost their lives due to traffic accidents, and 15,000 others were severely injured.

The Vision Zero Strategy focuses on three main points: 1) any death or injury on the streets is unacceptable; 2) deaths and injuries caused by traffic accidents are preventable; 3) safe behavior should be expected of all citizens, and everyone must participate in cultural change. Specifically, the strategy focuses on making the streets safer through public dialogue and education, law enforcement, street design, and legislation. Citizens collaborated on the creation of each of these elements.

Between 2014 and 2015, fatalities related to traffic accidents dropped to 252, the lowest number ever reported in New York City's history. Moreover, since the first year of its implementation, the program has transformed the city's streets, increasing their safety and accessibility.

With respect to legislation, the speed limit was reduced to 24.8 miles per hour, and about 20,000 traffic monitoring units were installed. Eighty safe corridors and intersections have been completed, and 60 of them are located in priority sites. Furthermore, the redesign of four main corridors with the highest rates of traffic accidents has begun.

Under the Vision Zero Strategy, New York City will implement 50 projects each year to promote safety on the city's streets. An example is a project at Hunts Point Avenue and Bruckner Boulevard, an intersection where high rates of car crashes have been reported. Safety interventions such as islands, crosswalks, and extensions for sidewalks and medians were installed. Other streets where successful interventions were implemented are Queen's Boulevard, Capital Concourse, Atlantic Avenue and 4th Avenue.

**ACTION 4.3.2.****Transform public space to promote active mobility.**

Active mobility refers to non-motorized commuting by pedestrians and cyclists. Transformation of public space through the construction of models of Complete Streets should consider the inclusion of urban infrastructure for active mobility. Communication strategies must be integrated if the public is to be aware of and understand the health and economic benefits of active mobility.

Responsible Parties: SEDEMA
Partners: ITDP, CTS Embarq
Period: 2016 - 2025

Resilience Value:

Active mobility has many positive impacts, such as: health benefits, public space improvements, a reduction in car use, and decreases in vehicular pollution and traffic congestion.

ACTIVITY 4.3.2.1. Widen cycling infrastructure network.

The Government of CDMX is widening the cycling infrastructure network to encourage bicycle use in combination with other modes of transportation. The main initiatives are the creation of new bike lanes,^[101] parking spaces for bikes, Complete Streets, and the expansion of the EcoBici system. The goal is to make streets accessible, with ramps and even pavements, so that cyclists can navigate safely. Currently, SEMOVI plans projects such as Calle Chilanga (Chilanga Street) and Corredores Cero Emisiones (Zero Emissions Corridors) (Trolebici) on Avenue 8 South, Central Avenue, and Avenue 2. These projects will serve as models for promoting streets as public spaces.

Participants: SEMOVI, SEDUVI, SOBSE, SSP
Partners: ITDP, CTS Embarq, Bicitekas
Period: 2016 - 2018



101. Recently bicycle lanes were built on main streets, such as Revolution Avenue, Patriotism Avenue, and Buena Vista Avenue.



GOAL 4.4.

Prepare the mobility system for the potential risks and effects of climate change.

ACTION 4.4.1.

Adapt the public transportation system to the effects of climate change.

It is essential to ensure that the mobility system has the ability to withstand disruptive or unexpected events and adapt to changing conditions. Transportation systems are constantly exposed to events, such as floods, which could occur more frequently in the future. The mobility planning in this area must be strengthened to reduce recovery costs in case of an event and to enhance the effectiveness of the public transportation system.

Responsible Parties: SEMOVI, SEDEMA
Partners: ITDP, CTS Embarq, RMS
Period: 2016 – 2018

Resilience Value:

Making adjustments to the city's mass public transportation network before effects associated with climate change occur (e.g., intense flooding, heat waves) helps avoid damaging impacts to the network's operation and reduces risks to users.



ACTIVITY 4.4.1.1. Assess the effect of heat waves and floods in STCM and Metrobus transportation systems, and create a portfolio of adjustment measures for public transportation.

In order to create an adjustment strategy to address the effects of climate change, proposals for STCM and Metrobus will be generated and analyzed. These proposals can provide a basis for the development of a portfolio of adjustment measures before the effects of climate change occur. The analysis will integrate, for example, information on historic data and flooding and waterlogging scenarios. This methodology could be replicated for other transportation systems. This activity will make the mass transportation system more efficient and robust.

Participants: SSP, SPC, Oficialía Mayor, STCM, Metrobús, OR
Partners: CTS Embarq, ITDP, RMS
Period: 2016 – 2025.

ACTION 4.4.2.

Improve mobility planning for emergency and disaster situations.

Because the city is exposed to earthquake hazards and other potential disasters, there are mitigation measurements and response protocols for each of the different transportation systems. However, a comprehensive strategy is needed to ensure the smooth functioning of the city during emergencies and to improve communications and connections with safety areas and emergency responders. Currently, the Ministry of Civil Protection (SPC) is working on developing cooperative agreements for free transit on urban highways during an emergency, accident, or disaster, and for proposing signaling and disseminating entry and evacuation routes to the drivers of emergency and support vehicles.

Responsible Parties: SEMOVI, SPC
Partners: CTS Embarq, ITDP, RMS, Veolia
Period: 2016 – 2025

Resilience Value:

By consolidating CDMX mobility network response protocols and mitigation measures for emergency and disaster situations, system recovery costs may be reduced, negative effects on public transportation users can possibly be prevented, and the continuity of a critical city service is ensured.





GOAL 4.5.

Promote the use of data to improve mobility decision making.

ACTION 4.5.1. Promote public-private partnerships to encourage mobility data use.

CDMX generates an enormous amount of data daily; however, not all of that data is available to the public. There are private companies with critical data and information that could be used to expand understanding of mobility patterns, which could, in turn, inform transportation mobility planning and decision making. Access to information has multiple benefits for different sectors. There is a potential opportunity to establish public-private partnerships that can strengthen access, collection, distribution, and use of information.

The Laboratory for the City (LabCDMX) and other organizations implemented the Mapatón program, which is an unprecedented collective effort based on users collaborating in the creation of open mobility databases.

Resilience Value: Data usage through data exchange platforms, data management, and the creation of digital tools can improve the decision making involved in the creation of effective public policies that are crucial to successful development of a more reliable mobility system.

Responsible Parties: SEMOVI
Partners: Audi Urban Future Initiative, a911, CTS Embarq, C40, ITDP, TomTom
Period: 2016 - 2025



ACTIVITY 4.5.1.3. Implement projects that support shared mobility in universities and companies.

At the end of 2014, a Mexico City team, led by a911, won the International Audi Urban Future Award 2014 contest. The proposal suggested an alternative for reviewing and understanding the role of private cars and the possibility of their being part of the transportation solution, not just a mobility problem.

Through partnerships created with more than 43 participants and the data obtained through these, the proposal managed to take a first step towards the creation of a mobility agreement among the different participants.

During 2015, collaboration agreements with six companies and institutions in the Santa Fe area were formalized, and mobility patterns and behaviors were

studied to identify possible solutions and recommendations. Currently, the aim is to strengthen and widen these partnerships to support institutions and corporations in optimizing their resources, and promote sustainable work environments that improve employees' quality of life. An agreement on a collaboration between neighborhood associations, the private sector, the public sector, and Audi to promote mobility transformation is being pursued.

Participants: SEMOVI, OR
Partners: a911, Audi Urban Future Initiative
Period: 2016 - 2018.

INSPIRATION: URBAN TRANSFORMATION - METROCABLE MEDELLIN

Metrocable is an aerial public transportation system in Medellin. The system consists of several interconnected lines that supplement the subway lines. This project has a social element, as it focuses on improving the living conditions of low-income users living in the most deprived and unsafe areas of the city through urban design strategies that promote accessibility to transportation, public space, and urban amenities.





PILLAR 05.
**DEVELOP
INNOVATION
AND ADAPTIVE
CAPACITY**

PILLAR 05.

DEVELOP INNOVATION AND ADAPTIVE CAPACITY

VISION: **CDMX adapts to the impacts of climate change and responds proactively and innovatively to dynamic risks of natural and social origin.**



 **GOAL 5.1**
Integrate the principles of resilience in public facilities, investments, and new strategic projects, and promote private-sector participation in building resilience.

 **GOAL 5.2**
Promote community resilience through citizen participation, strategic communication, and education.

 **GOAL 5.3**
Review and adjust the regulatory framework to promote the implementation of adaptive measures.

PROBLEM STATEMENT

CDMX faces a variety of dynamic risks that may bring about human and economic losses. These risks may also result in impacts on the provision of basic services or reduce quality of life. The adaptive capacity of society, institutions, and strategic infrastructure must therefore be strengthened.

The concept of adaptation refers to measures and adjustments in natural or human systems in response to actual or expected stimuli, or their effects, in order to moderate damage and exploit any beneficial opportunities.^[102] The scientific community has recognized that adaptive challenges cannot be addressed through traditional responses, but require a constant process of learning, evaluation, and change.^[103]

Cities are recognized as centers of innovation that can generate transformations in their relationships and interactions with social-ecological systems. Cities, as centers of innovation, are ideally positioned to build a sustainable future,^[104] since innovation is essential for adaptation of the strategic infrastructure upon which the provision of basic urban services depends

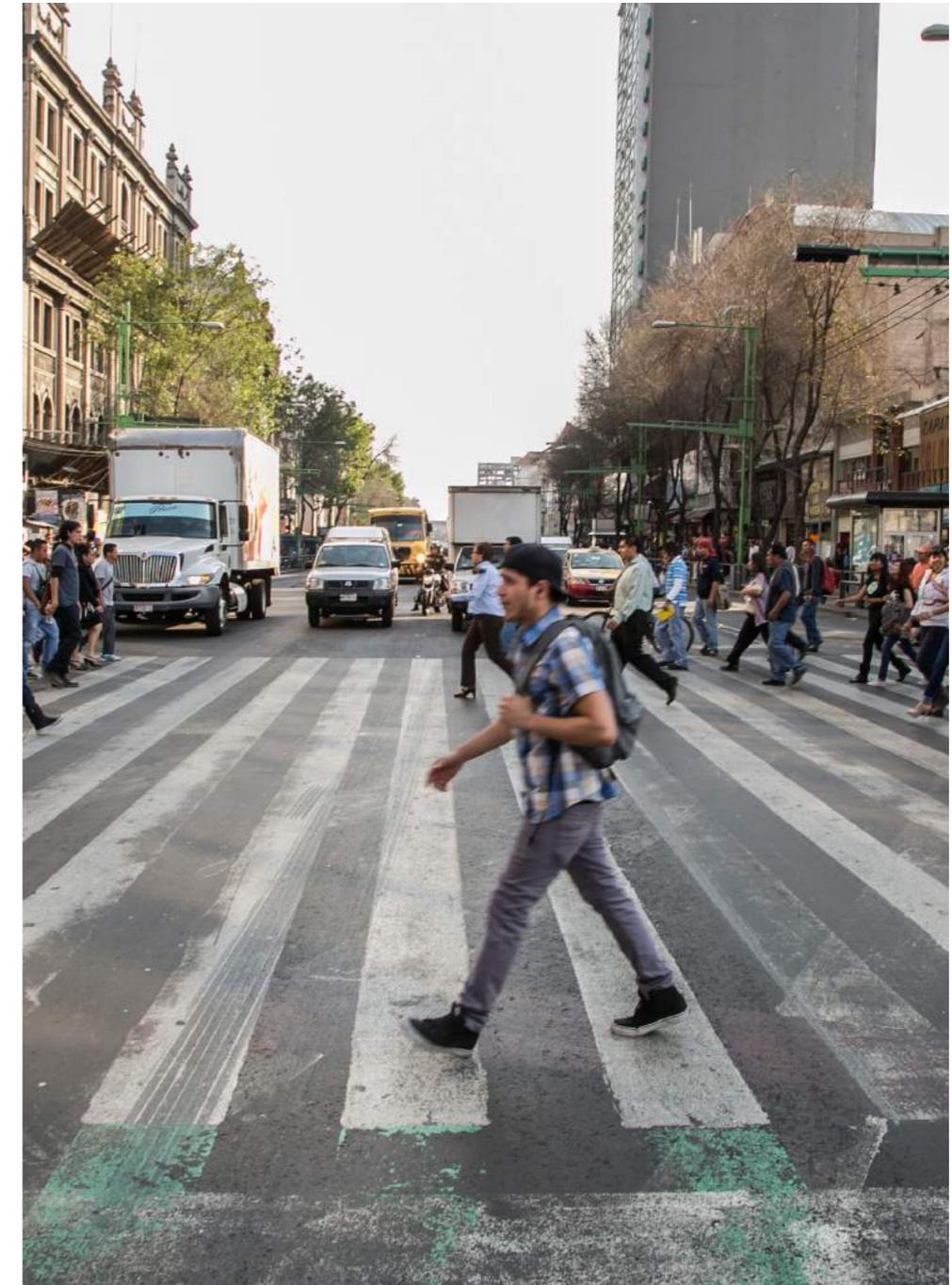
Risk assessment for strategic infrastructure can be a valuable tool for making decisions about risk reduction and transfer. Additionally, large infrastructure projects such as the NAICM offer a valuable opportunity for the development of the city and the region. Investments linked to these projects should be strengthened by incorporating the principles of resilience (Figure 19) from initial construction through all stages of design.

The intensification of the disaster risks associated with climate change and other dynamic processes is a challenge for the public and private sectors. Their capacity to address these risks may be exceeded, forcing them to turn to external support. To address this challenge, the government of CDMX created the Fund for Assistance with Natural Disasters in Mexico City (FONADEN) in 2015, with an initial budget of 3 billion pesos (USD \$162 million). The city is the first in the country to have a fund of this type, 30 percent of which is intended to address disasters such as earthquakes and floods. The private sector is also participating through strategic partnerships with the city, which can improve overall response and reduce losses. Innovative, inclusive, and flexible solutions are required, such as risk transfer instruments that allow early recovery, continuity of operations, independence of public support, and improved reconstruction.

It is essential to promote the adaptive capacities of citizens, which will enable them to respond in an organized way in the event of emergencies and which will strengthen social cohesion and responsibility at the community level, reduce domestic risks, and scale up resilience. The implementation of public policies for disaster relief should concentrate on the most vulnerable groups, as these policies will generate improvements in quality of life regardless of the risks to which these groups are exposed.

In the development of this strategy, in some cases existing regulations may need to be reviewed to facilitate the promotion of adaptive measures by government and society.

For public resources to be able to contribute to building resilience, potential barriers need to be identified and alternatives found.



102. This definition of adaptation is presented in the General Law on Climate Change (Official Gazette of the Federation (DOF), 2012a), which refers to climatic stimuli; however, it has been modified to include other possible stimuli.

103. Brooks and Adger, 2005; Hallegatte, 2009; Birkmann et al., 2010; Moser, 2010.

104. Calvente, 2007; Olsson et al., 2014; Redman, 2014.



GOAL 5.1.

Integrate the principles of resilience in public facilities, investments, and new strategic projects, and promote private-sector participation in building resilience.

ACTION 5.1.1.

Foster innovation for integrated risk management.

This action seeks to strengthen the integrated risk management in CDMX through innovative mechanisms for assessment, reduction, and risk transfer by which participation is encouraged in various sectors, both public and private.

Resilience Value:
By expanding the options for sharing risks and strengthening the culture of insurance, it is possible to reduce the economic impact of disasters to which the city is exposed, and ensure continuity of activities that support the financial well-being of families.

Responsible Parties: SEFIN, SEDECO
Partners: BM, SwissRe, RMS, Veolia
Period: 2016-2025

Resilience Value:

By expanding the options for sharing risks and strengthening the culture of insurance, it is possible to reduce the economic impact of disasters to which the city is exposed, and ensure continuity of activities that support the financial well-being of families.



FEATURED ACTIVITY 5.1.1.1. Promote disaster risk transfer alternatives for CDMX: World Bank initiative of risk transfer for resilient cities.

This joint initiative between the World Bank and 100RC is aimed at working with cities that are part of a network that is building a strategy for the integrated management of catastrophic risks. In addition, it aims to provide technical advice to the city regarding transfer of part of its catastrophic risk resulting from disasters via the World Bank platform in order to have immediate liquidity after a disaster of great magnitude. Financial protection, which is a central pillar of comprehensive risk management, consists of the following:

- Assess the risk: define and measure contingent liabilities; assess and quantify the risk of disasters.
- Develop a comprehensive strategy: take into account the frequency and severity of disasters, develop a cost-efficient strategy of financing risk, and improve the budgetary response capability once disasters occur without compromising the sustainability of public finances.
- Allocate resources efficiently: establish effective administrative and legal systems for approval, transfer, and monitoring of funds after disasters.
- Reduce the risk: scale down contingent liabilities due to disasters, reduce the impact of disasters through the integration of risk information in public investment, and reduce economic impacts by creating incentives for private-sector resilience.

The aim is to contribute to the efforts being made in CDMX, such as the recently created FONADEN, to complement the proposals by various sectors and achieve coordination among projects for a more efficient deployment of resources. By improving understanding of the city's resources for responding to disasters, particularly large-scale disasters, the proactive planning and management of the response to emergencies and disasters can be strengthened to better facilitate rehabilitation and reconstruction.

Responsible Parties: SEFIN, SEDECO
Participants: Chief Administrative Office, SPC, SACMEX
Partners: World Bank, RMS, SwissRe y Veolia
Period: 2016 - 2025

ACTION 5.1.2.

- ▣ **Develop methodologies for the inclusion of the concept of resilience in large infrastructure projects, and propose adaptive measures to various risks for strategic provisioning of public facilities.**

The concept of resilience is new, even within the decision-making process. This action is therefore aimed at influencing construction projects in the operation and improvement of strategic infrastructure and public urban facilities so that these projects incorporate resilience qualities, recognize the risks to which they are exposed, improve the effectiveness of adaptive measures, and better prioritize investments.

Responsible : OR
Partners: 100RC, RMS, PwC, CEMEX
Period: 2016-2025

Resilience Value:

This action helps promote a multifunctional information infrastructure that can reduce risks to the population, ensure continuity of basic services, and improve the environment and quality of life of the inhabitants of CDMX.

ACTIVITY 5.1.2.3. Perform a risk and resilience analysis for strategic public facilities.

At an early stage, a study will be developed of the seismic risk of public facilities that provide basic services for the city. This will include: all CDMX markets, the Central Supply Station (Central de Abasto), modal transfer centers (CETRAMs), and major roads. This work will be carried out by RMS as part of the services provided by the platform of partners of 100RC. Once this first stage is concluded, analysis of other possible low-frequency, high-severity risks will be pursued, and this methodology will be replicated in the evaluation of other strategic infrastructure.

Participants: SEDECO, SPC, SEMOVI, FICEDA, CETRAM
Partners: RMS
Period: 2016 - 2025

**RISK MANAGEMENT SOLUTIONS INC:
 Preliminary results of seismic risk analysis for public markets in CDMX.**

A sophisticated approach to measuring extreme risk is necessary to increase the resilience of the city's strategic public facilities. That measurement is complicated because disasters can occur unexpectedly and can vary in duration and intensity.

Probabilistic models of loss due to a catastrophe can be applied when a disaster occurs. Based on a simulation of about 100,000 projections for the following year, which results in an estimate of the severity of potential losses based on a series of probabilities, these models can be used to quantify the current resilience of the city and to set a realistic goal for resilience in the future.

Various sectors of the CDMX government are working with RMS on evaluating the possible impacts on strategic public facilities in the event of a major earthquake. The preliminary analysis shown here, which characterizes the resilience of the network of nearly 300 public markets in the event of a major earthquake, is an example of the results that can be obtained from this effort.

The exceedance probability curve shows that a seismic event, such as the one that occurred in 1985, is not the worst-possible scenario for the city. Actually, there is a 1 percent chance that markets will suffer losses five times greater than those that were modeled for the 1985 earthquake, and a still substantial likelihood that the losses will be even ten times higher. This

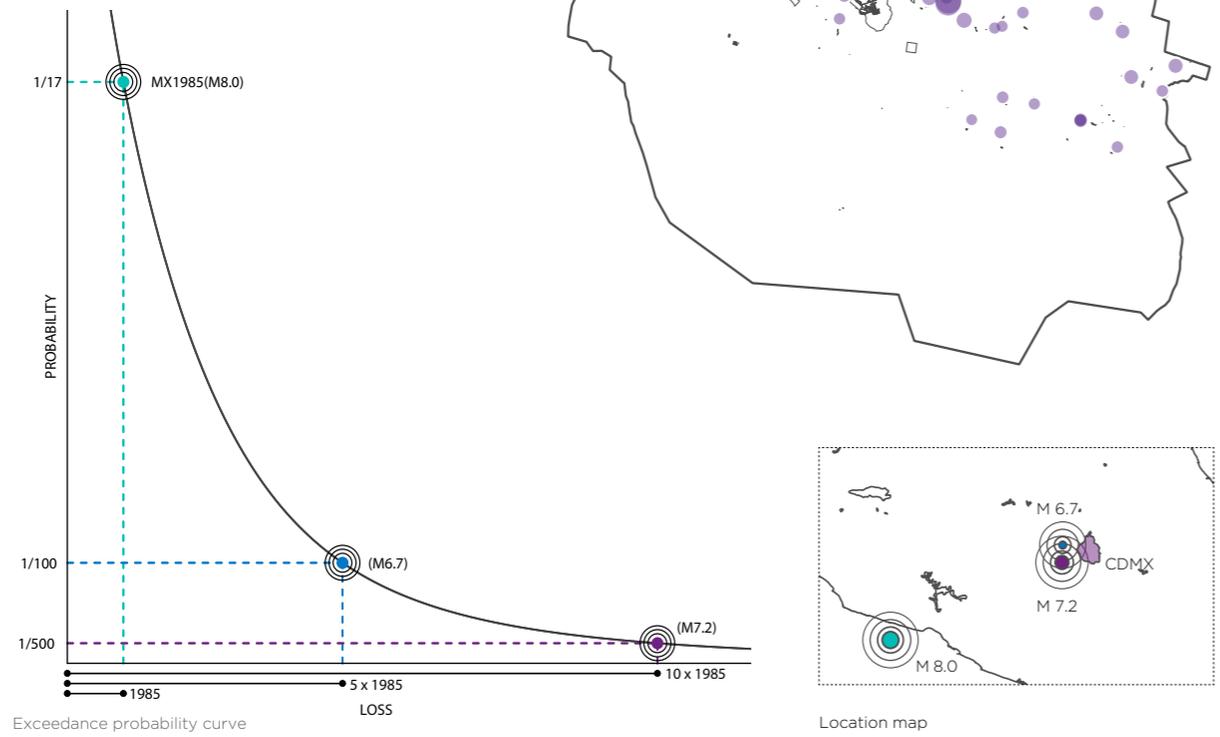
analytical approach also provides an opportunity to identify where investments in resilience can be more productive; for example, considering the profile of resilience from multiple perspectives only, four markets have been highlighted, as shown in Figure 24.

Furthermore, this analysis, performed with limited information on exposure, demonstrates the importance of having high-quality data on public and private property in the city. Intelligent assumptions can be derived from models, but the more complete and accurate the exposure data, the more accurate the results. From the modeling of resilience, the cost-benefit of investments in resilience for individual markets can be identified, and the modeling can also facilitate a holistic vision of the recovery capacity that includes other dangers, such as terrorism, infectious diseases, and drought.

This approach can be used to analyze other sections of critical infrastructure in the city, such as the network of modal transfer centers (CETRAMs) and roads, and to discover and quantify the complex interdependencies between the city assets and the risks that they face.

Figure 26. Risks in CDMX markets (RMS)

The map indicates the location of public markets in CDMX, and the diameter of each circle represents the risk of each according to PAE. The exceedance probability curve shows that there is a 1 percent chance that the damages caused by an earthquake in the markets will be five times greater than the damages in 1985. In the lower box, the epicenter of stochastic earthquakes identified in the curve for the chosen probabilities is shown (1/100 and 1/500). Finally, the table shows the variations in damages undergone by the markets with three different earthquakes and according to the PAE.



Risk analysis in CDMX markets (RMS)

Order	MX 1985 (1/17)	1/100	1/500	PAE
1	Merced Market Main Unit			
2	Jamaica New Market	Jamaica New Market	Jamaica New Market	Jamaica New Market
3	Hidalgo Zone	Hidalgo Zone	Hidalgo Zone	Hidalgo Zone
4	Santa Úrsula Coapa	La Villa	Lagunilla Clothing and Fabrics	Lagunilla Clothing and Fabrics
5	Lagunilla Clothing and Fabrics	Lagunilla Clothing and Fabrics	Abelardo L. Rodriguez	Jamaica Zone

ACTION 5.1.3.
Promote private-sector participation in building urban resilience.

The government response to disasters or emergencies is strengthened by the participation of the private sector in the response. Collaboration with the private sector expands government capabilities and enhances disaster recovery. The purpose of this action is to identify economic activities that may be affected by a disaster and to share responsibility with the private sector for the decision-making process on issues of risk prevention and reduction, performance during emergencies, and reconstruction improvements.

Responsible Parties: SPC, OR
Partners: CENACED, CEMEX
Period: 2016-2025

Resilience Value:
 Private sector involvement in the various stages of planning in the event of a disaster (prevention, preparedness, recovery, and reconstruction) improves the response by government, reduces disaster impacts, and accelerates recovery.





GOAL 5.2.

Promote community resilience through citizen participation, strategic communication, and education.

ACTION 5.2.1. Create a communication platform for risk and resilience for citizens.

The aim is to create a platform that facilitates communication of risk information to the public and that allows community networks for the construction of urban resilience and adaptive capacities.

Responsible Parties: SPC, OR

Partners: City Heroes, Fundación Carlos Slim, RMS

Period: 2016-2025

Resilience Value:

This action provides information in a timely and adequate manner to help the public address risks, increase their adaptive capacity at the community level, guide their actions in emergency situations, and increase social cohesion, citizen participation and empowerment through risk awareness.



ACTIVITY 5.2.1.1. Create a platform to facilitate the communication of risk information to the public and to enable citizens to build citizen networks for improving adaptive capacities and building urban resilience.

The international community has gained experience in the field of risk reduction for disasters.^[105] In Sendai Framework 2015-2030, the need for a broad preventive approach towards disaster risks, an approach that is more focused on people, is acknowledged;^[106] this is reflected in one of seven global goals: “Considerably increase the availability of early alert systems on multiple threats and information and assessments on disaster risk communicated to people, and access thereto, by 2030.”^[107]

A positive correlation between transparency of information on risk assessment and the competitiveness of cities has been recognized.^[108] Some of these cities, recognized as more competitive internationally, match those cities that promote data sharing and risk communication.^[109]

In this context, several organizations have developed open communication platforms for the public on various risks in different regions or countries. In addition, several cities around the world are working to create platforms that allow their citizens to learn of risks where they live and prepare for emergencies. For example, the City of San Francisco, USA, has an Internet platform that shares

information on risks within the city and local region, and helps city residents and the general public to prepare for emergencies.

The City of San Francisco’s Internet platform shares information on risk assessment, action plans for different events, and a geographical information system where individuals can look up the risks they are exposed to by location. San Francisco’s platform also has various applications that promote citizen participation in building resilience on a routine basis; for example, there is a dynamic database where different groups in the community can share real-time information about what is happening in the city. Additionally, a neighborhood empowerment network^[110] was created, which includes information on neighborhood meetings for preparing working plans that improve neighborhood resilience, plans that are shared with other neighborhoods through the Internet.

Participants: SPC, SEDUVI, AGU, LabCDMX

Partners: City Heroes, RMS

Period: 2016 – 2025

105. The disaster risk reduction was promoted internationally from the “International Decade for Natural Disaster Reduction” in the 1990s, culminating in the Hyogo Framework for Action: Increased resilience of nations and communities in the event of disasters, approved at the “World Conference on Disaster Reduction” in 2005. One of the objectives of this document was to increase the availability of adequate and reliable information on disasters, not only for decision makers, but for the general population (UN, 2005).

106. UN 2015b.

107. UN 2015b.

108. The Rockefeller Foundation, 2014.

109. Among the 25 cities recognized as the most competitive in promoting data sharing on disaster risks are New York, London, Tokyo, Amsterdam, Copenhagen, San Francisco, and Melbourne (The Economist, 2013).

110. Neighborhood Empowerment Network at: <http://empowersf.org>

ACTION 5.2.2.

● Strengthen the technical capacity of civil servants to build resilience.

Resilience depends largely on the ability of people to be prepared, transform themselves, respond, and survive in the face of destructive events that can occur in the place where they live.

This is particularly important for civil servants, who are responsible for meeting the needs of others during emergencies, so it is necessary to strengthen their capacities.

Responsible Parties: EAP y OR

Period: 2016-2018

Resilience Value:

Building the response capacities of civil servants helps them make critical decisions in emergency situations and prioritize assistance to the population. This knowledge also helps civil servants to create long-term public policies that increase the security of citizens.



ACTION 5.2.3.

▣ Encourage citizen participation and communication of priority resilience issues.

This action consists of implementing communication campaigns on topics that contribute to building the city's resilience, so that citizens become aware of the actions that are being carried out and which they can join, and inviting them to actively participate in the resilience building effort. Initially, the issues to be promoted based on their importance in building resilience are: Vision Zero, water poverty, and protection and care of green areas.

Responsible Parties: SEDEMA, OR

Partners: 100RC, Pacífico, Banamex, Fundación Carlos Slim, MakeSense, CENACED

Period: 2016-2018.

Resilience Value:

Clear and accurate communication on key resilience issues provides citizens with reliable information to make better decisions, encourages citizen participation, and promotes action and leadership.

INSPIRATION: REBUILD BY DESIGN – WORKING TOGETHER TO BUILD A MORE RESILIENT REGION.

Rebuild by Design (RBD) can collaborate with CDMX in the introduction of a collaborative design process for planning and specific problem solving—a process that contributes to improving urban and regional resilience. RBD emerged from the call for a design contest for the reconstruction of areas affected by Hurricane Sandy in New York, and has evolved into the promoter of an innovative process that generates practical solutions to complex problems.

The purpose is not only to invite sectors that were usually excluded from urban planning solutions, but to place them in the middle of a solid, interdisciplinary, and creative design process that generates innovative responses.

The RBD process is carried out in a series of successive and connected stages that are established to maintain cross collaboration among sectors, academic strength, and a mobile design and that result in an easily replicable process. Based on the success of this methodology in the city of New York, RBD's goal has been to establish it as a model for designing resilience solutions to problems in other cities.

This methodology has been considered a paradigm shift in the way governments and those responsible for urban planning consider emergency preparedness and disaster response. RBD relies on collaboration among designers, researchers, community members, and government officials in a process that proposes solutions to problems, solutions that take into account physical, social, and ecological factors.

In addition to increasing risk awareness in society, RBD has an important connection to the community during the implementation process and explores the need for changes in policies and regulatory structure to improve resilience building.



ACTION 5.2.4. Develop initiatives focused on vulnerable groups.

Some social groups are more vulnerable to disaster events than the average population due to conditions that may be permanent or dynamic. These factors contribute to vulnerability: age (dependent children, older adults who need special help in emergencies), gender, economic conditions (poverty, unemployment, homelessness), location (ravines, dry stream beds), and social situation (lack of social cohesion, exclusion), among others. Initiatives that reduce the vulnerability stemming from these factors should be developed.

Responsible Parties: OR
Partners: Save the Children, UNESCO, UNISDR, Fundación Centro Histórico, Make Sense, SEDEREC, FAO, OXFAM
Period: 2016-2025

Resilience Value:

Addressing these specific vulnerabilities generates multiple benefits because doing so not only builds urban resilience, but also helps create a sense of community, reduces social inequality, and improves everyone's quality of life.

INSPIRATION: RIO DE JANEIRO STRATEGY: FEATURED ACTION - EDUCATE CHILDREN FOR RESILIENCE.

In the Rio de Janeiro Strategy for Resilience, the action of educating children for resilience is highlighted. The project seeks to develop and implement urban resilience topics to complement civil protection concepts in the curriculum of the municipal schools. Resilience topics were recently included in an educational program that is currently benefitting around 5,000 children aged 10 to 12 years. It is estimated that this complementary project will benefit 100,000 students by 2020.

Content is included on the following three topics:

- Impact of climate change on cities and how it affects the lives of young people.
- Basic civil protection concepts and disaster preparedness.
- Sustainable consumption and resource efficiency, particularly regarding energy and water; introduction of recycling fundamentals and the processing of materials and products.

The project believes that children should become aware of the risks they are exposed to in their neighborhood and city, and should develop resilient behaviors in their youth. This project will create awareness and promote a culture of risk prevention and mitigation, and it will also foster environmental and civic responsibility.



GOAL 5.3.

Review and adjust the regulatory framework to promote the implementation of adaptive measures.

ACTION 5.3.1.

Assess the contribution of relevant local programs and projects for resilience within the expenditures budget of the CDMX government (10 percent commitment).

As mentioned in Chapter III of this document, in November 2015, the CDMX government committed to allocate 10 percent of the expenditures budget to building resilience. This action fulfills the commitment to pursue investments in resilience that are transformative. The actions of all government institutions that contribute to the resilience of the city must be acknowledged, and programs and projects that make resilience investments safer, inclusive, and sustainable must also be promoted.

Responsible Party: OR
Period: 2016-2018

Resilience Value:

This action allows for the prioritization of CDMX actions in the budget, which will help reduce tensions among the proponents of different programs and projects and enable the city to be better prepared to deal with potential impacts.



ACTION 5.3.2.

🕒 **Propose a measuring, reporting, and verification (MRV) system that promotes continuous learning and adjustment of actions.**

The aim is to include the MRV System for the Resilience Strategy within the framework of the PACCM. The MRV assesses the progress made in the fulfillment of the PACCM's goals and objectives, and monitors the development of the city's mitigation and adaptation actions. Suitable criteria and indicators for the actions that make up this strategy, developed by both the public and private sectors, civil society, and the scientific community, should be integrated into the MRV System.

Responsible Parties: OR
Period: 2016-2018

Resilience Value:

This action validates the actions that underpin the resilience strategy of CDMX, promotes continuous learning, and guides the necessary process of making changes and updating actions.



VI. NEXT STEPS

After adoption of the CDMX Resilience Strategy by the Resilience Steering Committee (Comité Directivo de Resiliencia) of the CICCDF, the implementation stage will begin. This stage will be an inclusive process; stakeholders from government, the private sector, non-governmental organizations (NGOs), and the scientific community will participate as responsible parties and partners in specific activities within the framework of the five pillars for creating resilience in the CDMX and the region.

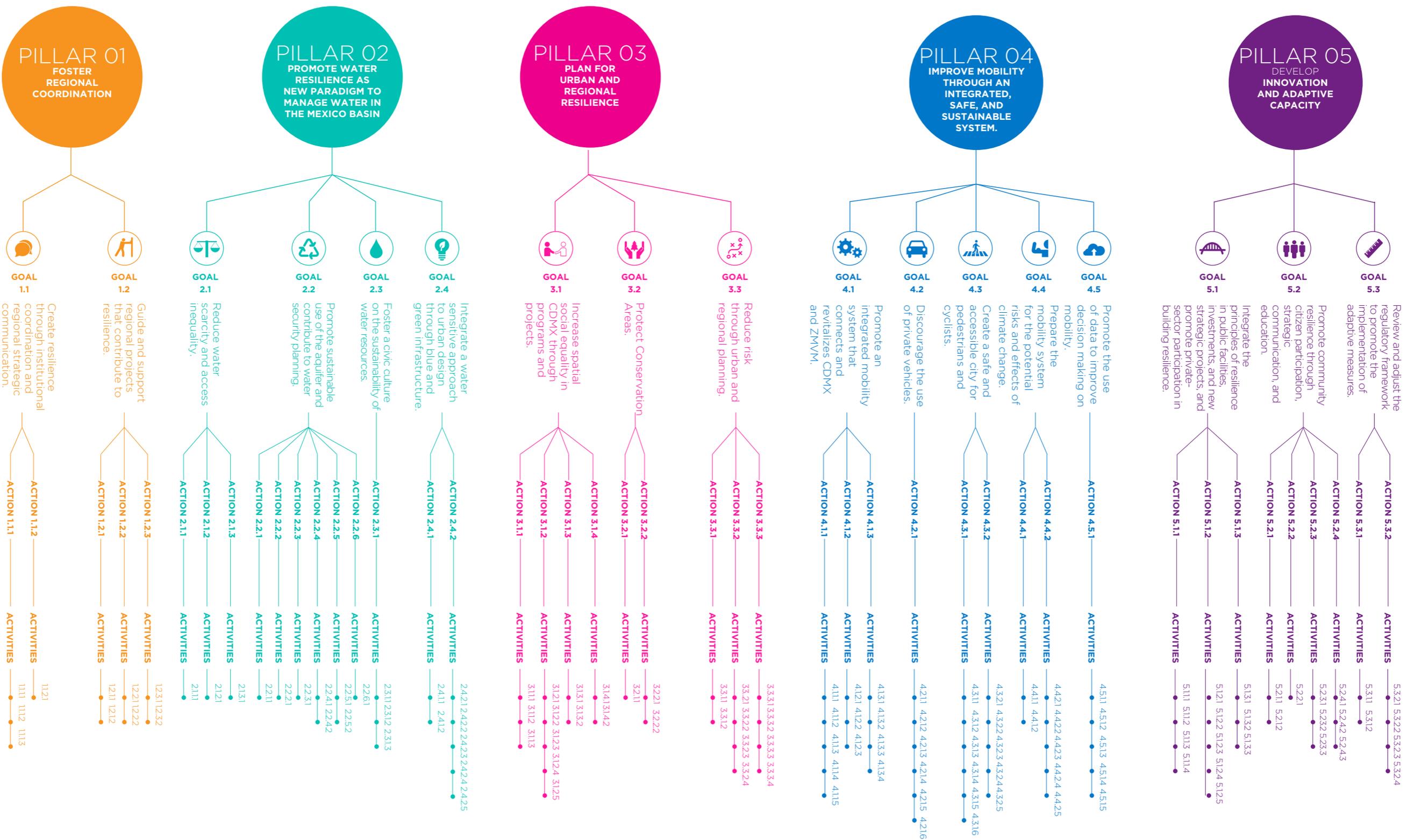
The path toward the creation of resilience is a process that involves continuous learning to address the multiple risks that the city is exposed to in a dynamic environment. The creation of an MRV system will be a key element in establishing periodic evaluations and facilitating continuous learning, because the MRV system will be linked to the Monitoring of the CDMX Climate Change Action Program (SSPACCM). Inclusion of NGOs in implementation actions and the MRV system would be innovative and address the need to share responsibilities.

Building resilience is a process that uses long-term planning and implementation actions to meet the Resilience Strategy goals. The Resilience Office for CDMX will pursue the following objectives:

- Coordinate transdisciplinary and interdisciplinary work for designing, implementing, monitoring, and evaluating the Resilience Strategy goals and actions.
- Provide innovative solutions to existing and potential resilience challenges in the city and the region.
- Identify and promote the implementation of global best practices for resilience in the city.
- Provide technical assistance and collaboration to 100RC partners.
- Promote the incorporation of the principles of resilience in public planning and actions at different levels of government (boroughs, city, and the region).
- Promote regional coordination and create collaborative mechanisms between different levels of government on critical resilience issues.
- Promote agreements between stakeholders from different sectors and public-private collaborations to reduce chronic stresses and improve responsiveness to shocks.
- Promote citizen communication, education, and participation campaigns to build and strengthen resilience in society.
- Monitor the Government of Mexico City's on its commitment to allocate 10 percent of public expenditures to actions that contribute to resilience improvements.

Resilience will be built in the city through joint efforts; thus, continued support from the institutions and organizations that have been identified so far will be essential. In addition, the Resilience Strategy is a living process that will continue to identify new resilience opportunities and stakeholders interested in and committed to joining this collective and inclusive effort to create a resilient CDMX and region.





PILLAR 01.

FOSTER REGIONAL COORDINATION



GOAL 1.1. Create resilience through institutional coordination and regional strategic communication.

ACTION 1.1.1. Foster resilience integration in regional programs

Responsible Parties: OR

Activity	Participants/Partners	Period
1.1.1.1 Create a resilience baseline through the development of the Scorecard (ARISE initiative), which enables evaluation of institutions' capacities to coordinate and respond to risk management.	AECOM, ARISE	2016-2018
1.1.1.2 Contribute to integration of a resilience work stream in the next Management Program for ZMVM.	UNAM	2018-2025
1.1.1.3 Strengthen existing institutions and promote a resilience agenda through coordination mechanisms in CDMX/ ZMVM and the greater megalopolis for specific topics. For example, reactivate COMETRAVI.	Federal Government, National Congress, Local Congress	2018-2025

ACTION 1.1.2. Drive and support the creation of a national resilience agenda with Mexican cities belonging to 100RC Network

Responsible Parties: OR

Activity	Participants/Partners	Period
1.1.2.1 Share experiences and best practices with other cities to strengthen national capacities for prevention, care, climate mitigation and adaptation, and management of impacts and tensions to build urban resilience.	SEDATU / 100RC, Dutch Embassy	2018-2025



GOAL 1.2. Guide and support regional projects that contribute to resilience.

ACTION 1.2.1. Strengthen projects that foster conservation of ecosystems.

Responsible Parties: CI

Activity	Participants/Partners	Period
1. 2.1.1 Implement Water Forest initiative.	SEDEMA / SEMARNAT, Fundación Gonzalo Río Arronte, LANCIS-UNAM	2025-2040
1.2.1.2 Identify, preserve, and restore ecosystems that provide essential ecosystem services for CDMX.	SEMARNAT CONAFOR CONANP / UNAM	2025-2040

ACTION 1.2.2. Reduce pollution in the region (air, water, solid waste, and chemical waste, among others).

Responsible Parties: State Environmental Authorities

Activity	Participants/Partners	Period
1.2.2.1 Promote the implementation of PROAIRE.	SEMARNAT, OR / Lancis-UNAM	2025-2040
1.2.2.2 Promote economic, market, and tax incentives for the use of electric vehicles.	SEDECO, SEFIN, SEDEMA / CAF	2016-2025

ACTION 1.2.3. Foster resilient infrastructure projects that contribute to the development of the region.

Responsible Parties: OR

Activity	Participants/Partners	Period
1.2.3.1 Implement measures that increase resilience around NAICM project.	GACM, Federal Government, SEDECO, SEDUVI, SEDATU / 100RC	2016-2018
1.2.3.2 Contribute to resilience by creating a resilience agenda for the New International Airport of Mexico City and the fate of the current Mexico City International Airport.	SEDECO / 100RC	2016-2025

PILLAR 02.

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



GOAL 2.1. Reduce water scarcity and access inequality.

ACTION 2.1.1. Integrate the majority of the population without regular and continuous water service to the water supply system.

Responsible Parties: SACMEX

Activity	Participants/Partners	Period
2.1.1.1 Expand the potable water network.	AGU / BM, BID	2016-2025

ACTION 2.1.2. Promote public, economic, regulatory, and political instruments to reduce water scarcity and inequality.

Responsible Parties: SACMEX

Activity	Participants/Partners	Period
2.1.2.1 Review fees to make adjustments according to consumption and socioeconomic status.	Asamblea Legislativa, SEFIN, SEDEMA, OR / BID	2016-2025

ACTION 2.1.3. Promote the establishment of temporary rainwater catchment systems and water "kiosks" in areas and houses with a scarcity of water.

Responsible Parties: SEDESO

Activity	Participants/Partners	Period
2.1.3.1 Install rainwater catchment systems in housing with water scarcity.	IMTA / CAF, CEMEX Isla Urbana	2016-2018



GOAL 2.2 Promote sustainable use of the aquifer and contribute to water security planning

ACTION 2.2.1. Support the creation and consolidation of the CDMX Water Fund.

Responsible Parties: TNC, on behalf of the Latin American Water Funds Partnership

Activity	Participants/Partners	Period
2.2.1.1 Implementation of the Water Fund.	SACMEX, SEDEMA CONAGUA, OCAVAM / Fundación Kaluz, Banamex, Fundación FEMSA, Fundación Gonzalo Río Arronte	2016-2025

ACTION 2.2.2. Innovate in the maintenance and renovation of the water network and drainage system as well as in water reuse and treatment.

Responsible Parties: SACMEX

Activity	Participants/Partners	Period
2.2.2.1 Upgrade the drinking water distribution network associated with the loan granted by the World Bank to CDMX.	AGU / BM	2016-2025

ACTION 2.2.3. Identify optimal investments for water resilience and develop public policy recommendations.

Responsible Parties: SACMEX

Activity	Participants/Partners	Period
2.2.3.1 Implement tools that prioritize investments under risk and uncertainty scenarios: See Decision Tree for Resilience under Uncertainty.	SEDEMA, OCAVAM, OR / BM	2016-2018

ACTION 2.2.4. Improve the quality and quantity of water in the area of aquifer recharge.

Responsible Parties: CI

Activity	Participants/Partners	Period
2.2.4.1 Reduce aquifer pollution due to domestic and agricultural use.	SAGARPA, SEDEREC	2016-2025
2.2.4.2 Construct filtration wells for aquifer recharge.	SACMEX, CONAGUA / TNC	2016-2025

ACTION 2.2.5. Prevent damages to the water infrastructure in the event of a major earthquake.

Responsible Parties: SACMEX

Activity	Participants/Partners	Period
2.2.5.1 Identify areas of the city where water infrastructure is vulnerable to the effects of a major earthquake.	IMTA, CONAGUA	2016-2025
2.2.5.2 Map areas where the primary water network would be at risk in the event of a major earthquake.	SPC	2016-2025

ACTION 2.2.6. Identify the opportunities and shocks of mega-infrastructure projects on water security.

Responsible Parties: SACMEX

Activity	Participants/Partners	Period
2.2.6.1 Conduct water resilience and security analysis for NAICM and the future of AICM.	CONAGUA, SEDATU SEDECO, GACM / Veolia, RMS	2016-2018



GOAL 2.3. Foster a civic culture on the sustainability of water resources.

ACTION 2.3.1. Increase education in schools on responsible water use.

Responsible Parties: SEDEMA

Activity	Participants/Partners	Period
2.3.1.1 Promote water culture through the Ecoguardas center.	SEDU, SACMEX, SEMARNAT, OCAVAM, SEP	2016-2040
2.3.1.2 Hold a competition to propose innovative solutions that help reduce water demand by the population.	SACMEX / BID	2016-2040
2.3.1.3 Raise public awareness about the link between conservation of green areas and water supply for the CDMX.	SEDU, SACMEX	2016-2040



GOAL 2.4. Integrate a water sensitive approach to urban design through blue and green infrastructure.

ACTION 2.4.1. Promote the restoration of bodies of water and watersheds.

Responsible Parties: SEDEMA

Activity	Participants/Partners	Period
2.4.1.1 Implement the comprehensive rescue program of the Magdalena and Eslava Rivers.	SACMEX, SEDUVI / LANCIS-UNAM	2016-2025
2.4.1.2 Create the Water Resilience Strategy and Plan for Xochimilco.	SEDUVI , AZP, SACMEX, OR / LAN- CIS-UNAM, Dutch Embassy, TNC, Deltares	2016-2018

ACTION 2.4.2. Develop rainwater catchment, retention, regulation and infiltration, and flood prevention alternatives.

Responsible Parties: SEDEMA, SACMEX, AEP

Activity	Participants/Partners	Period
2.4.2.1 Create strategic infrastructure for water catchment and retention and flood mitigation, including water conservation areas, green spaces, and multifunctional parking lots.	SPC, AGU / Deltares , BID Veolia, CAF	2016-2018
2.4.2.2 Create green areas in strategic water retention and flood mitigation areas.	SEDUVI, SACMEX / BID	2016-2025
2.4.2.3 Implement public space projects with responsible water management, such as La Viga Park.	SACMEX / Deltares, CAF	2016-2018
2.4.2.4 Integrate rainwater catchment systems into urban amenities.	IMTA / BID, Isla Urbana	2016-2025
2.4.2.5 Use technologies for in situ water treatment in the area surrounding the NAICM to promote reuse and to reduce water poverty.	Veolia, NAICM	2016-2025

PILLAR 03.

PLAN FOR URBAN AND REGIONAL RESILIENCE



GOAL 3.1. Increase spatial social equality in CDMX through programs and projects.

ACTION 3.1.1. Preserve, expand, and recover green areas.

Responsible Parties: SEDEMA

Activity	Participants/Partners	Period
3.1.1.1 Promote investment in programs for creation and recovery of urban green areas: Green Roofs, Urban Image Improvement Program, Gullies Management Program, and Environmentally Valuable Areas Management Program.	OR	2016-2025
3.1.1.2 Design and build model green infrastructure projects that promote hydrological restoration, such as New Xochimilco Ecological Park, Tlahuac Lagoon Ecological Park, Quebradora Water Park in Iztapalapa, and recovery and reactivation of potential rivers: Magdalena and Eslava Rivers Comprehensive Recovery Program, Cuitláhuac Park in Iztapalapa, Bosque de Tlalpan, Biometrópolis and La Mexicana.	SEDUVI, AEP, OR / CEMEX	2016-2025
3.1.1.3 Recognize the value of urban green areas through environmental education and projects such as the Environmental Education Center, Bike paths in Conservation Areas or the Mercado del Trueque (Barter Market).	SEDEREC, OR	2016-2018

ACTION 3.1.2. Enhance access to public space in working class and marginalized areas.

Responsible Parties: AEP

Activity	Participants/Partners	Period
3.1.2.1 Build and design pilot projects for emblematic public space. Case of La Viga Linear Park.	CAF	2016-2025
3.1.2.2 Create for CDMX the General Public Space Program and the Public Space Index to locate public space and optimize access.	SEDUVI, OR	2016-2025
3.1.2.3 Integrate an agenda for public space improvement, rescue, and creation projects into the PGDU.	SEDUVI, SEDEMA Delegaciones, DGPI	2016-2018
3.1.2.4 Generate innovative financial and regulatory instruments for public space management.	BM, BID, CAF	2016-2018
3.1.2.5 Develop manuals to orient project implementation in public spaces, including: a) CDMX Sidewalk Manual b) CDMX Intervention Manual c) Accessibility Manual - Technical Training for Public Space Manual d) Toward a Water Sensitive City		2016-2018

ACTION 3.1.3. Expand urban amenities to integrate resilience elements.

Responsible Parties: SEDUVI

Activity	Participants/Partners	Period
3.1.3.1 Provide regulatory guidance to optimize urban amenity improvement programs such as (1) Program for Neighborhood Improvement and (2) Public Markets Improvement Program.	SEDESO, SEDECO, OR	2016-2025
3.1.3.2 Promote the construction of high-quality urban amenities in underserved areas: Health, education, sports, culture and shelters through actions determined in the PGDU, PDDU, and PPDU	SEDECO, SEDESO, SG, SEDU, SEDESA	2016-2025

ACTION 3.1.4. Improve access to affordable and public housing in areas with access to public transportation and sources of employment.

Responsible Parties: INVI

Activity	Participants/Partners	Period
<p>3.1.4.1 Optimize and innovate in social and public housing programs for CDMX and ZMVM connected to the public transportation network:</p> <ul style="list-style-type: none"> a) Multi-family Housing Program b) Housing Improvement Program. c) Emergent Affordable Housing Program 	SEDUVI, SEDESO, SEMOVI, SEDECO, CONAVI, INFONAVIT / BM, BID	2016-2025
<p>3.1.4.2 Generate innovative affordable housing models. For example:</p> <ul style="list-style-type: none"> a) Metro and Metrobus Corridors and nodes with multimodal transfer centers (Centros de Transferencia Modal) b) Mixed-income housing model (NYC inspiration). 	TRAM, SEMOVI, OR	2016-2025



GOAL 3.2. Protect Conservation Areas.

ACTION 3.2.1. Implement the Borde Activo initiative to control the expansion of the urban areas into Conservation Areas.

Responsible Parties: SEDEMA

Activity	Participants/Partners	Period
<p>3.2.1.1 Promote and develop the Borde Activo Initiative</p>	SEDUVI, SEDEREC, Boroughs, PAOT, OR / TNC	2016-2040

ACTION 3.2.2. Strengthen protection of Conservation Areas.

Responsible Parties: SEDEMA

Activity	Participants/Partners	Period
<p>3.2.2.1 Promote programs to finance and implement Conservation Areas: Payment for Environmental Services, Water Forest Initiative, Conservation Areas and Natural Protected Areas Inspection and Monitoring Program, Forest Fire Prevention and Fighting Program, PROFACE, and Forest Sanitation Program.</p>	SEDUVI, SEDEREC Boroughs, PAOT, OR / TNC, CI	2016-2040
<p>3.2.2.2 Identify projects that ensure the preservation and renewal of Conservation Areas through the Water Fund.</p>	OR / TNC, Veolia	2016-2025



GOAL 3.3. Reduce risk through urban and regional planning

ACTION 3.3.1. Promote institutional synergy and incorporate the principles of resilience at various planning levels

Responsible Parties: SEDUVI, OR

Activity	Participants/Partners	Period
<p>3.3.1.1 Embed resilience into the General Urban Development Program and the POZMVM.</p>	SEDATU, CENAPRED, State of Mexico, state of Hidalgo State, SPC,	2016-2018
<p>3.3.1.2 Incorporate information from the CDMX Hazard and Risk Atlas into regional and urban plans and programs as well as into material for public use.</p>	SEDEMA, Boroughs, SPC, CENAPRED / TNC	2016-2018

ACTION 3.3.2. Invest in areas and urban renewal projects that reduce risk and promote sustainable management of economic, environmental, and social resources.

Responsible Parties: SEDUVI

Activity	Participants/Partners	Period
3.3.2.1 Recovery of the Xochimilco, Tlahuac, and Milpa Alta Heritage Area through the creation of the Water Resilience Strategy in the Xochimilco-Tlahuac-Milpa Alta and Resilience Integration in AGE Design Master Plan for the area.	SEDEMA, AZP, OR, SEDEREC, Consejo de Pueblos Originarios Barrios de la CDMX / Rebuild by Design, Deltares, TNC	2016-2025
3.3.2.2 Promote urban development projects to reduce the risk in SACS and AGES (Identify pilot project).	SEDEMA, AEP, AGU, OR	2016-2018
3.3.2.3 Develop tools to support urban planning (e.g., CDMX Historical Display and 3D Urban Simulator).	Fundación ICA, Veolia	2016-2018
3.3.2.4 Contribute to resilience projects in World Design Capital 2018.	AEP, SEDEMA, OR	2016-2018

ACTION 3.3.3. Implement adaptation, mitigation, and resilience actions for communities and housing facilities in high-risk and marginalized areas.

Responsible Parties: SEDUVI

Activity	Participants/Partners	Period
3.3.3.1 Develop projects that focus on developing resilient urban areas.	SEDEMA, SEDECO, SPC, Delegación Iztapalapa, OR / La Cuadra AC, CEMEX	2016-2025
3.3.3.2 Support service program financing and implementation in risk areas: Gullies Improvement Program, Housing Improvement Program for Risk Areas, and the Housing Improvement Pilot Program in Iztapalapa.	SPC, SEDEMA, SG INVI, CONAVI, INFONAVIT, OR / CEMEX, Tenoli	2016-2025
3.3.3.3 Carry out assessments and technical opinions focused on housing in high-risk and vulnerable areas.	SPC, SEDEM, City Districts, INVI CONAVI, INFONAVIT OR / UNAM, Colmex	2016-2018
3.3.3.4 Create urban development guidelines for strategic and specific intervention areas. (pilot project in Pensil Neighborhood).	SEDEMA / Fundación Carlos Slim	2016-2018

PILLAR 04.

IMPROVE MOBILITY THROUGH AN INTEGRATED, SAFE, AND SUSTAINABLE SYSTEM



GOAL 4.1. Promote an integrated mobility system that connects and revitalizes CDMX and ZMVM.

Improve infrastructure to create an integrated, accessible public transportation system for CDMX and ZMVM that includes service for people with disabilities and vulnerable groups.

Responsible Parties: SEMOVI

Activity	Participants/Partners	Period
4.1.1.1 Modernize components of the public transportation system.	SSP, SEDEMA, STCM, Metrobús, RTP, EcoBici, SEFIN, SOBSE / ITDP, CTSEmbarq	2016-2025
4.1.1.2 Improve transfers between mobility modes through better infrastructure.	SSP, SEDEMA, SEDUVI, SOBSE, SEFIN, EcoBici / ITDP, CTSEmbarq	2016-2025
4.1.1.3 Create a CDMX card, integrate rates, and develop an easier payment system.	SSP, SEFIN, STCM, Metrobús, RTP, EcoBici / ITDP, CTS Embarq	2016-2025
4.1.1.4 Unify service and integrate it with non-motorized modes of transportation.	SEDEMA, EcoBici / ITDP, CTSEmbarq	2016-2025
4.1.1.5 Consolidate management of the transportation system under a single authority.	STCM, Metrobús, RTP, EcoBici / ITDP, CTSEmbarq	2016-2025

ACTION 4.1.2. Establish policies and pilot projects to promote transportation-oriented urban development.

Responsible Parties: SEMOVI, SEDUVI

Activity	Participants/Partners	Period
4.1.2.1 Renovate and redesign main CETRAMS' transportation nodes: Transfer Areas Manual (operation design).	SEDEMA, SOBSE, SEFIN, COCETRAM, EcoBici /RMS	2016-2025
4.1.2.2 Integrate TOD principles in all urban development projects in cooperation-based performance systems (SAC).	AEP, SEDEMA, SOBSE / ITDP, CTS Embarq	2016-2025
4.1.2.3 Integrate mobility as a central guiding principle for CDMX urban development in PGDU and POZMVM.	AEP, SEDEMA, SEDECO, SEDATU, CONAPRA, SCT / OR, ITDP, CTS Embarq	2016-2025

ACTION 4.1.3. Expand and innovate the consolidated public transportation network.

Responsible Parties: SEMOVI

Activity	Participants/Partners	Period
4.1.3.1 Widen the coverage of the consolidated public transportation network to areas in CDMX and ZMVM with high demand and a lack of access.	SEFIN, SOBSE, Metrobús, Mexibús, STCM / ITDP, CTS Embarq	2016-2025
4.1.3.2 Analyze and plan for future growth, and use a project prioritization methodology to guide the extension of mass BRT public transportation and corridors to areas with high demand and access inequality.	OR, Metrobús / ITDP	2016-2018
4.1.3.3 Promote new proposals, such as personalized elevated high-speed transportation (TUEP).	SECITI, STE, RTP / ITDP, UNAM, CTS Embarq	2016-2025
4.1.3.4 Promote electric public transportation and other innovative modes.	STE, RTP / ITDP, CTS Embarq	2016-2025



GOAL 4.2. Discourage the use of private vehicles.

ACTION 4.2.1. Promote pedestrian, cyclist, and public transportation mobility over private transportation mobility.

Responsible Parties: SEMOVI

Activity	Participants/Partners	Period
4.2.1.1 Expand the EcoBici system.	SEDEMA	2016-2040
4.2.1.2 Promote the Coparq program	AEP, SEDUVI	2016-2025
4.2.1.3 Promote car-free zones and integrate TOD principles through a study of the City's Historic Center and fee structure.	SEDEMA, AEP, SEDUVI, ACH, CAME / C40, Fundación Carlos Slim , ITDP, CTS Embarq	2016-2025
4.2.1.4 Promote the "Rebuild by Design" initiative to generate proposals to improve air quality and mobility in ZMVM.	SEDEMA, SEDECO, CAME, SG / Rebuild by Design , ITDP, CTS Embarq, Fundación Carlos Slim	2016-2018
4.2.1.5 Install dedicated lanes for cars with more than three passengers.	SEDEMA, SOBSE / CTS Embarq	2016-2018
4.2.1.6 Develop and implement construction regulations that discourage the use of private vehicles (e.g., regulating the number of parking lots).	SEDUVI / ITDP	2016-2018



GOAL 4.3. Create a safe and accessible city for pedestrians and cyclists

ACTION 4.3.1. Implement the Vision Zero initiative.

Responsible Parties: SEMOVI

Activity	Participants/Partners	Period
4.3.1.1 Create a Road Safety Center.	SSP, SEDEMA, Chief Administrative Office, OR / BID, Visión Cero (Zero Vision) coalition	2016-2018
4.3.1.2 Develop an Integrated Road Safety Program (PISV) and promote the 10 fast implementation actions suggested in the PISV.	SSP, SEDEMA, SEDUVI, OR / BID	2016-2018
4.3.1.3 Promote initiatives aligned to the PISV, such as the Safe Steps (Pasos seguros) initiative, through communications and implementation support	AEP / ITDP Estrategia camina (Walk Strategy)	2016-2018
4.3.1.4 Develop a “safe arrival” pilot program (“Llega Seguro”) and a “network for road safety” (“Red por la Seguridad”) program in 13 schools.	SEDU, SSP	2016-2018
4.3.1.5 Implement road safety education programs.	SEDU / Coalición Visión Cero, Fundación Carlos Slim	2016-2025
4.3.1.6 Promote, monitor, and generate communication strategies for the new transportation regulations.	LabCDMX, SSP, Oficialía Mayor, AGU	2016-2018

ACTION 4.3.2. Transform public space to promote active mobility.

Responsible Parties: SEDEMA

Activity	Participants/Partners	Period
4.3.2.1 Expand the cycling infrastructure network.	SEMOVI, SEDUVI, SOBSE, SSP / ITDP, CTS Embarq	2018-2025
4.3.2.2 Create pedestrian streets, such as Calle Chilanga (Chilanga Street), and pedestrian corridors, such as Zero Emissions Corridors (Trolebici) in Eje 8 Sur, Eje Central, and Eje 2.	AEP, SEDUVI, STE, City Districts, ITDP, CTS Embarq	2018-2025
4.3.2.3 Create a pilot “Walk Up” project to analyze mobility patterns related to urban land use.	SEDUVI / GWU	2018-2025
4.3.2.4 Promote “Muévete en bici” (move by bike) and “Cyclothons” programs, and create “borough bicycle schools.”	SEMOVI, SEDESA Indeporte, City boroughs / ITDP, CTS Embarq	2018-2025
4.3.2.5 Conduct studies highlighting and proving that active mobility has health benefits.	SEMOVI, SEDESA, EcoBici / ITDP, CTS Embarq	2016-2018



GOAL 4.4. Prepare the mobility system for the potential risks and effects of climate change.

ACTION 4.4.1. Adapt the public transportation system to the effects of climate change.

Responsible Parties: SEMOVI, SEDEMA

Activity	Participants/Partners	Period
4.4.1.1 Assess the effects of heat waves and floods on STCM and Metrobus transportation systems, and create a portfolio of adjustment measures for public transportation.	SSP, SPC, Chief Administrative Office, STCM, Metrobus, OR / RMS CTS Embarq, ITDP, Veolia	2016-2018
4.4.1.2 Integrate information on floods, ponding, and quadrant mapping from the CDMX Risk and Hazard Atlas.	STCM, Metrobús, SSP SPC, Chief Administrative Office, OR / ITDP, CTS Embarq	2016-2018

ACTION 4.4.2. Improve mobility planning for emergency and disaster situations.

Responsible Parties: SEMOVI, SPC

Activity	Participants/Partners	Period
4.4.2.1 Assess the impacts of flooding on bicycle and road infrastructure to promote transportation designs that allow continuous operation.	SSP, OR / ITDP, CTS Embarq, Veolia	2016-2018
4.4.2.2 Propose mitigation measures and response protocols for disruptive events that can impact mobility, and integrate these measures and protocols into plans for the different transportation systems.	SSP, SEDEMA, STCM, Metrobús, STE, RTP, EcoBici, SEFIN, SOBSE /RMS	2016-2018
4.4.2.3 Identify mobility corridors on the main avenues and arteries as alternatives for emergency use.	SSP, SEDUVI / RMS	2016-2018
4.4.2.4 Develop signage and communication information on entry and evacuation routes for support and emergency vehicles.	SSP	2016-2018
4.4.2.5 Develop cooperative agreements for free transit on urban highways during an emergency, accident, or disaster in CDMX.	SSP, Urban Highways	2016-2018



GOAL 4.5. Promote the use of data to improve mobility decision making

ACTION 4.5.1. Promote public-private partnerships to encourage the use of mobility data.

Responsible Parties: SEMOVI

Activity	Participants/Partners	Period
4.5.1.1 Build a strategy to strengthen and promote the “Mapatón” (map-a-thon) Program.	Lab CDMX	2016-2018
4.5.1.2 Develop a pilot project that uses open data from various public and private transportation sources to analyze mobility patterns before disruptive events.	SEDEMA, SSP, OR / Tomtom, ITDP	2016-2018
4.5.1.3 Implement projects that support shared mobility in universities and companies. Example: the Audi Urban Future Initiative and other projects with similar technologies.	OR / a911, Audi Urban Future Initiative (AUI)	2018-2025
4.5.1.4 Support collaborations and agreements that promote intelligent mobility through initiatives such as Waze Pool and Waze Connected Citizens.	SSP, Lab CDMX, OR / ITDP, CTS Embarq	2018-2025
4.5.1.5 Develop methodologies to support climate actions from quantifying the mobility data for CDMX.	SEDEMA/ C40	2016-2018

PILLAR 05

DEVELOP INNOVATION AND ADAPTIVE CAPACITY



GOAL 5.1. Integrate the principles of resilience in public facilities, investments, and new strategic projects, and promote private-sector participation in building resilience.

ACTION 5.1.1. Foster innovation for integrated risk management.

Responsible Parties: SEFIN, SEDECO

Activity	Participants/Partners	Period
5.1.1.1 Promote disaster risk transfer alternatives for CDMX: "World Bank initiative of risk transfer for resilient cities."	Oficialía Mayor / BM, RMS, SwissRe, Veolia	2016-2025
5.1.1.2 Assess risks and contingencies to foster insurance for small and medium enterprises (SMEs).	SwissRe, RMS	2018-2025
5.1.1.3 Strengthen Fonaden CDMX and promote reinsurance.	SwissRe, RMS	2018-2025
5.1.1.4 Promote an insurance culture.	SwissRe, RMS, BM	2018-2025

ACTION 5.1.2. Develop methodologies for the inclusion of the concept of resilience in large infrastructure projects, and propose adaptive measures for various risks related to strategic provisioning of public facilities.

Responsible Parties: OR

Activity	Participants/Partners	Period
5.1.2.1 Conduct workshops with stakeholders in major investment projects. Example: Resilience Garage.	AICM, SEDECO / 100RC	2016-2025
5.1.2.2 Perform high-impact simulations to assess the resilience capacity of various sectors.	SEDEMA, SCP / PwC	2016-2018
5.1.2.3 Perform risk and resilience analysis for strategic public facilities.	SEDECO, SPC, SEMOVI, FICEDA, CETRAM / RMS	2016-2025
5.1.2.4 Integrate the risk, hazard, exposure, and vulnerability analyses produced by different institutions.	SPC, SSP, CAEPCCM / RMS	2016-2018
5.1.2.5 Propose adaptive measures for infrastructure as part of disaster preparation.	SEDEMA / CEMEX	2016-2018

ACTION 5.1.3. Promote private-sector participation in building urban resilience.

Responsible Parties: SPC, OR

Activity	Participants/Partners	Period
5.1.3.1 Promote the CDMX chapter for CENACED.	SPC / CENACED	2016-2025
5.1.3.2 Establish interim emergency care centers in private parking lots.	SPC / CENACED, CEMEX	2016-2025
5.1.3.3 Collaborate on a pilot project on drought stress as part of the Natural Capital Declaration (NCD).	RMS, GIZ	2016-2025



GOAL 5.2. Promote community resilience through citizen participation, strategic communication, and education.

ACTION 5.2.1. Create a risk and resilience communication platform for citizens.

Responsible Parties: SPC, OR

Activity	Participants/Partners	Period
5.2.1.1 Create a platform to facilitate the communication of risk information to the public and to enable citizens to build citizen networks for improving adaptive capacities and building urban resilience.	SEDUVI, AGU, LabCDMX / City Heroes, RMS	2016-2025
5.2.1.2 Consolidate the digital communication tools for disasters.	Fundación Carlos Slim	2016-2025

ACTION 5.2.2. Strengthen the technical capacity of public officials to build resilience.

Responsible Parties: OR

Activity	Participants/Partners	Period
5.2.2.1 Create a course on resilience in the School of Public Administration.	EAP	2016-2018

ACTION 5.2.3. Encourage citizen participation and communication of priority resilience issues.

Responsible Parties: SEDEMA, OR

Activity	Participants/Partners	Period
5.2.3.1 Create a citizen council that promotes participation in building resilience.	Make Sense, CENACED, Banamex	2016-2018
5.2.3.2 Implement communication campaigns on issues that contribute to building city resilience. Examples: Vision Zero, water scarcity, value of green areas.	SEDESO / 100RC, Pacífico, Banamex, Fundación Carlos Slim, Make Sense	2016-2018
5.2.3.3 Develop tools and mechanisms for public participation at the community level.	Make Sense	2016-2025

ACTION 5.2.4. Develop initiatives focused on vulnerable groups.

Responsible Parties: OR

Activity	Participants/Partners	Period
5.2.4.1 Promote the creation of an internal resilience program in schools, and participate in the UNISDR initiative “Escuelas con futuro sostenible” (Schools with a sustainable future).	SEDU, SPC / Save the Children, UNESCO, UNISDR	2016-2025
5.2.4.2 Strengthen the support program for homeless people.	SEDESO / Fundación Centro Histórico	2016-2018
5.2.4.3 Strengthen food security programs..	Make Sense, SEDEREC	2016-2025



GOAL 5.3. Review and adjust the regulatory framework to promote the implementation of adaptive measures.

ACTION 5.3.1. Assess the contribution of relevant local programs and projects for resilience in the expenditures budget of the CDMX government (10% commitment).

Responsible Parties: OR

Activity	Participants/Partners	Period
5.3.1.1 Monitor and evaluate government investments in resilience.	SEFIN	2016-2018
5.3.1.2 Propose the integration of resilience in the corresponding government budget.	SEFIN	2016-2018

ACTION 5.3.2. Propose a measuring, reporting, and verification system (MRV) that promotes continuous learning and adjustment of actions.

Responsible Parties: OR

Activity	Participants/Partners	Period
5.3.2.1 Include a MRV system for the Resilience Strategy within the PACCM tracking system framework.	SEDEMA	2016-2018

GLOSSARY

Assets: Tangible assets owned by the city, categorized as elements or systems that are an essential part of its operation and are key to sustaining the quality of life of the city's inhabitants. Assets can be economic, environmental, social, or technological infrastructure in nature, or they can be urban amenities. Urban resilience is highly dependent on the proper functioning of its assets.^[111]

Adaptation: Measures and adjustments performed on natural or human systems in response to climatic stimuli or their effects, actual or expected, which can moderate damage or take advantage of their beneficial aspects.^[112]

Strategic Management Areas (AGE):

Are planning tools used in the public interest for regional planning to promote the renewal, requalification and revitalization of specific areas in a city. They meet the requirements for regulatory and management tools, and are used to develop specific areas that need strategic action for regeneration, restructuring, and requalification and urban and environmental revitalization. Each AGE will be handled by a specific, authorized agency.^[113]

Adaptive capacity: The capacity of systems, institutions, human beings, and government agencies to adapt to possible damage, seize opportunities, and respond to emergencies and disasters.^[114]

Strategic infrastructure: Essential infrastructure for the delivery of public goods and services whose destruction or disabling would threaten public safety.^[115]

Impact: Sudden and abrupt events that threaten a city. Examples: large-magnitude earthquakes, hurricanes, torrential rains, floods, heat or cold waves, fire, hazardous materials accidents, tornadoes, terrorism, epidemic outbreaks, riot / civil unrest, and infrastructure failure, among others.^[116]

Resilience: Capacity of individuals, communities, businesses and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience.^[117]

Risk: Probable damage or losses to a susceptible entity, resulting from the interaction between its vulnerability and the presence of a disruptive agent.^[118]

Cooperation-Based Performance System (SAC):

A legal tool to deliver projects and specific infrastructure, urban amenities, public space, and other elements that provide direct benefits to people and the environment in specific urban areas. This system is implemented through developing an urban strategy that is based on the contributions of various private, public, and other stakeholders who influence the region.^[119]

Environmental services: Ecological processes of natural ecosystems that provide a range of cost-free benefits and services upon which humans rely: air and water quality maintenance, control of the hydrological cycle, water generation and soil conservation, carbon storage, parasite and disease vector control, and preservation of recreational areas.^[120]

Conservation Area: An area that maintains natural ecosystems, such as forests, grasslands, mountains, bodies of water, as well as agricultural areas. A Conservation Area produces a significant number of environmental services that are essential to the city—economic, cultural, and public services that the Conservation Area conserves and protects.^[121]

Stresses: Factors that weaken city infrastructure daily or cyclically. Examples include lack of access to affordable housing, high and widespread unemployment, poverty and inequality, deteriorating infrastructure, water and air pollution, drought and water shortages, public safety threats and violence, social instability, and deteriorating macroeconomic conditions.

Transformation: A change in the fundamental attributes of natural and human systems. A transformation may occur in technological or biological systems, in financial structures, or in regulatory, statutory, or administrative law based on paradigms; transformation often takes place by adjusting paradigms, goals, or values.^[122]

Adaptive transformation: Adjustment of the fundamental attributes of a system in response to climate change and its effects.^[123]

Vulnerability: Describes the degree of resistance or susceptibility of an asset with respect to the impacts of natural disasters and related technological and environmental disasters. The degree of vulnerability is determined by a combination of factors, including: the existing awareness of these dangers, conditions that affect housing and infrastructure, public and administrative policy, as well as the presence of organizational skills in all fields related to disaster management. Poverty is also one of the main causes of vulnerability in most parts of the world.^[124]

111. 100RC, 2015.

112. DOF, 2012a.

113. SEDUVI, 2015b

114. IPCC, 2014.

115. DOF, 2012b.

116. 100RC, 2015.

117. 100RC, 2015.

118. DOF, 2012b

119. SEDUVI, 2015b.

120. CONABIO, 2016

121. GDF, 2012

122. IPCC, 2014.

123. IPCC, 2014.

124. UNISDR, 2001.

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ACKNOWLEDGMENTS

The CDMX Resilience Strategy was made possible thanks to the support of the Federal District Inter-Agency Committee on Climate Change (CICCDF) and the creation of the Resilience Steering Committee, which consisted of the Mayor of Mexico City, SEDEMA, SEDECO, SEDESA, SEDESO, SEDUVI, SEMOVI, SPC, SSP, AEP, CAEPCMM, and SACMEX, with the participation of members of the public, the scientific community and the private sector. The support of stakeholders from all these sectors is appreciated.

Development of the CDMX Resilience Strategy required the involvement of many agencies, and it was finally completed because of the efforts of all those individuals who contributed to its development. The contributions of the following are particularly appreciated:

100RC: Michael Berkowitz, Bryna Lipper, Olivia Armenta, Emilia Carrera, María Ortiz, Liz Yee, Armstong Amy, Lauren Sorkin, Alvaro Soldevila, Paul Nelson, Alyssa Rhodes, Leah Flax, Juliana Villabona, Maxwell Young, Chris Choi.

AECOM (Strategic Partner): Claire Bonham-Carter, T. Luke Young, Melissa Higbee, Humberto Armenta, Virginia Kean, Jay Plano, Lina Maria Puerto.

a911: Jose Castillo, Monica Arzoz, Annika Ussel.

SEDEMA: Yolanda Alonso, Oscar Vazquez, Itzel Alcérreca, Cesar Ocana, Claudia Ramos, Ana Penalosa, Patricia Narvaez, Ruben Lazos, Enrique Castelán, Fernanda Rivera, Ivan de la Lanza, Fernando Paredes, Paredes Paris, Angelica M. Moon, Enrique Abe.

SEDUVI: Pipola Gomez, Martha Perez, Jorge Perez, Luis Zamorano.

SEDECO: Ricardo Becerra, Abraham Torres, N. Gyorgy Szanto.

SEFIN: Edgar Abraham Amador, Erick Hernán Cárdenas.

SEMOVI: Laura Ballesteros, Natasha Uren, Luis Enrique Fuentes, Luis Armando Cuevas.

SPC: Andres Escobar, Roberto Appel.

AEP: Gabriela Quiroga.

AZP: Norma Sanchez.

CAMe: Rocio Rodriguez, Octavio Molina.

CEJUR: Manuel Granados, Aurélien Guilabert.

CETRAM: Simon Neumann, Silvia Blancas.

EAP: Leon Aceves, Luis Octavio Trinidad.

Ficeda: John Lau, Miguel Angel Monterde, José Luis Figueroa, Alejandro Santiago, Miriam Apartado.

CMAG: José Luis Romo, César Nájera.

LabCDMX: Gabriela Gomez-Mont, Clorinda Romo, Joy Nuño, Isaac Perez-Serrano, Daniel Tello.

SACMEX: Ramon Aguirre, Mauricio Hernandez, Alejandro Martinez.

Banamex: Maria Lascrain.

BID: David Wilk, Gmelina Ramirez, Maria Eugenia de la Peña.

BM: Luis de la Plaza, Juan Diego Rodriguez, Miguel Navarro-Martin, Oscar Ishizawa, Niels B. Holm-Nielsen.

C40: Rafael Ramos.

CEMEX: Vicente Saiso, Mario Elias Gonzalez.

CENACED: Roberto Delgado, Emma Gonzalez.

CI: Jürgen Hoth.

CMM: Francisco Barnes, Andres Flores, Alejandro Villegas, Tania Guerrero.

COLMEX: Boris Graizbord.

Independent consultants: Lara Becerra, Roman Gomez, Juan Carlos Hernandez, Cesar Herrera, Salvador Herrera, Mario Quintanilla, Victor Rico, Moises Vargas, Guillermo Velasco.

CTS Embarq Adriana Lobo, Julia Martinez, Fernando Paez, Gustavo A. Jimenez, Lorena Vaca.

Deltares: Hans Geherels, Bas van de Pas.

From URBANISTEN: Florian Boer, Eduardo Marin Salinas.

Embassy of the Kingdom of the Netherlands: Jaap Verman, Judith Blaauw, Silvana Ilgen.

Fundación Carlos Slim Adrian Pandal, Virginie Martin-Onraët, Christiane Hajj.

Idea Consultores: Ana Basurto, Cesar Canavati, Mercedes Lujan, Victor Hugo Gomez.

Isla Urbana: Enrique Lomnitz.

ITDP: Bernardo Baranda, Salvador Medina, Valentina Delgado, María Nelly Patlán.

Ithaca Consultants: Jose Castro, Jorge Hinojosa, Karen Navarrete.

Keystone: Juan Pablo Rico, Arturo Farias.

Kuradzo: Luis Sanchez-Catano, Lourdes Cazares.

La Cuadra, AC: Francisco Ayala.

Make Sense Maria Fernanda Ramirez, David Araiza.

New York University (NYU): Neil Kleiman, Katherine Downes-Angus, Jeremy Neiman, Simon C. Lim, Daniel Francis.

PwC Carlos Mendoza, Deyanira Pedreros, Nicholas Shufro.

Rebuild by Design: Amy Chester, Lynn Englum, Tara Eisenberg.

RMS: Daniel Stander, Conor Meenan, Nimo Freitag, Navin Peiris, Mutahar Chalmers, Charlotte Acton.

SwissRe: Nikhil da Victoria Lobo, Alex Kaplan, Rubem Hofliger.

TNC: Hugo Contreras, Colin Herron, Hilda Hesselbach.

UAM: Eugenio Gómez.

UNAM Alicia Ziccardi, Luis Bojorquez, Amy Lerner, Loreta Castro, Elena Tudela.

Veolia: Mauricio Romero, Sarita Mazuera, Federico Padilla, Rodrigo Vignau, Theophile Morice.



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