



NATIONAL CLIMATE CHANGE STRATEGY

10-20-40 VISION

FEDERAL GOVERNMENT OF MEXICO

National Climate Change Strategy. 10-20-40 Vision

Ministry of the Environment and Natural Resources

Under Ministry of Planning and Environmental Policy

General Direction of Climate Change Policy

Bld. Adolfo Ruiz Cortines 4209

Jardines en la Montaña, Tlalpan

C.P. 14210, México, D.F.

www.semarnat.gob.mx

First edition: June 2013

Printed and made in Mexico with Lynx[®] paper opaque ultra FSC*C001844

Cite as: NCCS (2013) National Climate Change Strategy. 10-20-40 Vision.

Mexico: Federal Government of Mexico.

Free copy. Not for sale.

INTER-MINISTERIAL COMMISSION ON CLIMATE CHANGE (IMCC)

Enrique Peña Nieto

President of the United Mexican States

Miguel Ángel Osorio Chong

Minister of the Interior
President of the IMCC

Juan José Guerra Abud

Minister of Environment and Natural Resources
Technical Secretary of the IMCC

José Antonio Meade Kuribreña

Minister of Foreign Affairs

Vidal Francisco Soberón Sanz

Minister of the Navy

Luis Videgaray Caso

Minister of Finance and Public Credit

Rosario Robles Berlanga

Minister of Social Development

Pedro Joaquín Coldwell

Minister of Energy

Ildefonso Guajardo Villarreal

Minister of Economy

Enrique Martínez y Martínez

Minister of Agriculture, Livestock,
Rural Development, Fisheries and Food

Gerardo Ruíz Esparza

Minister of Communications and Transportation

Emilio Chuayffet Chemor

Minister of Public Education

Mercedes Juan López , PhD.

Minister of Health

Claudia Ruíz Massieu Salinas

Minister of Tourism

ELABORATED BY THE MINISTRY OF THE ENVIRONMENT AND NATURAL RESOURCES; WITH THE PARTICIPATION OF THE NIECC; THE OPINION OF THE CLIMATE CHANGE COUNCIL, AND THE APPROVAL OF THE INTER-MINISTERIAL COMMISSION ON CLIMATE CHANGE.

AUTHORS

Juan José Guerra Abud	Diana Lahoz Gómez
Rodolfo Lacy Tamayo	Fátima Alejandra López Solana
Francisco Barnés Regueiro	Lucrecia Martín Chávez
Beatriz Bugeda Bernal	Elizabeth Mosqueda Rodríguez
Fernando Oléa Tinoco	Eduardo Olivares Lechuga
Luis Alfonso Muñozcano Álvarez	Juana Itzchel Nieto Ruiz
Lucía Cortina Correa	Celia Piguerón Wirz
Mónica Paola Echegoyen López	Mildred Trejo Chávez
Soffía Alarcón Díaz	
Ainara Aranguren Sánchez	
Miguel Ángel Ayala Mata	
Iliana Cárdenes Trujillo	
María Eulalia Mildred Castro Hernández	
Gloria Cuevas Guillaumin	
Hugo González Manrique Romero	
Víctor Hugo González Sánchez	

Ministry of the Environment and Natural Resources
Under Ministry of Planning and Environmental Policy
General Direction of Climate Change Policy
Blvd. Adolfo Ruiz Cortines 4209
Col. Jardines en la Montaña, Tlalpan
C.P. 14210, México, D.F.
www.semarnat.gob.mx

WE APPRECIATE THE COLLABORATION OF:

Andrés Flores Montalvo	Iván Islas Cortés
Cecilia Conde Álvarez	Luis Conde Álvarez
Julia Martínez Fernández	Yusif Nava Assad
Jorge Alberto Tovilla Cao Romero	Mariam Nava Assad
Israel Laguna Monroy	Pablo Hernández Ávila
Beatriz Cárdenas Zavala	Margot Aguilar

CLIMATE CHANGE COUNCIL

José Mario Molina Pasquel y Henríquez , PhD.

President

Juan Carlos Belausteguigoitia Rius , PhD.

Secretary

Gustavo Alanís Ortega

General Director at the Mexican Center
for Environmental Rights, A.C.

Rubén Barocio Ramírez

Coordinator of Environmental Topics at the Mexican
Academy of Engineering

Boris Graizbord Ed, PhD.

Director for the LEAD Program at El Colegio de México

Martín Gutiérrez Lacayo

General Director at Pronatura México

Roberto Hernández Ramírez

President of the Banamex Administration Council

Sergio Madrid Zubirán

Director and Founding Member of the Mexican Civil Council for
Sustainable Forestry

Luis Farías Martínez , PhD.

President of the Private Sector Study
Center for Sustainable Development

María Amparo Martínez Arroyo, PhD.

Director of the Atmosphere Science Center at the National
Autonomous University of Mexico

Pablo Mulás del Pozo , PhD.

Mexican Representative at the World Energy Council

Norma Patricia Muñoz Sevilla, PhD.

Secretary of Research and Graduate Studies at the National
Polytechnic Institute

Carlos Santos-Burgoa Zarnecki, PhD.

Senior Consultant at the Pan American Health Organization

José Aristeo Sarukhán Kermez, PhD.

National Coordinator at the National Commission for the
Knowledge and Use of Biodiversity

María Isabel Studer Noguez, PhD.

Founding Director of the Global Institute for Sustainability

Alfonso de la Torre Vega

President of the Consultant Council for the Sustainable
Development of the Central Region of the country, PNUD-
SEMARNAT Project

We appreciate the support of the United States Agency for International Development (USAID), the Embassy of the United Kingdom, and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of the Federal Republic of Germany (BMU), who, through the German Cooperation for Development (GIZ) contributed to the development and public consultation of this Strategy. Also, we thank the support of several areas of SEMARNAT that collaborated in the making of this document: Coordinator Unit of Social Participation and Transparency (UCPAST), Coordinator Unit for Delegations, Social Communication General Coordination, and the General Direction of Telecommunications and Computer Science (DGIT). For the public consultation of this document we highlight the contribution of the Core Advisory Councils on Sustainable Development, REDD+ Mexican Alliance, Climate Works, and the Commission of Private Sector Studies for Sustainable Development (CESPEDES). Likewise, we thank the comments received from diverse experts in climate change mitigation and adaptation from the World Wildlife Fund (WWF), The Nature Conservancy (TNC), the Climate Change Council, the Mario Molina Center for Strategic Studies on Energy and the Environment C.A., and the federal institutions that integrate the Inter-ministerial Commission on Climate Change.

TABLE OF CONTENTS

Prologue	8
1. Introduction	9
2. Context	10
2.1 Science of climate change	12
2.2 International context	12
2.3 National context	13
2.3.1 National policy on climate change and instruments	13
2.3.2 Guiding principles for the national climate change policy	17
3. Objective of the National Climate Change Strategy	18
3.1 Objective	18
3.2 Scope	18
3.3 Elaboration process	18
3.4 Structure	19
4. 10-20-40 vision	22
5. Pillars of the national climate change policy	24
5.1 Assessment	24
5.2 Policy pillars and lines of action	27
P1. Have cross-cutting, articulated, coordinated and inclusive climate policies and actions.	27
P2. Develop climate specific fiscal policies and economic and financial instruments	28
P3. Implement a platform for research, innovation, development and adjustment of climate technologies, and strengthening of institutional capacities.	
P4. Promote the development of a climate culture	30
P5. Implement mechanisms for Measurement, Reporting, and Verification (MRV) and Monitoring and Evaluation (M&E).	31
P6. Strengthen strategic cooperation and international leadership	32
6. Adaptation to the effects of climate change	33
6.1 Climate change vulnerability assessment	33
6.2 Strategic axes and lines of action	38
A1. Reduce the vulnerability and increase the resilience of the social sector to the effects of climate change	38
A2. Reduce the vulnerability and increase the resilience of strategic infrastructure and production systems to the effects of climate change	39
A3. Conserve and use ecosystems sustainably and maintain the ecosystem services they provide	40
6.3 Criteria for the prioritization of adaptation measures	41
7. Low-emissions development / Mitigation	43
7.1 Policy for climate change mitigation	43
7.2 Diagnosis of GHG emissions	45
7.3 Diagnosis of SLCPs emissions	47
7.4 Strategic axes and lines of action	49
M1. Accelerate the energy transition toward clean energy sources	49
M2. Reduce energy intensity through efficiency and responsible consumption schemes	50
M3. Shift towards models of sustainable cities with mobility systems, integrated waste management, and low-carbon footprint buildings	51
M4. Promote best practices in agriculture and forestry to increase and preserve natural carbon sinks	52
M5. Reduce emissions of Short-Lived Climate Pollutants (SLCPs), and promote co-benefits in health and well-being	53
8. Review, evaluation, and adjustment of the National Climate Change Strategy	54
Glossary	55
References	58
Acronyms and abbreviations	59

FIGURE INDEX

- Figure 1.** Cyclone track comparison in current times and the Early Pliocene. P. 10
- Figure 2.** Climate anomaly from 1981 to 2012 against average temperature (°C) between 1951 and 1958. P. 11
- Figure 3.** Mitigation strategies in the short and long-term. P. 11
- Figure 4.** Institutional framework for the National Climate Change System. P. 14
- Figure 5.** Policy instruments foreseen on the General Climate Change Law. P. 15
- Figure 6.** Structural map of the National Climate Change Strategy. P. 20
- Figure 7.** Number of files in the Mexican database on historical catastrophes. P. 33
- Figure 8.** Data for climate events. P. 34
- Figure 9.** Climate events in high-risk municipalities. P. 35
- Figure 10.** Municipalities with high vulnerability and risk of climate event occurrence. P. 36
- Figure 11.** Vulnerability indexes by CENAPRED. P. 36
- Figure 12.** Climate projections by the Mexican Climate Modeling Network (CICESE, IMTA, CCA-UNAM, SMN, INECC), flooding and landslide risks. P. 37
- Figure 13.** Energy infrastructure in municipalities with high and extremely high risk of flooding. P. 37
- Figure 14.** Conceptual representation of GHG and SLCs participation in mitigation efforts. P. 43
- Figure 15.** Execution terms for mitigation actions, in accordance with guidelines defined in the General Climate Change Law. P. 42
- Figure 16.** Evolution of GHG emissions in Mexico. P. 45
- Figure 17.** NIGHG (2010) GHG emissions breakdown by type of greenhouse gas. P. 45
- Figure 18.** Baseline and objective trajectory of GHG emissions in Mexico 2010-2050. P. 46
- Figure 19.** Matrix for the mitigation actions in the medium term (2020-2050). P. 47
- Figure 20.** Breakdown of black carbon (BC) national emissions by type of source. P. 48

CHART INDEX

- Chart 1.** Instruments for climate change policy within the three orders of government. P. 16
- Chart 2.** 10 / 20 / 40 years route. P. 22
- Chart 3.** Aspects evaluated in the selection of adaptation measures. P. 42
- Chart 4.** Main criteria for the identification of priority actions in the short, medium, and long term. P. 44

PROLOGUE

Climate change is a global challenge that demands a rapid and decisive response from every nation. In order to face it and to contain its effects, it is necessary that each country takes bold actions within its own boundaries.

Mexico assumes its commitment and global responsibility in the face of this challenge, which threatens the whole of humankind.

Aware that we are one of the most vulnerable countries to climate change impacts, we require the co-responsible action of both citizens and authorities to modify consumption and production habits, in order to encourage more sustainable and environmentally friendly practices. It is fundamental that alliances are consolidated between society and governments to create a common front against climate change. To achieve this, the talent of the scientific community and the decided actions of the private sector will be crucial. In the Federal Government we know that one of the most effective ways to stop climate change is by encouraging sustained and sustainable growth of our economy. We must generate an inclusive green growth, based on a higher productivity rather than on the irresponsible exploitation of our natural resources.

The National Climate Change Strategy is the instrument that will guide our actions as a nation, to fight against this phenomenon for the next 40 years. Built upon sound scientific foundations, it poses feasible goals that go beyond reducing greenhouse gases. It sets a long term route to improve the health and quality of life of the population, while also turning Mexico into a more resilient society.

This Strategy is the result of the joint participation of citizens, enterprises, and academics with the Government. Thus, it is the product of a democratic exercise of society as a whole.

In sum, Mexicans undertake the challenge of climate change as an additional motivation to increase productivity, boost competitiveness, generate jobs, and build the thriving and sustainable Mexico that we all look forward to. We have the creativity, the resolve, and the talent to accomplish so.

Enrique Peña Nieto

President of the United Mexican States

1. INTRODUCTION

Global action against climate change is inevitable and cannot be delayed. According to the international scientific community, it is necessary that all countries jointly and decisively reduce their greenhouse gas and compound emissions, in order to avoid climate change effects from worsening. For Mexico, this challenge goes hand in hand with social, economic, and environmental problems that already affect its population, infrastructure, production systems, and ecosystems..

Long-term planning and immediate action becomes imperative, in order to adapt ourselves to potentially negative impacts, as well as to reduce greenhouse gas and compound emissions. The National Climate Change Strategy is the planning instrument that defines a long-term vision while guiding the national policy through a path that sets the national priorities of attention and defines criteria to identify regional priorities.

The long term vision of this guiding instrument poses the sustainable growth of the country and the promotion of a sustainable and equitable management of its natural resources, as well as the use of clean and renewable energies that will lead towards a low-emission development. It also aims for Mexico to become a prosperous, competitive, socially inclusive and globally responsible country, which generates enough well paid jobs for its population, particularly the most vulnerable. It proposes a socially equitable nation, with a green economy, with ecosystems and populations that are resilient to climate change, and with sustainable cities.

To achieve this vision and based on a 10-20-40 year route, the National Climate Change Strategy defines the pillars of the national climate change policy, which in turn sustain the strategic axes in matters of adaptation that lead us into a resilient country, and of mitigation, which lead us into a low-emission development.

Each of these axes contain lines of action that will require integration, continuity and the participation, most of the time, of the three orders of government, as well as the Legislative Branch and every sector of society. It is important to clarify that, due to its guiding character for the first half of this century, this Strategy does not define concrete actions or particular

responsibilities. The National Development Plan 2013-2018 already establishes the basis of the actions to be followed in the short-term, which will be complemented with the Special Program and the State Climate Change Programs.

To achieve the objectives on adaptation and mitigation, a coordinated, strong national policy that supports development must exist. That is why the National Climate Change Strategy integrates a chapter that identifies the pillars of the national climate change policy. In this section, fundamental aspects of the aforementioned policy are presented: have cross-cutting, articulated, coordinated and inclusive policies and actions; develop climate specific fiscal policies and economic and financial instruments; encourage research; promote the development of a climate culture; implement mechanisms of Measurement, Reporting and Verification (MRV) and Monitoring and Evaluation (M&E); and strengthen international cooperation.

The challenge is huge. The accomplishment of the mitigation objectives of reducing 30% of emissions by 2020 relating to the 2000 baseline, and 50% by 2050, requires structural transformations in the development model of the country.

Regardless of the scope of this challenge, the General Climate Change Law (GCCL), which entered into force in October 2012 and mandates the Federal Government to elaborate this Strategy, reflects the decisive action of the Mexican State to face it firmly. In light of the National Climate Change Strategy, Mexico will turn this great challenge into an opportunity to conserve and sustainably use its natural capital; to take advantage of its vast potential to develop clean energies; to correct inefficiencies in the use of energy; to generate jobs within a green economy; to promote sustainable territorial development; to increase competitiveness, and to improve public health and quality of life.

This Strategy is a fundamental step towards the instrumentation of the GCCL and shows that the country is moving forward in the fulfillment of its international commitments. It will also be, as it is executed, the best argument to demand collective action from the international community against climate change

2. CONTEXT

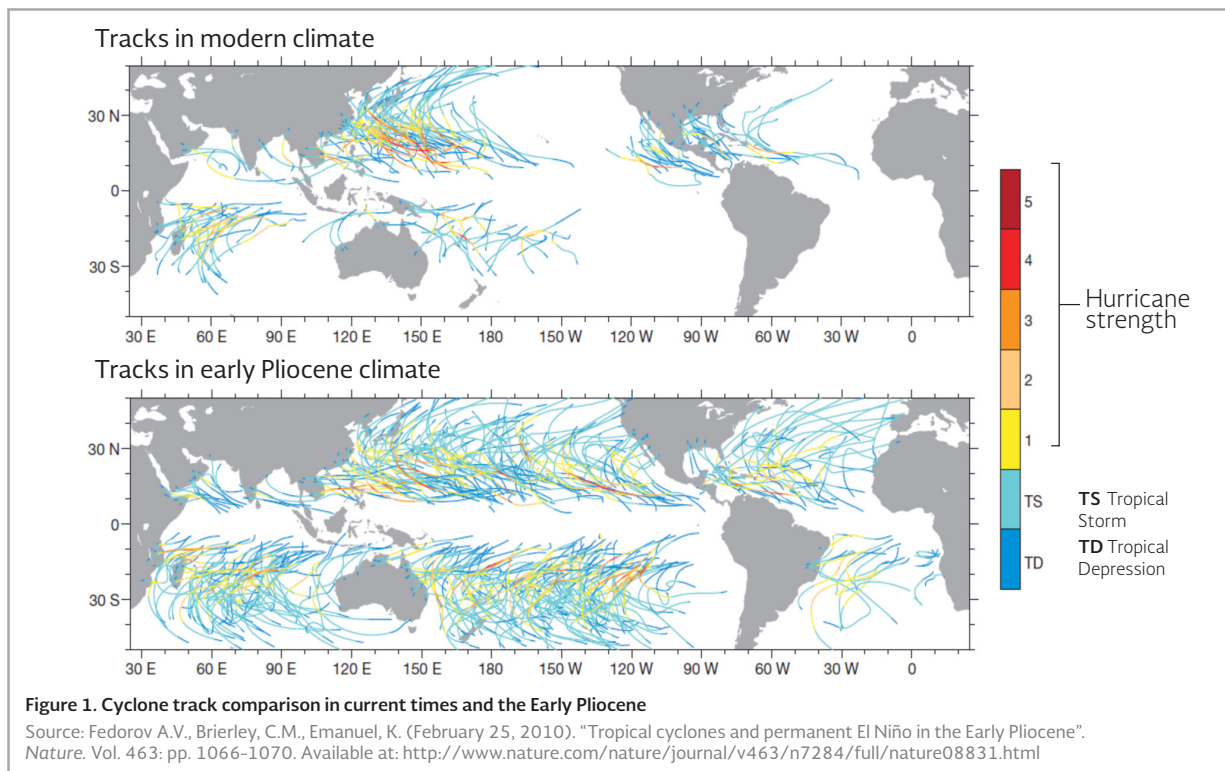
2.1 SCIENCE OF CLIMATE CHANGE

The Intergovernmental Panel on Climate Change (IPCC) has manifested that the Earth warming is unequivocal^[1]. The average global surface temperature of the Earth has increased since the Industrial Revolution, more notably so in the past 50 years. Scientific evidence proves with a high level of confidence that many of the observed changes in the climate system are significant. Likewise, such evidence indicates that human actions, particularly the burning of fossil fuels and deforestation, are causing these changes.

The climate system depends on the balance of several internal and external factors. Amongst the external factors, solar radiation and orbit cycles stand out, while some of the internal factors are the atmosphere chemical composition or the water and carbon cycles. An important increase in the concentration of greenhouse gases (GHG) that alter the atmosphere chemical composition has been identified in the past decades. This concentration has practically reached 400 parts per million^[2], escalating 40% above

average values registered in the last half a million years^[3]. This has resulted in the increase of the average global temperature, which could surpass 4°C as we get closer to the end of the century. If this happened, society would face serious environmental, economic, and social consequences. For that reason this is a crucial moment to act immediately to minimize the aggravation and impacts of climate change.

Amongst the possible effects that an increase of 2°C or 3°C above pre industrial levels in the average surface temperature of the Earth could have, are changes in the frequency of extreme events such as droughts and heat waves. In addition, it could change oceanic patterns, which in turn would increase hurricane intensity. For example, it has been studied that this increase in temperature could derive in a similar situation to the one occurred in the early Pliocene (between 3 to 5 million years ago), when, because of high sea temperatures, the surface of the sea presented a constant high cyclonic activity phenomenon similar to El Niño^[4].



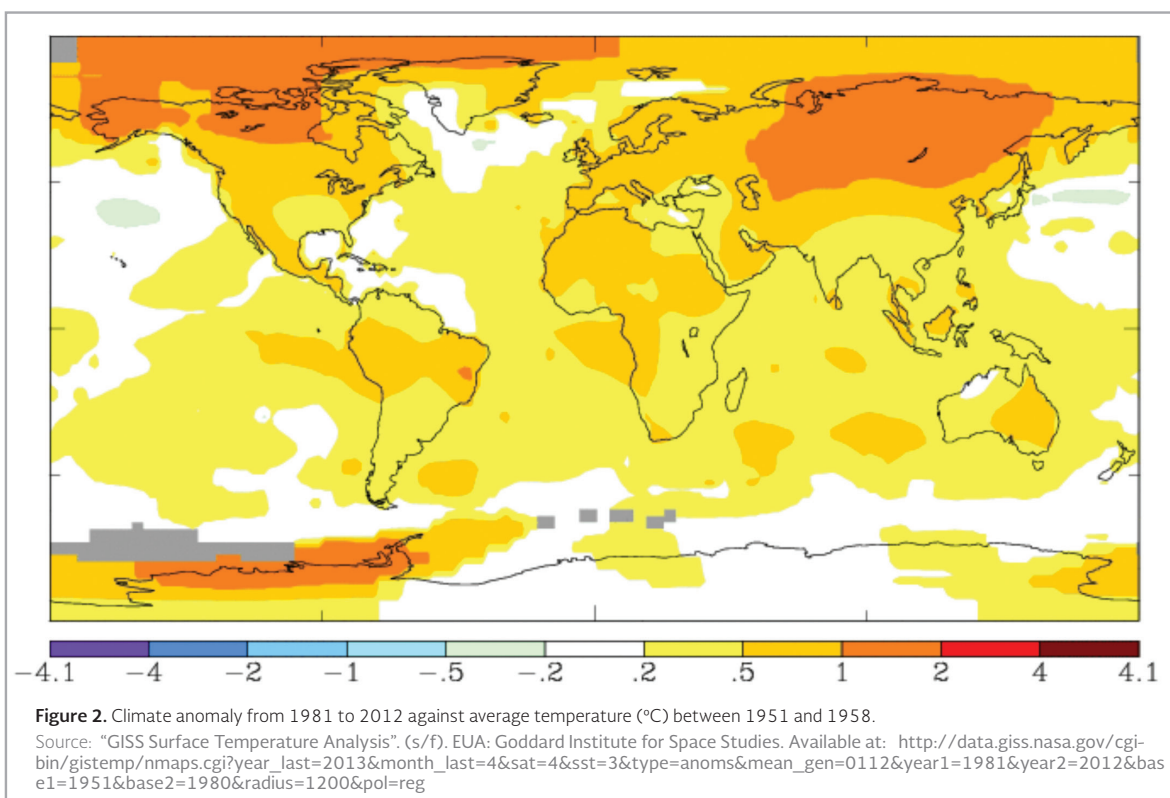
¹ Solomon, S., Qin, D., Manning, M., et al. [editors]. (2007). "Summary for Policymakers". In *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*.

² Earth System Research Laboratory. (April / 2013). *Trends in Carbon Dioxide*. Hawaii, USA: National Oceanic and Atmospheric Administration. Available at: <http://www.esrl.noaa.gov/gmd/ccgg/trends/>

³ Lüthi, D., Le Floch, M., Bereiter, B., et al. (May 15th, 2008). "High-Resolution carbon dioxide concentration record 650,000-800,000 years before present

As can be observed in figure 1, the current cyclone track is limited to some tropical and subtropical zones of the Atlantic, Indian, and Pacific oceans. However, given a situation such as that of the early Pliocene, these areas would expand through the oceans East to West. Furthermore, the strength of cyclones might increase and result not only in more hurricanes, but also of a higher intensity, which could have irreversible impacts on the biosphere.

Currently, the change in the temperature of the Earth is evident. As may be seen in figure 2, variation in global temperature between 1981 and 2010, compared to the average between 1951 and 1980, shows extreme temperature conditions, where certain regions of the planet, specially the poles, surpassed 2°C over their historical average.



Although the international community has committed to reducing their GHG emissions as part of the United Nations Framework Convention on Climate Change (UNFCCC), the efforts have not been enough and GHG concentration in the atmosphere keeps increasing. By 2100, under current conditions, the raise in temperature might reach up to 4°C over pre industrial levels ^[5]. Emissions must be considerably reduced in order to avoid this situation.

To maintain the increase in global mean temperature below 2°C, it is possible to carry out short term actions besides reducing

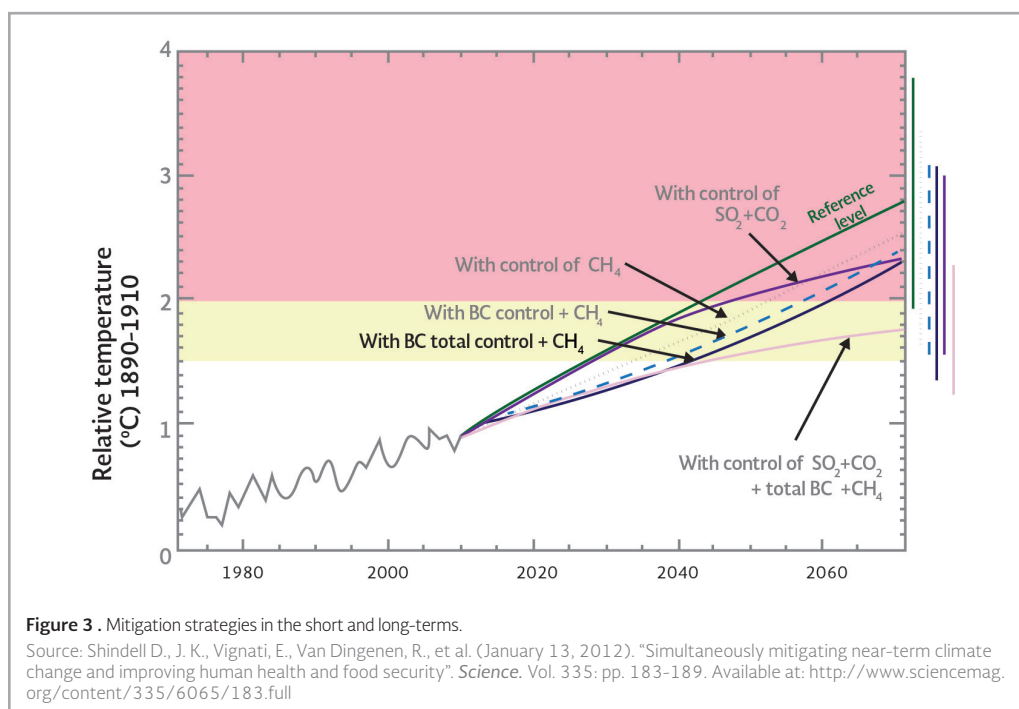
CO2 emissions. For example, several climate-forcing gases and compounds exist that can be addressed with additional strategies to those of CO2. Amongst them are the Short-lived Climate Pollutants (SLCPs), which include: black carbon (BC), methane (CH4), tropospheric ozone (O3), and some hydrofluorocarbons (HFC). Unlike other pollutants, such as CO2 whose lifespan in the atmosphere may last centuries, the lifespan of SLCPs is relatively short and can amount from days up to decades. The control of SLCPs has an impact on climate change mitigation, while also contributing to solve local air pollution problems and positively impacting public health.

⁴ Fedorov A.V., Brierley, C.M., Emanuel, K. (February 25th, 2010). "Tropical cyclones and permanent El Niño in the Early Pliocene"

⁵ The World Bank. (2012). *Turn Down The Heat, why a 4°C warmer world must be avoided*.

As can be seen in figure 3, a better control of SLCPs –such as BC and CH₄– in the short term, along with actions for the mitigation of CO₂ emissions, could avoid a larger increase in temperature. This demonstrates the relevance of including them in mitigation strategies.

Nevertheless, it is important to highlight that it is indispensable to control and reduce every greenhouse gas and compound to successfully mitigate climate change in the medium and long-term ^[6].



2.2 INTERNATIONAL CONTEXT

For over two decades, the answer to the challenge of climate change has been presented as a shared responsibility in the international negotiation arena. The UNFCCC establishes a series of mechanisms whose objective is to stabilize GHG concentrations in the atmosphere allowing for sustainable development^[7].

Since its accomplishment has not been possible yet, it is necessary to transit towards a new, legally binding, science based instrument with differentiated though comparable commitments. In the 18th Conference of the Parties of the UNFCCC (COP 18), held in Doha, Qatar, on December 2012, an amendment to the Kyoto Protocol^[8] was approved, which formalizes the entry into force of the second commitment period, and advances were made in the denominated Durban Platform for Enhanced Action. This Platform aims to develop a new protocol, another legal instrument or at least an agreed outcome with legal

force by 2015, to be implemented from 2020. At the same time, developing countries are being encouraged to elaborate Nationally Appropriate Mitigation Actions (NAMA), with the possibility of receiving support and facilitation from international funding and technologies. These actions are meant to contribute to the fulfillment of the voluntary emission reduction goals established by developing countries.

The effectiveness of multilateral agreements is being affected by the lack of commitment shown by certain countries to reduce their emissions, and to generate and manage sufficient resources for adaptation measures. The prevalent polarization of positions and the lack of leadership have hindered the overcoming of these divergences.

With this in mind, both emerging carbon markets and bilateral cooperation actions take form and value. The European Union, as well as Australia, Japan, and New Zealand, several states in the

⁶ IPCC. (2007), Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*.

⁷ Article 2 of the UNFCCC: "The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner". Available at: <http://unfccc.int/resource/docs/convkp/conveng.pdf>

⁸ The Kyoto Protocol adopted in 1997 during COP 3 establishes quantifiable objectives to reducing GHG emissions in Annex I or developed countries. Mexico adheres to this protocol as non-Annex I country. Available at: <http://unfccc.int/resource/docs/convkp/kpspan.pdf>

United States of America, and provinces in Canada, have created emission markets that promote mitigation actions, starting from emission caps and commerce measures. These markets minimize the cost of GHG reductions; promote new capacity building and the strengthening of Measurement, Reporting, and Verification systems.

In the context of international actions on adaptation, Mexico is pushing for the instrumentation of the Adaptation Framework that was approved during the COP 16 in Cancun, which establishes that adaptation should be dealt with the same level of priority as mitigation. Under this approach, national efforts on

adaptation to climate change have received technical and financial support through bilateral cooperation from Germany, the United Kingdom, and France, amongst other countries, as well as from multilateral organisms.

Tackling climate change requires international cooperation, but also, a decisive national commitment for developing effective response measures to climate change, that simultaneously provide direct benefits to the population, especially the most vulnerable.

2.3 NATIONAL CONTEXT

Mexico is highly vulnerable to the effects of climate change^[9]. Information on historical climate impact and both socioeconomic and socio-ecological trends, added to current industrialization and urbanization phenomena, as well as the indiscriminate use and consequent decay of natural resources, amongst others, represent an environmental, social, and economic problem that will grow worse due to climate change impacts. In that context, adaptation should be a central component of any effort in fighting it. With regards to CO₂ emissions, Mexico contributed

in 2011, 1.4% of global emissions mainly derived from burning fossil fuels. According to these numbers, Mexico is the 12th highest emitter in the world^[10].

Even though it could be said that its contribution is not significant if compared to that of high emitters, Mexico is a globally responsible country, which holds the conviction that economic development could and should be achieved whilst protecting the environment, since it is a public good on which every country in the world depends.

2.3.1 NATIONAL CLIMATE CHANGE POLICY AND INSTRUMENTS

General Climate Change Law

The main political instrument that the country has for tackling climate change is the General Climate Change Law. This legislation aims to regulate, encourage, and make the implementation of the national climate change policy possible. It also incorporates a long-term, systematic, decentralized, participatory and integrated approach into adaptation and mitigation actions.

The GCCL clearly determines the scope and content of the national climate change policy, and defines the obligations of State authorities and the faculties of the three government orders. It also establishes the institutional mechanisms needed to face this challenge. As stated by the Law, the Federal Government is in charge of formulating and conducting the national climate change policy based upon clearly defined principles^[11], amongst which social

co-responsibility significantly stands out.

National Climate Change System

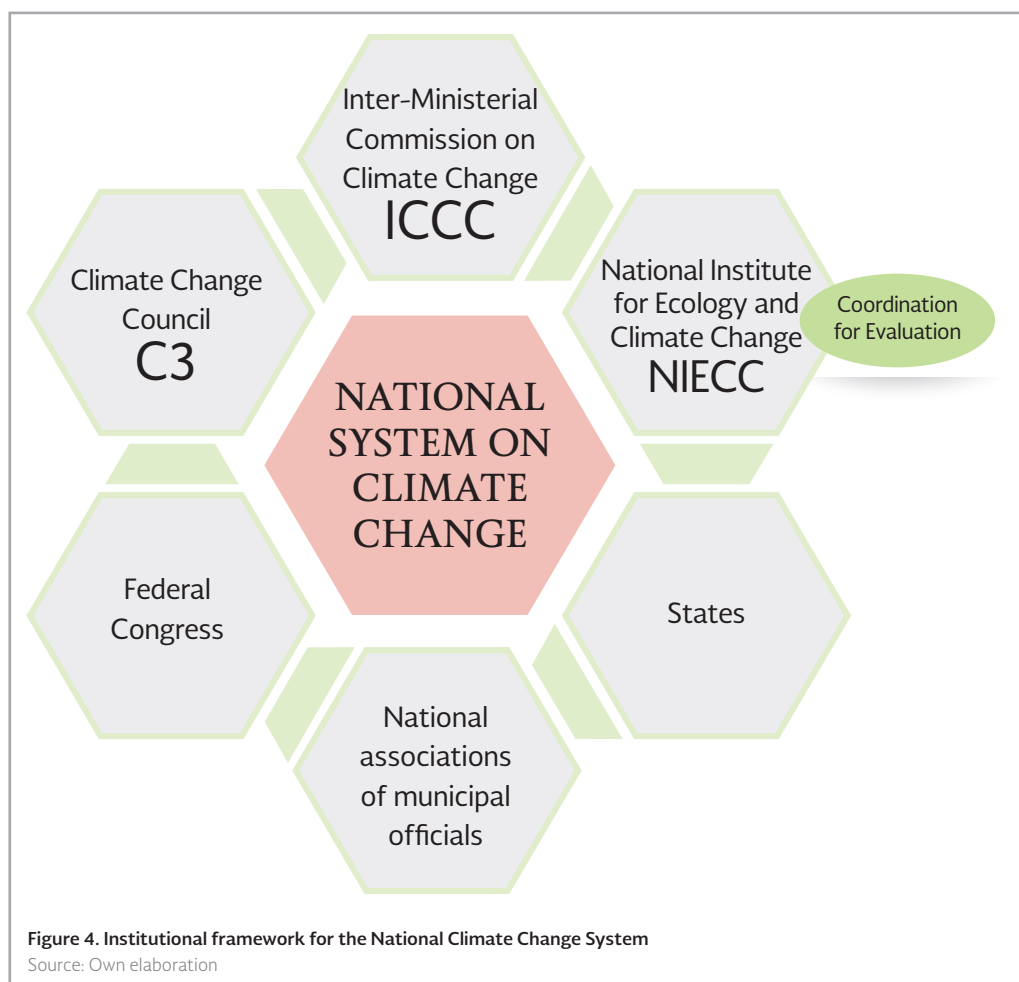
To achieve the effective coordination of different government orders, as well as the agreement between public, private, and social sectors, the GCCL foresees the integration of the National Climate Change System (NCCS). This system must favor the synergy to jointly face the vulnerability and risks of the country towards climate change, establishing priority actions in mitigation and adaptation.

The Inter-ministerial Commission on Climate Change (IMCC), the National Institute for Ecology and Climate Change (NIECC), the Climate Change Council (C₃); the States, the national associations of municipal officials and the Federal Congress integrate the NCCS. See figure 4.

⁹ Section 6.1 of this Strategy presents an assessment on the vulnerability of the country.

¹⁰ International Energy Agency. (2012). CO Emissions from Fuel Combustion. Paris, France: OECD/IEA.

¹¹ These principles are stated in section 2.3.2 of this document.



The IMCC is the permanent mechanism in charge of coordinating actions between institutions of the Federal Public Administration (FPA) in the matter of climate change. It is integrated by 13 Ministries: Ministry of the Interior (SEGOB), Ministry of Foreign Affairs (SRE), Ministry of the Navy (SEMAR), Ministry of Finance and Public Credit (SHCP), Ministry of Social Development (SEDESOL), Ministry of Environment and Natural Resources (SEMARNAT), Ministry of Energy (SENER), Ministry of Economy (SE), Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), Ministry of Communications and Transportation (SCT), Ministry of Public Education (SEP), Ministry of Health (SSA), and Ministry of Tourism (SECTUR).

The functions of the IMCC include: 1) to formulate and implement national policies on climate change mitigation and adaptation, and incorporate them into the corresponding sector programs and actions; 2) to develop criteria for the cross-cutting and comprehensive nature of public climate change policies so that they may be applied by institutions of the centralized and state-owned Federal Public Administration; 3) to approve the National Climate Change Strategy; and 4) to participate in the elaboration and implementation of the

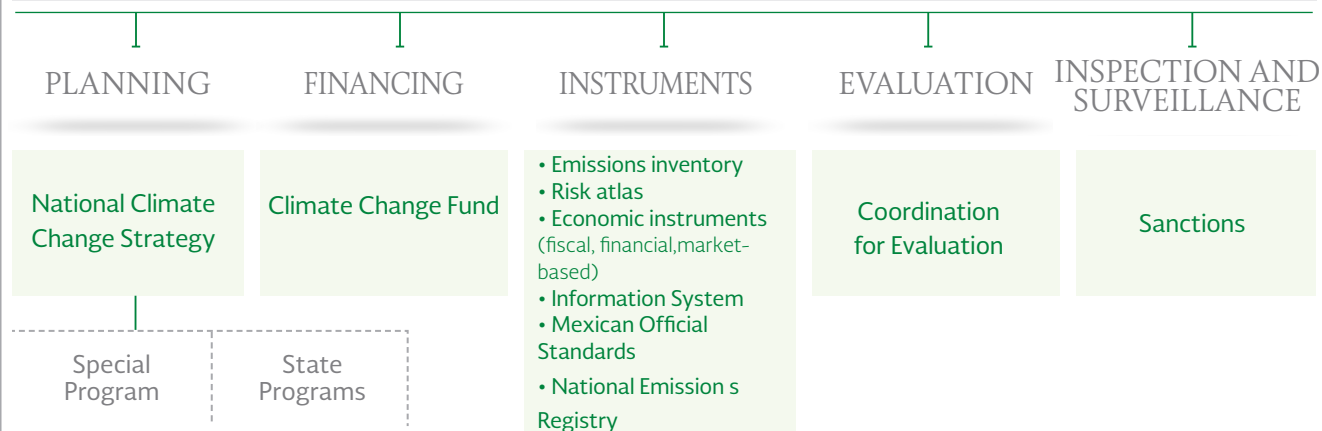
Special Climate Change Program (SCCP).

The NIECC is the research institute created by the GCCL to coordinate and carry out scientific and technological research and projects on climate change, with the assistance of public or private academic and research institutions, both, national or foreign. It is the institution in charge of making prospective sector analysis and collaborating in the elaboration of strategies, plans, programs, and instruments related to climate change. Its work includes the estimation of future costs associated with this phenomenon and the benefits derived from actions taken to confront it. The evaluation of the national climate change policy relies on the Coordination for Evaluation, comprised by the head of the NIECC and six civil society advisors, and may be conducted through one or several independent organizations.

The C3 is the permanent consultative body of the IMCC that is integrated by members from the social, academic, and private sectors, with renowned merit and experience in climate change. Some of its responsibilities include: 1) to advise the IMCC and recommend it to carry out studies, policies, and actions, and set goals to combat climate change, and 2) to promote the informed and responsible social participation, through public consultation.

GENERAL CLIMATE CHANGE LAW

INSTITUTIONAL FRAMEWORK NATIONAL CLIMATE CHANGE SYSTEM



WITH TRANSPARENCY, ACCESS TO INFORMATION, AND SOCIAL PARTICIPATION.

Figure 5. Policy instruments foreseen on the General Climate Change Law

Source: Own elaboration.

Policy instruments

In addition to the institutional framework, the GCCL foresees a series of financial, regulatory, technical, planning, evaluation, and surveillance instruments within the national climate change policy. See figure 5.

Amongst the planning instruments that the GCCL dictates, the National Climate Change Strategy stands out. Other planning instruments are the Special Climate Change Program and the State Climate Change Programs.

The GCCL also foresees different instruments, such as the National GHG Emissions Inventory, the National Emissions Registry, the Climate Change Information System, the Climate Change Fund, economic instruments, Mexican official standards, and national, state, and municipal risk atlases. Chart 1 shows some of these instruments and points out the government orders involved in them.

INSTRUMENTS FOR THE POLICY ON CLIMATE CHANGE WITHIN THE THREE ORDERS OF GOVERNMENT

NATIONAL		FEDERAL	STATE	MUNICIPAL
LEGAL FRAMEWORK	General Climate Change Law		Existing state laws on climate change	
PLANNING	National Climate Change Strategy	Special Climate Change Program	State programs on climate change	Municipal programs on climate change
INSTITUTIONAL ARRANGEMENTS	National Climate Change System National Institute for Ecology and Climate Change	Inter-ministerial Commission on Climate Change Climate Change Council	State Inter-ministerial Commissions on Climate Change ³	
INSTRUMENTS	National Emissions Registry National Emissions Inventory National Risk Atlas Information System	Mexican Official Standard	State Emissions Inventory State Risk Atlas	Vulnerable Municipalities Risk Atlas
EVALUATION	Coordination for Evaluation (NIECC)	Coordination of Evaluation (NIECC)	State program evaluation procedures	Municipal program evaluation procedures
FUNDING	Climate Change Fund	Climate Change Fund	Climate Change Fund and State funds	Climate Change Fund and other resources management

¹ By February 2013, five state climate change laws had been published: Veracruz (November 2010), Chiapas (December 2010), Federal District (June 2011), Quintana Roo (May 2012), and Baja California (June 2012).

² In the Fifth National Communication to the UNFCCC it is mentioned that eight states have this kind of programs: Chiapas, Federal District, Guanajuato, Hidalgo, Nuevo Leon, Puebla, Tabasco, and Veracruz.

³ In the Fifth National Communication to the UNFCCC it is mentioned that sixteen states have this kind of commissions: Campeche, Coahuila, Distrito Federal, Durango, Guanajuato, Guerrero, Jalisco, Michoacan, Queretaro, Quintana Roo, San Luis Potosi, Tabasco, Tamaulipas, Tlaxcala, Veracruz, and Yucatan.

Chart 1. Instruments for the policy on climate change within the three orders of government.

Source: SEMARNAT. (2012). Fifth National Communication to the UNFCCC. Mexico: Federal Government. Available at: <http://www2.ine.gob.mx/publicaciones/download/685.pdf>

2.3.2 GUIDING PRINCIPLES FOR THE NATIONAL CLIMATE CHANGE POLICY

The guiding principles that support the National Climate Change Policy, as well as the National Climate Change Strategy are based on the GCCL and include the following:

- » Sustainability in the exploitation or use of ecosystems and natural resources
- » Co-responsibility between the State and society
- » Precaution when faced with uncertainty
- » Prevention of environmental damage and preservation of ecological equilibrium
- » Adoption of responsible production and consumption patterns
- » Comprehensiveness and cross-cutting nature in the adoption of a coordinated and cooperative approach between orders of government, as well as with social, public, and private sectors
- » Effective citizenship participation
- » Environmental liability
- » Transparency, and access to information and justice
- » Commitment to the economy and economic development without undermining competitiveness in international markets



Joanna Acosta/CONABIO Photobank

3.OBJECTIVE OF THE NATIONAL CLIMATE CHANGE STRATEGY

3.1 OBJECTIVE

The National Climate Change Strategy is the guiding instrument of the national climate change policy, both in the medium and long-term, to face the impacts of climate change and to transition towards a competitive, sustainable low-carbon emission^[12] economy. As the guiding instrument and based on the available information, it describes the strategic axes and lines of action to be followed, in order to orient the policies of the three orders of government, and to encourage the co-responsibility of the society. This aims to address national priorities and to achieve the long-term vision for the country ^[13].

3.2 SCOPE

It is worth mentioning that the Strategy is not exhaustive and does not intend to define concrete short-term actions or specific responsible federal institutions. At the federal level, the Special Climate Change Program will define for each six year term, the objectives and specific actions and goals for mitigation and adaptation, as well as the allocation of responsibilities. In accordance with the GCCL, State and Municipal Climate Change Programs at the local level will do the same.

The medium and long-term goals will be achieved through the aforementioned planning instruments, the effective operation of the institutional framework established by the GCCL, the development of economic instruments and the design of technical tools that are consistent with this Strategy.

3.3 ELABORATION PROCESS

The technical and scientific inputs have been provided mainly by NIECC and other research centers across the country dedicated to the subject. The Strategy presents the state of the art on all covered topics, aiming to reflect the latest developments. All sources used are referenced throughout the document.

The use of the following documents published in 2012 was noteworthy to the formulation of the pillars, axes and lines of action:

- » Adaptation to Climate Change in Mexico: Vision, Elements, and Criteria for Decision Making. (IMCC, 2012).
- » Bases for Low-emission Development in Mexico. (NIECC, 2012).

In observance of the GCCL, the Strategy has been elaborated by SEMARNAT with the participation of the NIECC. It has been enriched with formal contributions from every federal institution within the IMCC and with the ideas derived from bilateral meetings with climate change areas of the Federal Public Administration (FPA). The Strategy was also reinforced through an ample participative and consultative process. Firstly, input was received from Core Advisory Councils on Sustainable Development^[14] in all states. Secondly, input was also received from the workshop carried out in the Federal District, in which there were over 80 representatives from the organized civil society, and the academic, private and social sectors, most of whom were climate change experts^[15]. Thirdly, input was also received through a nationwide online consultation^[16]. On top of this, vital contributions by the Climate Change Council were added to the Strategy.

¹² Article 60 of GCCL

¹³ The Vision of Mexico to tackle climate change is defined in Chapter 4 of this document.

¹⁴ Core Advisory Councils on Sustainable Development are plural spaces integrated by actors from private, academic, and governmental sectors.

¹⁵ This workshop was held on April 12th, 2013, at the Royal Pedregal Hotel, in Mexico City.

¹⁶ The consultation was available between April 8th and the 26th, 2013 on at SEMARNAT website. 12,900 participants were registered, whose information was systematized, analyzed, and evaluated. This public consultation was supported by GIZ on behalf of the BMU

3.4 STRUCTURE

Recognizing that the achievement of the adaptation and mitigation objectives requires a strong policy that supports national development, the National Climate Change Strategy introduces a chapter about the pillars of the national climate change policy. In other words, the national policy on climate change serves as a foundation for the topics of adaptation and mitigation.

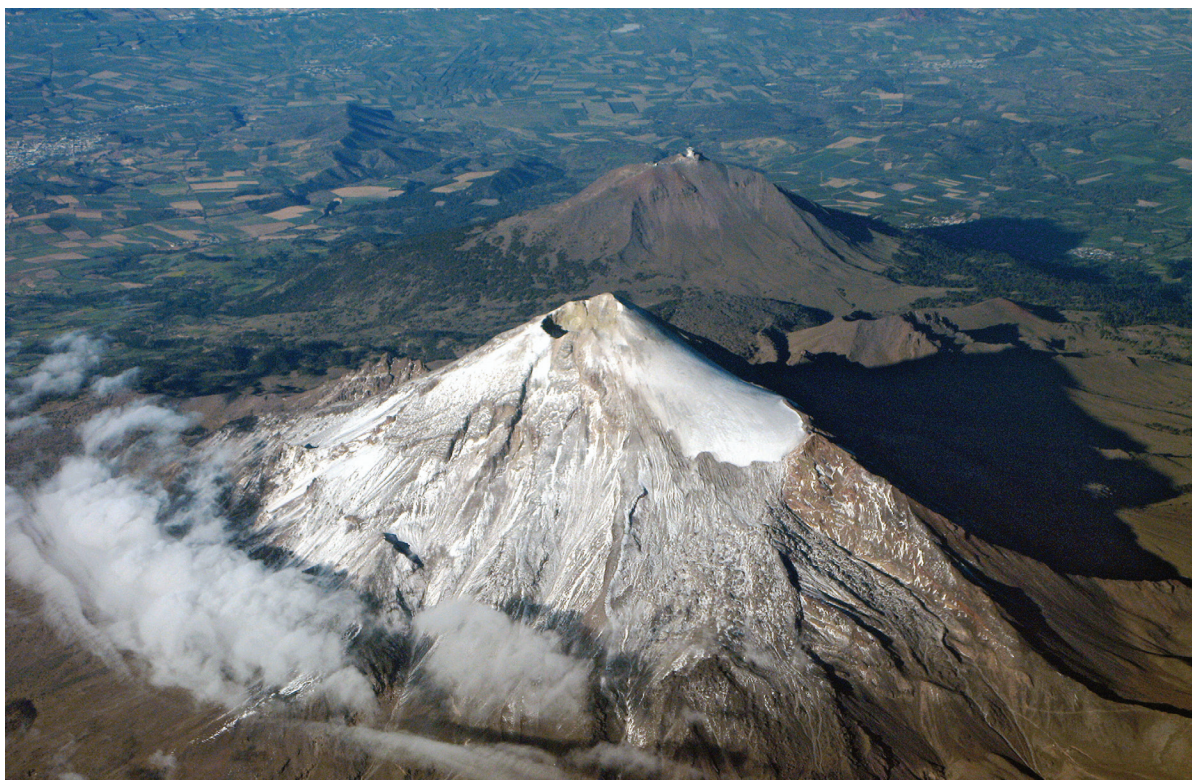
The Strategy is integrated by the three following topics:

	Topic	Terminology
1	Pillars of the national climate change policy	P
2	Adaptation to the effects of climate change	A
3	Low-emissions development / Mitigation	M

Each of these topics incorporates a brief diagnosis of the situation in the country:

- » **Pillars of the national climate change policy** integrate a brief analysis of the policy on climate change. It is complemented by the contents in section 2.3.1.
- » **Adaptation to the effects of climate change** includes climate scenarios as well as a vulnerability and adaptive capacity assessment of the country. The technical foundations are integrated in the methodological annex, available at: www.encc.gob.mx
- » **Low-emission development / Mitigation** incorporates an assessment of the emissions of the country, the mitigation opportunities, the baseline emissions and scenario, and the target trajectory of emissions. The technical rationale is integrated in the methodological annex, available at: www.encc.gob.mx

Each of these topics contains a section describing the policy pillars or the strategic axes and the lines of action. The objectives are more deeply defined in the pillars and axes, inasmuch as they include the variety of actors involved, the actions and perspectives, and the resources needed to achieve them. The Strategy defines six pillars of the national climate change policy (P); three strategic axes in the subject of adaptation (A) that lead us into a resilient country; and five strategic axes in the subject of mitigation (M) that will guide us towards a low-emission development. In Figure 6, the pillars and strategic axes are shown.



Humberto Bahena/ CONABIO Photobank

PILLARS OF THE NATIONAL CLIMATE CHANGE POLICY

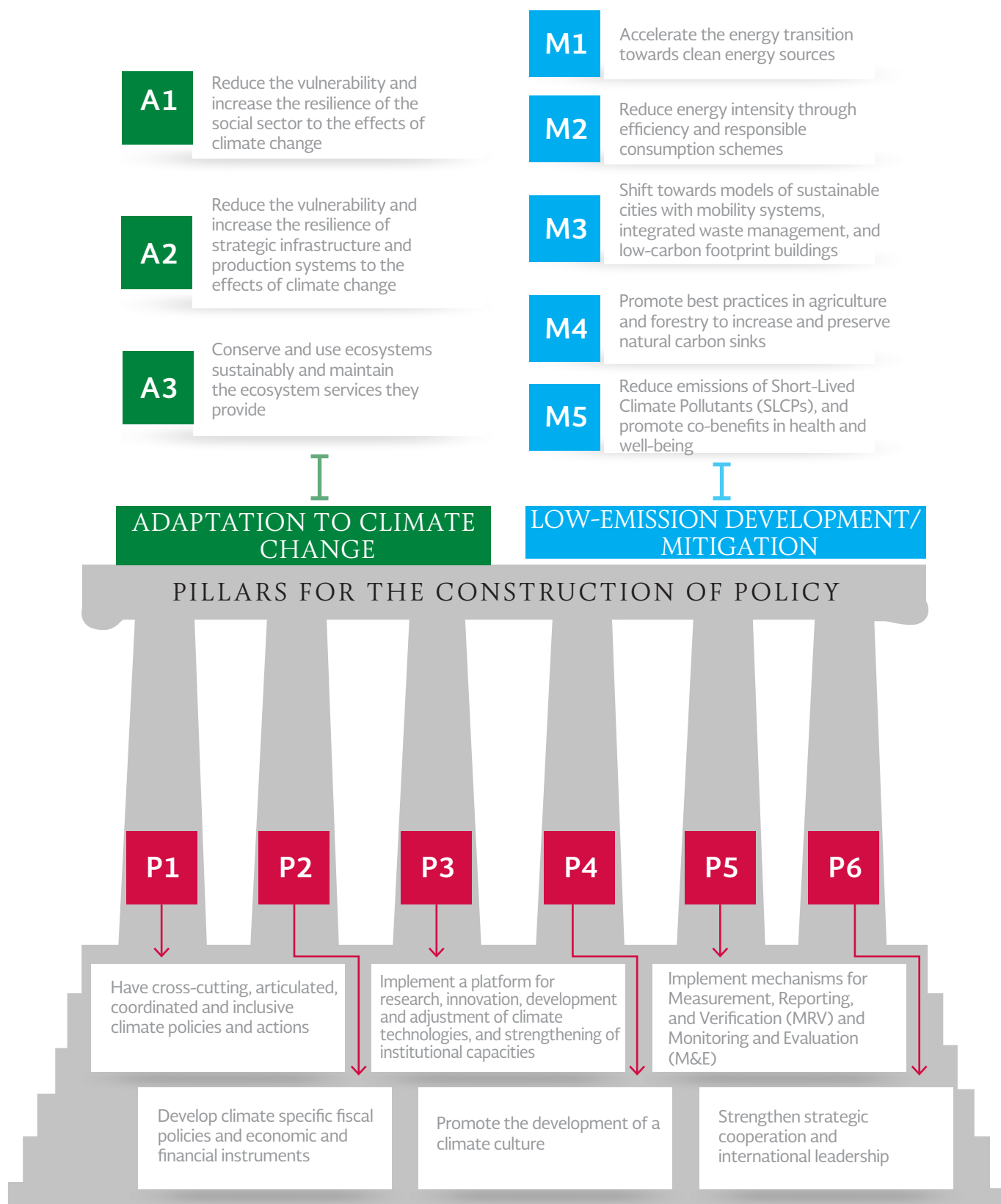




Figure 6. Structural map of the National Strategy for Climate Change
Source: Own elaboration.

The pillars and strategic axes contain lines of action, which are guidelines that involve different activities and require participation, integration, and continuity. They are presented in order of relevance, pointing out the critical aspects that will determine their success.

Some lines of action are more specific than others, because they are intended to overcome the barriers to the mitigation and adaptation objectives. In those cases, an icon indicates the strategic axis that is being favored (A1, A2, A3, M1, M2, M3, M4, M5). In addition, the icon  points out the necessity of social participation for its fulfillment, whether from the private, academic or social sectors. Finally, the letter “T” indicates when all the strategic axes are involved.



P1.14 To encourage inter-state and inter-municipal association of producers and other technical public agents towards an environmental management that is coherent in a landscape unit level. **A2, A3, M4, **

Both adaptation and mitigation sections include prioritization criteria. Considering the limited resources for the execution of mitigation and adaptation actions, this section offers criteria to decision makers so that they might capitalize actions in the three orders of government, according to their respective competencies.



Manuel Grosselet/CONABIO Z

4. 10 / 20 / 40 VISION

Mexico grows sustainably and promotes a sustainable, equitable, and efficient management of its natural resources, as well as the use of clean and renewable energies; allowing a low GHG and compound emission development. Mexico is a thriving, competitive, socially inclusive, and globally responsible country, which generates enough well-paid jobs for the whole of its population, especially for the most vulnerable. Mexico has a green economy and sustainable cities, and is also a nation with ecosystems and population that are resilient to climate change.

The following chart identifies milestones for the following 10, 20, and 40 years that would allow us to reach said vision.

AREA	10 YEARS
SOCIETY/ POPULATION	<ul style="list-style-type: none"> ➔ Attention is given to the most vulnerable groups to the effects of climate change. ➔ Society is involved and actively participates in the subject of climate change.
ECOSYSTEMS (WATER, FORESTS, BIODIVERSITY)	<ul style="list-style-type: none"> ➔ The most vulnerable ecosystems are protected and receive both attention and capital flow. ➔ Ecosystemic management and sustainable management become axes for the conservation strategy. ➔ Actions for conservation and sustainable use are implemented across the country. ➔ Integrated territorial management schemes are implemented. ➔ Appropriate financing schemes to promote sustainable landscapes. ➔ Technical and technological tools for local adaptation exist and are used ➔ Strategies are implemented for the transition to a zero percent rate of carbon loss in original ecosystems.
ENERGY	<ul style="list-style-type: none"> ➔ Clean technologies are integrated to the national productive development. ➔ Socioeconomic schemes encourage the use of clean energy. ➔ Incentive system promotes the larger advantages in the use of non-fossil fuels, energy efficiency, power saving, and sustainable public transportation versus the use of fossil fuels. ➔ Near to reach 35% of electricity generation from clean sources.
EMISSIONS	<ul style="list-style-type: none"> ➔ 30% emissions reduction compared to baseline ➔ Mexico substantially reduces emissions of Short-Lived Climate Pollutants ➔ Parastatal industries implement energy efficiency schemes in all its operations and increase the use of renewable energy ➔ Urban centers whose population are larger than fifty thousand inhabitants have waste management infrastructure to prevent methane (CH₄) emissions to the atmosphere.
PRODUCTIVE SYSTEMS	<ul style="list-style-type: none"> ➔ Environmental impacts in the production sector are understood, acknowledged, monitored and tackled.. ➔ Production technologies and practices contribute in the diminishment of climate change risks. ➔ NAMAs (Nationally Appropriate Mitigation Actions) are implemented in various economic sectors.
PRIVATE SECTOR / INDUSTRY	<ul style="list-style-type: none"> ➔ Enterprises incorporate climate change criteria in their production projects. ➔ Main sources of GHG report their emissions component in the National Emissions Registry. ➔ Enterprises reduce their gas and compound emissions, and take advantage of opportunities in energy efficiency, power saving, and use of clean and renewable energy.
MOBILITY	<ul style="list-style-type: none"> ➔ Both public and private sectors adopt sustainable mobility systems. ➔ Socioeconomic schemes encourage the use of sustainable transportation. ➔ Common use of electric vehicles in public transportation.

Chart 2. 10 / 20 / 40 years route. Source: Own elaboration

20 YEARS

- Society is committed to the task of reducing the effects of climate change.
- Human settlements have expanded their capacity to adapt to the strikes of climate change.

- Ecosystems and their inhabitant species are conserved and used sustainably.
- Natural resources are economically valued in a correct and adequate way.
- Sufficient infrastructure exists for a sustainable and efficient management of water.
- Efficient use of hydric resources helps restoring ecological and physical functions of water bodies.
- The economic and social development of the country is enhanced by improving its natural capital.

- At least 40% of electric power generation comes from clean sources.
- Power generation through clean sources creates jobs, including vulnerable sectors.
- Residential, tourism, and industrial sectors use of various clean energy sources, energy efficiency and power saving schemes.

- Economic growth decoupled from the dependency on fossil fuels and their environmental impacts.
- Short-lived Climate Pollutant emissions are minimized.

- Positive rate in forest carbon sinks.
- Sustainable forest management stops deforestation
- Sustainable management practices in extractive, agricultural and livestock and forestry sectors increase productivity, reduce vulnerability and conserves land.

- Enterprises integrally manage their wastes.
- Production and sustainable consumption schemes are implemented.

- Freight transportation is multimodal, efficient and low emissions
- Cargo transportation is multimodal, efficient, and low-emission.

40 YEARS

- Society is culturally and socially integrated to tackling climate change.
- Low vulnerable rural society

- Hydric balance is ensured through sustainable and efficient use of water.
- Conservation and sustainable use of ecosystems help them improve their resilience against climate change.
- Local levels of resilience are adequate.

- Clean energy generation supports economic development of every production sector in a sustainable and equitable way.
- At least 50% of energy generation comes from clean sources.

- 50% emissions reduction compared to those of 2000.

- Production systems are resilient to the effects of climate change.

- Enterprises have sustainable production cycles.

- Common use of trains and electric vehicles

5. PILLARS OF THE NATIONAL CLIMATE CHANGE POLICY

5.1 ASSESSMENT

Climate change poses several challenges to every sector in Mexican society; attending to them requires an effective and coherent coordination between the actors and institutions involved. This is a brief diagnosis of some pillars of the national climate change policy:

Cross-cutting public policy

During the last few decades, and through the design and management of the national climate change policy, a general action framework against climate change has been built. Its best reference is the GCCL, which establishes the attributions and competencies for each order of government, as well as the institutional, planning, economic, financial, sanctioning, and surveillance instruments for climate policy. These instruments are framed within the guiding principles of this document, amongst which social co-responsibility stands out. Likewise, the GCCL establishes national medium and long-term goals, as well as their deadlines.

Climate change is a crosscutting challenge because it involves a variety of society sectors and orders of government. Thus, the fight against it requires the integration of multiple and diverse actors. The government is endowed with instruments that need focalization to regional, state, and local realities. However, to the date of publication of this Strategy, one fourth of the Mexican states had finished the elaboration of their State Climate Change Programs; five states had state legislation on climate change; and the elaboration of climate change programs have begun at the municipal level.

Economic, financial, and fiscal instruments

To fulfill the actions for tackling climate change, the support of accessible, opportune, and sufficient economic resources is needed. The limited resources of the country in the face of a diversity of challenges, forces us towards a more efficiently planning. In spite of this, fiscal, financial, and economic schemes that generate inefficient exploitation of natural resources, and accentuate the economic breach persist in Mexico. Advancing towards best practices requires a new way of planning such schemes, as well as the creation of new figures, instruments, regulations, policies, and programs for a more responsible resource

management, which will result in better living conditions for the population. Examples refer to the conservation of ecosystems and the species that inhabit them; the sustainable exploitation of forests and wildlife; the establishment of an effective control on protected natural areas; the creation of an economic value for environmental services; the adjustment of gasoline prices; and, finally, the implementation of new pricing schemes for the largest water and power consuming sectors. Nevertheless, none of the above is sufficient when faced with the multiple needs in matters of climate change and sustainable development.

The performance in this subject puts the country in the spotlight of the international community, as well as of cooperation agencies; international organisms, and even the international private sector, which have identified action opportunities against climate change in our country. However, Mexico is not the only country that has demonstrated high competitiveness proposing and executing initiatives to stop climate change. Therefore, the generation, ordainment, prioritization, canalization, application, and supervision of financial, economic, and fiscal resources, is a priority that will allow for a solid support of the national climate change policy in the face of eventual funding sources.

Research, development and technology adoption

For fighting climate change, it is fundamental to generate formal knowledge and to apply it in techniques, procedures, and technologies through the use of science, technological innovation, and education so to protect and maintain sustainable development. Research on climate change is relatively new in Mexico; therefore, the production of knowledge about it has become extremely significant and requires an ongoing dedication from the three orders of government, academic institutions (universities and research networks, amongst others), the production sector, and society as a whole.

There are in Mexico some supporting schemes such as higher education programs in governmental institutions, as well as research programs within the NIECC. Efforts are also being carried out to promote adaptation actions and to strengthen those meant for mitigation. However, we need to integrate in a single platform the research on the climate change

effects, the development of mitigation technology, and the identification of best practices to face this phenomenon. This should be accomplished in order to propitiate and integrate knowledge and focalize it on the different regions of the country. The requirements in the matter include: research on habitat fragmentation through land management; vulnerability assessment of the population; identification of infrastructure projects; equipment of the production sectors as a measure of adaptation; production sector related research; encouragement of technologies for climate parameters measurement; clean energy production followed by patent generation; waste management, etcetera.

Building of a climate culture

Mexico has a growing population that is increasingly plural and dynamic, and that both produces and demands intellectual, cultural, and scientific resources. Education and knowledge are indispensable tools for citizens to exercise their rights, acknowledge their responsibilities, and become capable of well-founded decision-making in everyday life. In our country, the scope of basic level schooling is practically universal, which makes it an effective vehicle for spreading climate change information. Besides, elementary and middle level schools already teach principles of environmental education. Also, training programs about sustainability and climate change have been implemented in the private, social, and academic sectors. A few products and services already inform consumers of their ecologic footprint, but those that take into account and inform their users about the emissions generated during their life cycle, are very few.

A study was conducted from 2009 to 2012, to measure the

climate change perception level amongst the average citizen¹⁷. In 2009, 87% of the polled population said they were concerned about climate change; in 2012, almost 97% of the polled said they were very, somehow, or a little concerned about climate change, and less than 4% said they were not worried at all. These results show that Mexican population is concerned about the matter. The proposed lines of action of this Strategy will serve as a guide for citizens to co-responsibly protect the environment.

Social participation, transparency, access to information and justice

This Strategy emphasizes the 10th principle of the 1992 Rio Declaration on Environment and Development: "Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities [...] and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided."

The introduction of "environmental responsibility" to our Constitution through an amendment to its 4th article in February 2012, along with the recent approval of the Environmental Responsibility Federal Law in April 2013, will allow individual access to the national justice system and the chance to demand the remedy of environmental damage. This gives society the opportunity of asserting the right to a healthy environment and also to achieve one of the GCCL objectives.



Educación/Semarnat Social Communications Office Photobank

¹⁷ National Study on Climate Change Perception. (2009). Mexico: CECADESU. / National Study on Climate Change Perception. (2010). Mexico: CECADESU. / National Study on Climate Change Perception. (2011). Mexico: CECADESU. / Assessment on Climate Change Social Perception. (2012). Mexico: CECADESU

Measurement, Reporting, and Verification and Monitoring and Evaluation

The Measurement, Reporting, and Verification instruments, along with those for Monitoring and Evaluation, ensure transparency and certainty of action, whilst also guaranteeing environmental integrity, comparability, consistence, transparency, and data accuracy. The MRV and M&E methodologies ensure the quality of adaptation and mitigation actions; therefore they are useful in the design, implementation, and evaluation of the national public policy on this subject. There is favorable international perception for the usage of these methodologies to the point that schemes are built upon them for the accompaniment and association between developed and developing countries, in order to exchange knowledge and experience. Mexico has actively participated in the setting of international criteria that define the use and scope of methodologies, and has begun training to incorporate MRV and M&E into its own activities against climate change. Regarding this National Strategy, the GCCL mandates that the national climate change policy is sustained on essential MRV and M&E activities, thus the three orders of government must assume an active task incorporating these criteria in their government and public policies schemes.

Strategic cooperation and international leadership

Mexico has sought to be a relevant actor amongst developing countries, and generally amongst those committed with the effective combat of climate change. The country is a part of the UNFCCC and the Kyoto Protocol. Besides, Mexico served as president and host of COP 16 in 2010, and participates in other instruments and international schemes related to climate change. Thus, Mexico actively participates in the negotiations to secure, improve, and perfect the corresponding international

regime. This has resulted in a significant leadership that seeks to strengthen and secure its position within Latin America and the Caribbean through South-South cooperation.

Mexico aspires to retain and increase its international recognition, whilst seeking to translate it into the achievement of more and better global agreements. For that, it pursues to position as a key actor in the region, which would also serve as a bridge to other developing countries. A solid national commitment will set an active participation standard directed towards solving the main problems faced by the international community whilst fighting climate change.

The drive and importance this topic has gained in Mexico is prominent. However, it is necessary to reinforce past achievements and to generate better results in the future through the exploration of new ways to implement public policies that will reach the whole population. Pending tasks mainly refer to the coordination between the orders of government, and their institutions, and of them with the rest of society. This would be achieved through the implementation of new governance schemes; the inclusion of all society sectors in the decision-making process, and the generation of a strong sense of shared responsibility that will allow the establishment of useful institutional agreements to combat climate change. In the following years, Mexico must set action standards that allow for the lines of action proposed in this Strategy to be implemented in a coordinated, coherent, cross-cutting manner, striving to achieve the objectives set for the country. Therefore, the pillars of the national climate change policy constitute the cornerstone of this National Climate Change Strategy.



Commuter train / SCT Photobank

5.2 POLICY PILLARS AND LINES OF ACTION



P1 HAVE CROSSCUTTING, ARTICULATED, COORDINATED AND INCLUSIVE CLIMATE POLICIES AND ACTIONS

The effective instrumentation of national climate change policy requires crosscutting coordination between sectors and actors, the revision of the judicial framework in order to avoid opposition, and the inclusion of all social groups. The articulation of these actors and instruments is indispensable for the execution of adaptation and mitigation policies and actions posed in the National Climate Change Strategy.

LINES OF ACTION:

- ➔ **P1.1** To integrate objectives and goals for climate change adaptation and mitigation into the National, State and FPA sector Plans and Programs. [E]
- ➔ **P1.2** To implement the National Climate Change System as a coordination mechanism between public, private, and social sectors, and as a platform for articulated planning between orders of government. [E, S]
- ➔ **P1.3** To guarantee the involvement of academic, private, and social sectors through the Climate Change Council as a support in the IMCC decision-making. [E, S]
- ➔ **P1.4** To develop, harmonize, and strengthen the current legal framework, incorporating climate change criteria through the coordination between the Executive and Legislative Branches in the three orders of government. [E]
- ➔ **P1.5** To promote the access of individuals to environmental justice and remediation of environmental damage *in natura* whenever possible, or else to the compensation in priority zones for climate change. [E]
- ➔ **P1.6** To consolidate the climate change institutional framework through intersectoral, crosscutting agreements, and the creation of climate change specific areas and local advisory groups, amongst others, within the three orders of government and sectors of society. [E, S]
- ➔ **P1.7** To consider gender, ethnicity, disability, inequality, wellbeing, and inequity in the access to public services, whilst designing climate change policies, as well as the involvement of different sectors of society in their implementation. Wherever it may concern, introduce the principle of “free, prior, and informed consent”. [E, S]
- ➔ **P1.8** To implement intersectoral mitigation and adaptation actions through the coordination and concurrence between federal institutions, and with both public and private actors [E, S]
- ➔ **P1.9** To guarantee the integration of climate change adaptation and mitigation criteria in political instruments such as the evaluation of environmental impact; general, state, and municipal land-use planning; ecological marine planning, and land-use planning for tourism and urban development. [A1, A2, A3, M3, S]
- ➔ **P1.10** To align land-use planning, urban development, sustainable buildings, housing, energy, transport, mobility, green areas, coastlines, comprehensive waste management, and water policies, in order to reduce the carbon footprint of human settlements. [M3]
- ➔ **P1.11** To guarantee crosscutting integration of water-related criteria in the formulation and implementation of climate change policies. [A1, A2, A3, M1, M3, M4]
- ➔ **P1.12** To guarantee the coherence between climate change and rural sustainable development policies, programs, and institutional agreements, towards the attention of deforestation and woodland degradation as a multifactorial problem in the three government orders. [A2, A3, M4]
- ➔ **P1.13** To introduce climate change criteria for articulating and improving legislation, policies, and instruments that promote sustainable forest management. [A2, A3, M4]
- ➔ **P1.14** To encourage inter-state and inter-municipal association of producers and other technical public agents towards an environmental management that is coherent in a landscape unit level. [A2, A3, M4, M5, S]
- ➔ **P1.15** To create and strengthen local institutions for the regulation and planning of regional and metropolitan transportation, particularly in terms of mobility, infrastructure optimization, transportation routes, and deficiency minimizing. [M3, S]
- ➔ **P1.16** To guarantee the consistency between instruments and programs of the agriculture, fishing, forestry, and urban sectors, in order to achieve synergy in matters of adaptation and mitigation, and to avoid their contradiction. [A2, A3, M3, M4, S]
- ➔ **P1.17** To encourage the evaluation of environmental impact in sectoral programs and projects. [E]
- ➔ **P1.18** To strengthen existent epidemiological surveillance systems and to include in the design of actions for epidemiological attention, the climate change related health impacts such as infectious intestinal disease; acute respiratory infections; food-poisoning related with phenomena like red tide, and attention to population affected by disasters as hurricanes and flooding. [A1]



P2 DEVELOP CLIMATE SPECIFIC FISCAL POLICIES AND ECONOMIC AND FINANCIAL INSTRUMENTS

To effectively fulfill the actions against climate change, the support of accessible, opportune, and sufficient economic resources is needed. Simultaneously, economic signals need to be sent to reflect the cost of environmental damage of greenhouse gases and compounds. Mexico can increase the use of economic instruments. The development of climate specific fiscal policies and economic instruments will promote a low-emission economic development and will raise competitiveness.

LINES OF ACTION:

- ➔ **P2.1** To design a national policy of economic, fiscal, financial, and market-based instruments in order to incentivize mitigation and adaptation actions, including the use of focalized subsidies, the elimination or decoupling of inefficient subsidies, and the creation of both public and private financial instruments. [E]
- ➔ **P2.2** To establish the mechanisms needed to turn the Climate Change Fund into an efficient and effective platform for the canalization of resources provided by other funds, including those of international origin. [E]
- ➔ **P2.3** To assign enough budgetary resources to execute adaptation and mitigation actions, and allocate them in federal, state, and municipal budgets. [E]
- ➔ **P2.4** To articulate existent national funds and other financial sources in order to foster climate change actions. [E]
- ➔ **P2.5** To ensure that economic and financial resources are canalized to the attention of priority climate actions and that social and environmental safeguards are considered. [E, ✖]
- ➔ **P2.6** To match the available public and private financial resources with the priority actions for mitigation and adaptation that need financial support. [✖]
- ➔ **P2.7** To promote sustainable production in the country through the use of economic incentives. [E]
- ➔ **P2.8** To favour the funding of national research and technology development for climate change adaptation and mitigation. [✖]
- ➔ **P2.9** To encourage new economic and financial mechanisms, including NAMAs and possible emissions markets, in order to incentivize mitigation actions. [M1, M2, M3, M4, M5, ✖]
- ➔ **P2.10** To define energy prices according to a life cycle analysis that considers externalities, including the cost of greenhouse emissions. [M1, M2]
- ➔ **P2.11** To redefine the current energy and water subsidies structure in order to increase efficiency both in power and water consumption. [M2, M4]
- ➔ **P2.12** To gradually adjust residential electricity and water prices to market prices, compensating the vulnerable groups through targeted measures. [M1, M2]
- ➔ **P2.13** To redirect fossil fuel subsidies in order to strengthen sustainable, efficient, and safe public transportation, as well as the railway system, amongst others. [M2, M3, M5]
- ➔ **P2.14** To guarantee the incorporation of climate change criteria in development bank guidelines for favoring projects that involve renewable and clean energies, and that promote the transition towards less carbon-intensive technologies. [M1, M2, M3, M4, M5]
- ➔ **P2.15** To encourage a mechanism to promote voluntary carbon markets, including forest carbon. [A3, M4]
- ➔ **P2.16** To identify, strengthen or create specific economic and financial instruments that incentivize the restoration, conservation, sustainable use, and resilience of ecosystems and the ecosystem services they provide. [A3, M4, ✖]
- ➔ **P2.17** To design and adjust economic and financial instruments and incentives for REDD+, whilst guaranteeing a fair and equitable distribution of the benefits obtained for avoiding emissions. [A1, A2, A3, M4, ✖]
- ➔ **P2.18** To consolidate the participation of social and private sectors in financial and market-based mechanisms that promote climate change adaptation and mitigation. [M4, ✖]



P3 IMPLEMENT A PLATFORM FOR RESEARCH, INNOVATION, DEVELOPMENT AND ADJUSTMENT OF CLIMATE TECHNOLOGIES AND STRENGTHENING OF INSTITUTIONAL CAPACITIES.

In order to make the right choices for climate change abatement and adaptation, our country needs to produce scientific and technological knowledge articulated on a broadcasting platform. This will allow creating synergies, promoting collaboration and avoiding duplicity. Technology innovation will permit developing new production capacities as well as the recovery of economic resources. Simultaneously, Mexico needs to create national capacities in the three government orders through training in adaptation and mitigation priority matters. The training of decision-makers as a base for the formulation of policy will allow the appropriation of knowledge and its successful application.

LINES OF ACTION:

- ➔ **P3.1** To create and operate an information platform in order to make publicly available the advances in the climate change national research. [E, R]
 - ➔ **P3.2** To develop and operate national, regional, and local research as well as technological exchange and development platforms, in order to communicate state, municipal, and regional priorities, as well as to establish consortiums for research, development, and innovation in low-emission services and technologies. [E]
 - ➔ **P3.3** To generate mechanisms for the decision-making of every governmental and social actor to be founded on scientific information and knowledge of climate change. [E, R]
 - ➔ **P3.4** To promote the elaboration of climate change scientific and technological research studies and projects, within a state, regional and municipal scope through research consortia that favors an effective coordination between academic and research public, private, national and international institutions. [E, R]
 - ➔ **P3.5** To identify, systematize, analyze, and disseminate existing climate change knowledge in the country, according to national requirements, in order to serve as the foundation of the national climate change policy. [E]
 - ➔ **P3.6** To encourage research and focus technological innovation actions on assessing vulnerability and designing adaptation measures, by region, ecosystems, population settlements, equipment and infrastructure, production sectors, and social groups; in order for the country infrastructure to be prepared for the risks of disasters caused by climate change, and for the existence of technology that allows Mexico becoming an emergent power in the following years. [A1, A2, A3]
 - ➔ **P3.7** To ensure academy-industry linkage for the development, appropriation, and technology transference for reducing and controlling greenhouse gases and compounds. [M1, M2, M3, M4, M5, R]
 - ➔ **P3.8** To encourage research, development and national adjustment of advanced technologies for generating renewable, clean energy such as oceanic, thermosolar, hydrogen, and bioenergetics, amongst others. [M1, R]
 - ➔ **P3.9** To encourage technology improvement for monitoring meteorological, climatological, and hydrometric conditions. [A1, A2]
 - ➔ **P3.10** To identify, systematize, and analyze existing climate change information in the country, particularly on adaptation, where required for research in production sectors facing the occurrence of climate events such as droughts and hurricanes; to define the infrastructure vulnerability, and to generate edification mechanisms and schemes for organizing ecological land-use planning in order to increase resilience.
 - ➔ **P3.11** To produce national research for understanding and interpreting climate change and its impacts in Mexico. [E, R]
 - ➔ **P3.12** To create and strengthen schemes for coordination, collaboration and networking that integrate and make the most of the local knowledge. [E]
- Strengthening of capacities**
- ➔ **P3.13** To create and strengthen climate change training schemes in the three orders of government, as well as in the Legislative and Judicial Branches. [E, R]
 - ➔ **P3.14** To strengthen capacities in the three orders of government in order to gain access to both national and international financial sources. [E]
 - ➔ **P3.15** To train sectors in the three orders of government in the use of effective planning instruments for mitigation and adaptation. [E]
 - ➔ **P3.16** To strengthen the capacities for territorial management on a landscape unit level, by creating, for example, local technical agents, local development agents and new spaces of collaborative management agents. [A1, A2, A3, M4, R]
 - ➔ **P3.17** To train those responsible for budget assignment within the three orders of government and the Legislative Branch on climate change, due to the importance of allocating funds to adaptation, disaster prevention and mitigation actions. [E]
 - ➔ **P3.18** To create institutional capacities for establishing mechanisms and procedures to measure, report, verify, monitor, and evaluate mitigation and adaptation actions. [E]
 - ➔ **P3.19** To encourage the development of a strategy for connectivity and complementarity amongst terrestrial, coastal, and marine ecosystems, in order to favor the maintenance of regional ecological processes and promote state and municipal natural protected areas. [A3, M4]
 - ➔ **P3.20** To create capacities for research and technological innovation on SLCPs and their warming potential, in order to identify local and national actions that could be included in mitigation strategies due to its co-benefits. [M5]



P4 PROMOTE THE DEVELOPMENT OF A CLIMATE CULTURE.

For successfully facing climate change it is essential to transform the production and consumption patterns of the population. To do so, Mexico requires an informed, conscious, committed, participative society that demands accountability from government. It is fundamental to guarantee the existence of educational programs and effective divulgation mechanisms for the actions needed for implementing such a transcendent policy.

LINES OF ACTION:

- ➔ **P4.1** To educate, inform and raise awareness through massive communication campaigns and training programs for inducing a change towards sustainable consumption and production patterns. [E, 3]
- ➔ **P4.2** To generate climate change educational projects for the elementary, middle, and high education, in order to form a culture that can be translated into values, conscience, knowledge, behavioral changes, and attitudes. [3]
- Transparency**
- ➔ **P4.3** To encourage co-responsible social participation in the formulation, implementation, and surveillance of the national climate change policy. [E, 3]
- ➔ **P4.4** To encourage accountability on climate change from authorities in the three orders of government through the effective divulgation of national climate change policy as well as its evaluation results. [E, 3]
- ➔ **P4.5** To enact regulations for the consumers to obtain timely and relevant information on emissions resulting from production and consumption of goods and services available in the market. [M1, M2, M3, M4, M5]
- ➔ **P4.6** To use information technologies for keeping the public informed about the climate change situation in the country, GHG emissions inventories, the National Emissions Registry, and the Climate Change Information System. [E]
- ➔ **P4.7** To design and enforce an effective communication strategy in every sector of society considering context diversity (cultural, economic, political, ethnical, gender-related, amongst others). [E, 3]



CONANP Photobank



P5 IMPLEMENT MECHANISMS FOR MEASUREMENT, REPORTING, AND VERIFICATION (MRV) AND MONITORING AND EVALUATION (M&E).

Climate change mitigation and adaptation actions require the development of Measurement, Reporting and Verification, as well as Monitoring and Evaluation instruments. These provide transparency and certainty to actions, whilst guaranteeing environmental integrity, comparability, consistence, transparency and data accuracy. The previous will allow evaluating and giving feedback to the formulation of climate change policies, whilst also encouraging their efficiency and impact. Particularly, correctly and efficiently using budgetary, international, public, and private resources will impact directly the achievement of the adaptation and mitigation national policy objectives.

LINES OF ACTION:

- ➔ **P5.1** To implement Measurement, Reporting and Verification, as well as Monitoring and Evaluation instruments for mitigation and adaptation measures. [E]
- ➔ **P5.2** To develop an M&E system for public policies including climate change adaptation criteria and indicators. [A1, A2, A3]
- ➔ **P5.3** To measure, report and verify the source, use and results of international, private, and public support resources for tackling climate change in Mexico [E, SP]
- ➔ **P5.4** To strengthen gradually the verification mechanisms according to type of measures and financial schemes. [E, R]
- ➔ **P5.5** To feed, with the participation of the three orders of government, the information of emissions, reductions and transactions of stationary and mobile sources from sectors reporting to the National Emissions Registry, including verification mechanisms. [M1, M2, M3, M4, M5, R]
- ➔ **P5.6** To establish and update with clear and transparent criteria, the emissions inventories, national and sector baselines and mitigation trajectories in order to monitor up and frequently evaluate the mitigation policies. [M1, M2, M3, M4, M5]
- ➔ **P5.7** To establish mechanisms for ensuring that recommendations from the Coordination of Evaluation are considered and where appropriate, reflected in adjustments to the national climate change policy. [E]
- ➔ **P5.8** To establish and develop mechanisms for making available to those interested the methodologies for measurement, monitoring, verification and reporting mitigation actions, as well as their constant updating. [M1, M2, M3, M4, M5]
- ➔ **P5.9** To develop a national, transparent and strong forestry monitoring system, for the monitoring, reporting, and verification of mitigation actions in the forestry sector. [M4, R]
- ➔ **P5.10** To integrate and maintain a national information system of safeguards associated to the implementation of REDD+ actions, guaranteeing its observance, respect and implementation [A1, A2, A3, M4, R]
- ➔ **P5.11** To establish mechanisms for measuring financial, human, and ecological risks related to diverse climate affectations in all economic sectors and regions of the country. [R]
- ➔ **P5.12** To strengthen the design of climate change related health indicators, where environmental, labor, and social factors of population are analyzed for providing updated information to the National Epidemiologic Surveillance System, in order to carry out prevention and attention actions for vulnerable population. [A1]



COP16 Cancun/Semarnat Social Communications Office Phobank



P6 STRENGTHEN STRATEGIC COOPERATION AND INTERNATIONAL LEADERSHIP

This pillar aims to maintain and strengthen the position of Mexico as a relevant actor in the international arena, as well as in the Latin American and Caribbean region, through the recognition of its high vulnerability to climate change and its potential for GHG emissions mitigation. This position grants access to international climate funding and allows the maintenance of strategic bilateral and regional cooperation.

LINES OF ACTION:

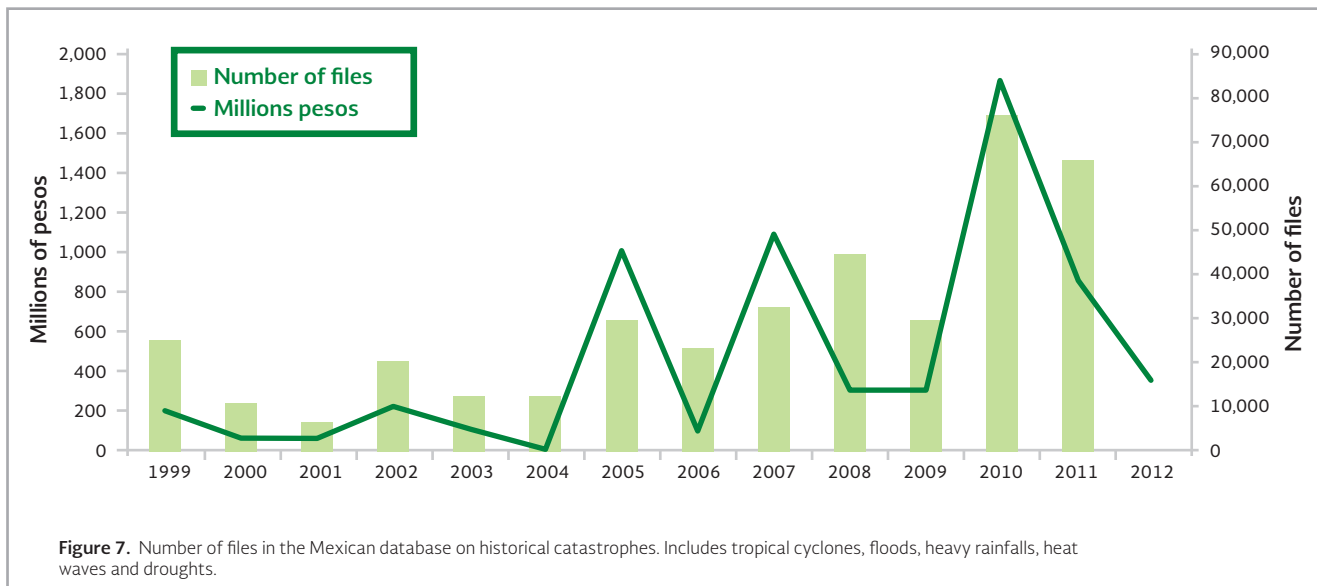
- ➔ **P6.1** To contribute to global efforts for strengthening the climate change regime within the United Nations, seeking to increase the level of ambition of mitigation commitments and actions from all countries. [E]
- ➔ **P6.2** To promote and benefit from the implementation of additional efforts in mitigation and adaptation within the framework of multilateral, regional, or bilateral processes complementary to the UNFCCC. [E]
- ➔ **P6.3** To promote opportunities for bilateral cooperation and sharing of experiences and best practices within a South-South cooperation framework. [E]
- ➔ **P6.4** To maintain an active and proactive presence in international climate change negotiations, based on an inclusive national dialogue. [E, R]
- ➔ **P6.5** To position Mexico in the international arena within the boundaries of a legally binding agreement by increasing its level of ambition in regards to mitigation and its need for adaptation due to high vulnerability. [E]
- ➔ **P6.6** To identify and promote the access to international funding sources that allow the definition of specific mitigation and adaptation actions. T
- ➔ **P6.7** To capitalize synergies of the three Rio conventions (Convention on Biological Diversity, United Nations Convention to Combat Desertification, and the UNFCCC) in order to enhance their impact. [E]
- ➔ **P6.8** To consistently link the climate change international position of Mexico to national actions. [E]

6. ADAPTATION TO CLIMATE CHANGE EFFECTS

6.1 CLIMATE CHANGE VULNERABILITY ASSESSMENT

In the last few years, Mexico has faced an increasing number of alterations due to extreme hydrometeorological events such as tropical cyclones, floods, and droughts, just to mention a few, which have resulted in human losses and high economic and social costs. Economic damage related to these events has grown from a yearly average of 730 million

pesos in the 1980 to 1999 period, to 21 billion 950 million pesos over the span from 2000 to 2012^[18]. This growth, on top of being associated with a higher occurrence of events, responds to an increasing exposure of growing urban areas. Evolution of disaster occurrence due to climate events and their associated damage can be observed in figure 7.



To understand the associated risk of climate events it is important to analyze it from two perspectives: occurrence of historical events and projection of future events, since each of them provides different and complimentary information. Historical analysis establishes a basis to understand the impact of a changing climate; whilst the usage of coupled atmosphere general circulation models^[19] allows understanding future climate behavior. Geological, ecosystem, and anthropological

local conditions are crucial in the events incidence, as the recurrence of hydrometeorological events is likely in zones where they have previously happened. Climate change scenarios are generated in a context of future climate uncertainty, which constitutes a serious problem to communicate future risks associated with global and regional climate change. However, these scenarios are constructed with the most advanced and updated internationally available models.

¹⁸ National Center for Disaster Prevention (CENAPRED), 2013

¹⁹ The term *coupled* refers to models that simulate interactions between the atmosphere, the crust of the Earth, and the ocean

The Mexican Network of Climate Modeling^[20] developed a set of projections that represents the climatology of the country under different climate change scenarios. A consensus exists that during the next few decades, Mexico will experience a general increase in temperature that will surpass the historic average over 6%, and that will be higher than the global increase in the same period. Recent history already shows indication of this growth. Consequently, we can expect an increase in the risk of climate events related to temperature growth, such as heat waves or the decrease of agricultural outputs, even in localities where there is no historical registry of them. Regarding rainfall, most models do not incorporate the effect of tropical

depressions, cold fronts, and cyclones; therefore the degree of uncertainty of rainfall projections is higher. Acknowledging the guiding precautionary principle when faced with uncertainty that supports this Strategy, the historical occurrence of these phenomena serves as the best information for the analysis.

Herein risks and vulnerability assessment towards climate change integrates, within the conceptual framework developed by the IPCC^[21], main adaptation concepts^[22]: risk of disaster, exposure, vulnerability, and frequency of climate events (danger). Results are shown in figure 8.

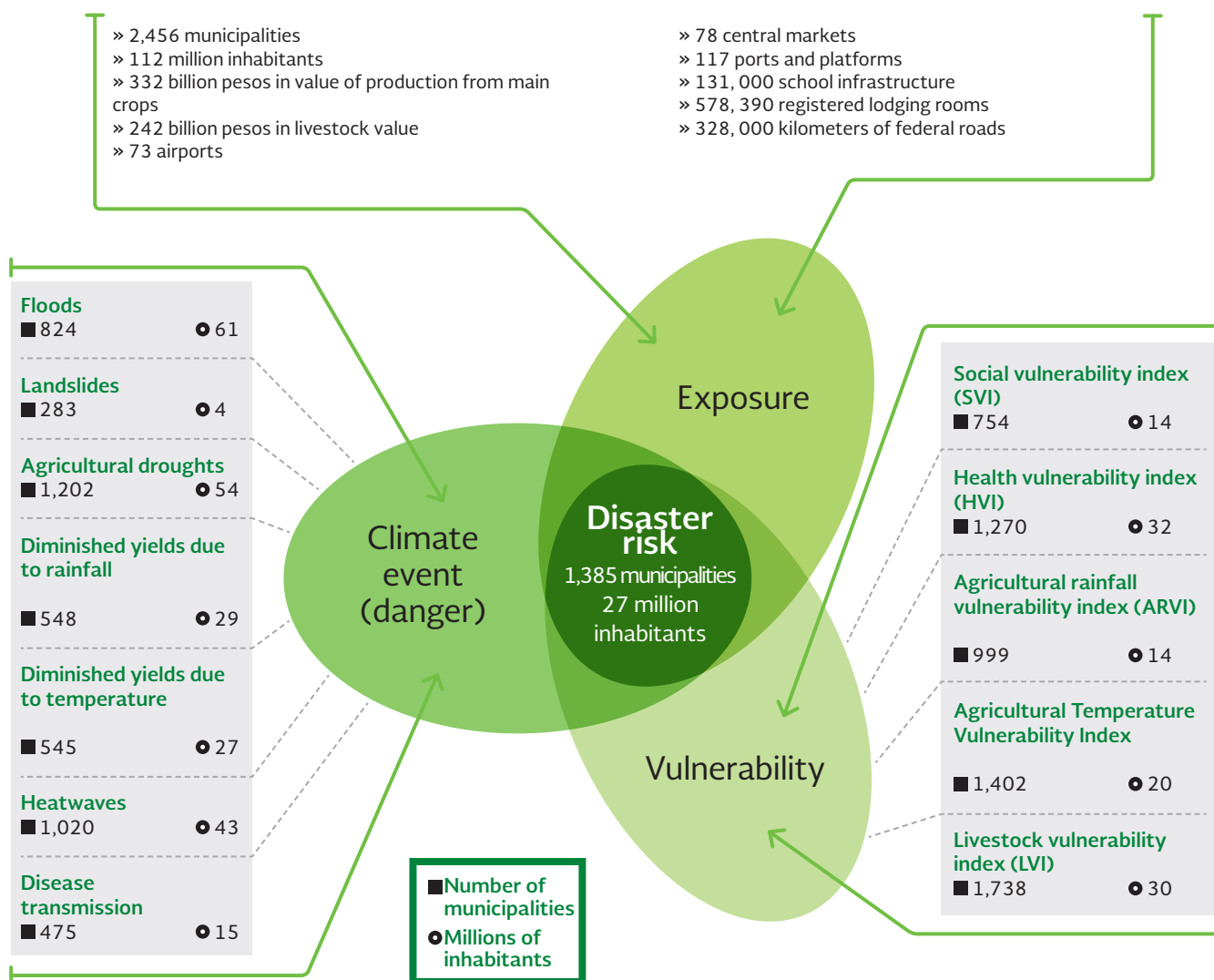


Figure 8. Data for climate events were calculated with information from the Climatic Research Unit (CRU) of University of East Anglia and Centro Mario Molina (CMM)

Source: INEGI and the General Direction of Ports.

²⁰ Integrated by the Center for the Sciences of the Atmosphere-UNAM, the Center for Scientific Research and Higher Education Center at Ensenada, Baja California, the Mexican Institute of Water Technology, and the National Meteorological Service, coordinated by National Institute of Ecology and Climate Change; together they have joined the results of 15 global models in an ensemble of projections that better represent the climatology of the country.

²¹ Intergovernmental Panel on Climate Change. (2012). Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation.

²² See concept definitions in Glossary

The following climate events were analyzed: droughts, floods, landslides, decrease in agricultural and livestock outputs, disease transmission, and heat waves.

To measure exposure, besides population, strategic social and economic infrastructure that is also exposed to catastrophical events was also considered. The value of this infrastructure is not limited to intrinsic asset value, but incorporates the provided services for the development of the country, such as federal highways and central markets.

The vulnerability analysis considers both the social aspect, through the Health Vulnerability Index and the Social Vulnerability Index developed by CENAPRED^[23], and the production aspect, through agricultural vulnerability indexes (Agricultural Temperature Vulnerability Index, Rainfall Vulnerability Index, and

Livestock Vulnerability Index). It should be noted that this study does not contemplate the ecosystem aspect.

Danger was defined as a function of the event occurrence frequency, measured by its return period that affects specific sectors^[24]. For example: an increasing change in temperature patterns may provoke a decrease in agricultural outputs, an increase in heat waves, or an increase in disease transmission.

Based on previous elements, high disaster risk municipalities were defined as those with high vulnerability and high risk of occurrence of climate events. Results show that from 2,456 municipalities in the country, 1,385 fall within that category, which concentrate 27 million inhabitants. Amongst them we could find 255 municipalities that participate in the Crusade against Hunger and that concentrate 10.4 million inhabitants.

Event breakdown in high-risk municipalities is shown in figure 9

The analysis concludes that

- » There are significant increases in risk associated to higher temperatures, this affects among others, agricultural yields
- » Agricultural sector presents higher risk to climate events
- » It is likely to occur and increase in droughts, especially in northern region, which mostly affect the livestock sector.
- » Population in municipalities with human health related risk surpass the population exposed to events such as floods and landslides.

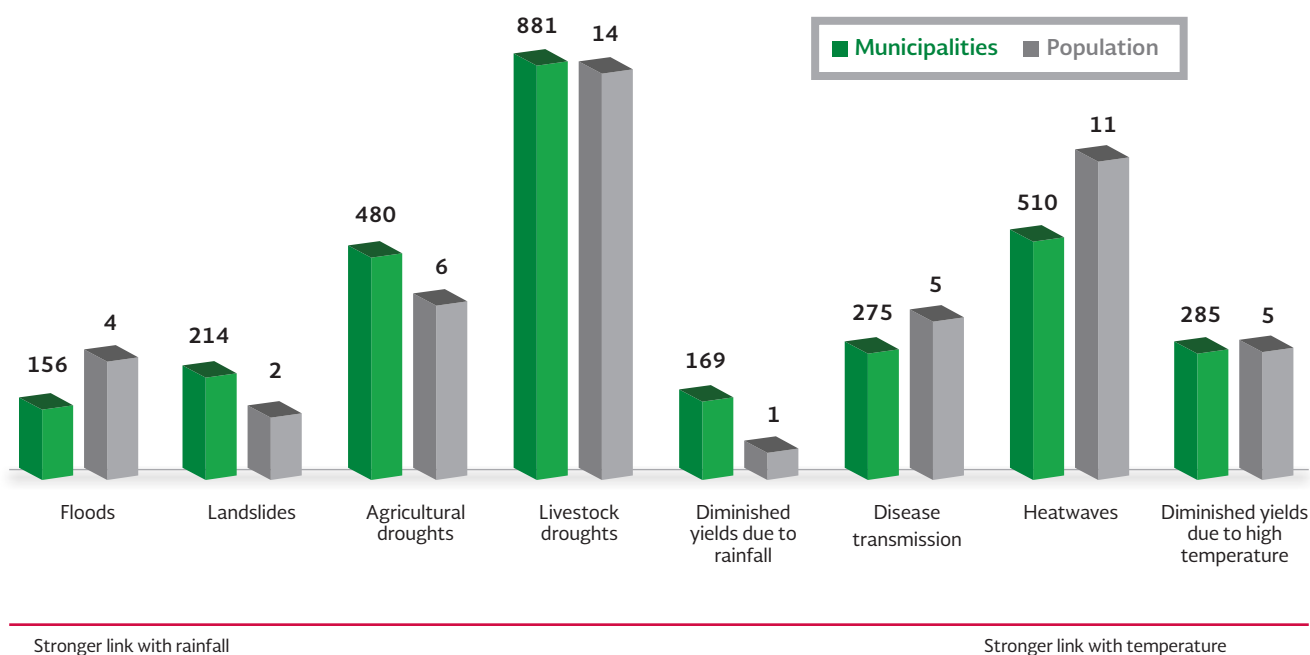


Figure 9. Climate events in high-risk municipalities.

Source: Climate Research Unit. Climate projections by the Mexican Climate Modeling Network (CICESE, IMTA, CCA-UNAM, SMN, INECC); flood and landslide danger from Mario Molina Center; and risk values based on the information provided by INEGI, qbic methodology, NIECC and GGGI.

²³Developed by CENAPRED, incorporates socioeconomic indicators, prevention and response capacity, as well as local risk perception that influences the preparation of population to face climate events

²⁴See Methodological Annex for definition and calculation of risk and return periods.

The following two maps of Mexico serve as examples: figure 10 shows municipalities identified as having high vulnerability and high risk of occurrence of climate events. Figure 13 presents energy infrastructure in zones identified as in high danger, and very high risk of flooding.

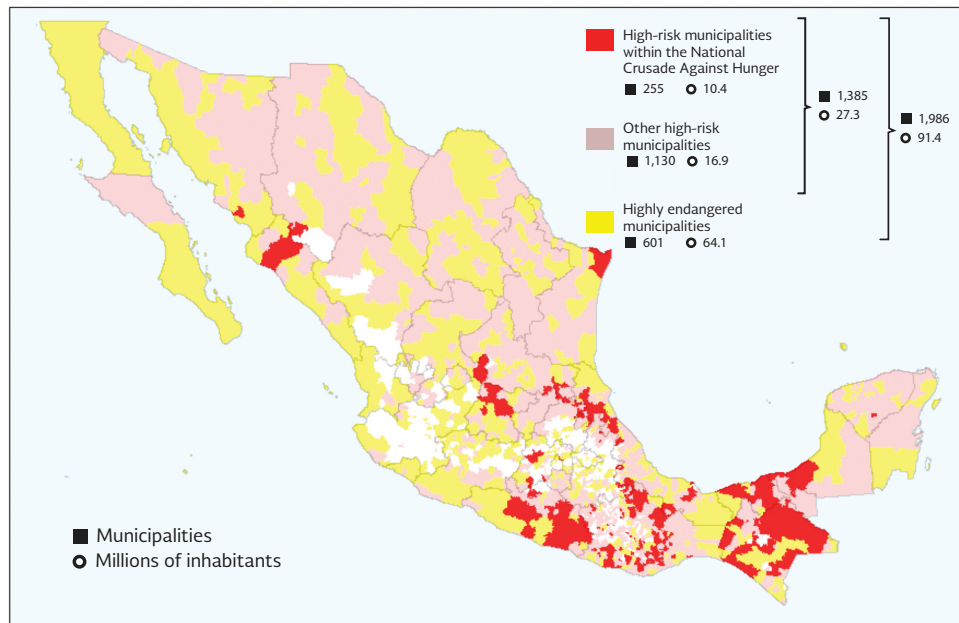


Figure 10. Municipalities with high vulnerability and risk of climate event occurrence

Source: Based upon climate projections by the Mexican Climate Modeling Network (CICESE, IMTA, CCA-UNAM, SMN, INECC), CENAPRED vulnerability indexes. Built upon information provided by INEGI and Ministry of Health; risk values based on information by INEGI, qbic methodology, NIECC, and GGGI.

Vulnerability breakdown for these municipalities is shown in figure 11.

This analysis concludes that:

- » 64% of municipalities have high livestock vulnerability.
- » 112 million people live in highly vulnerable municipalities for health issues.
- » There are 1,224 municipalities vulnerable to more than one climatic event

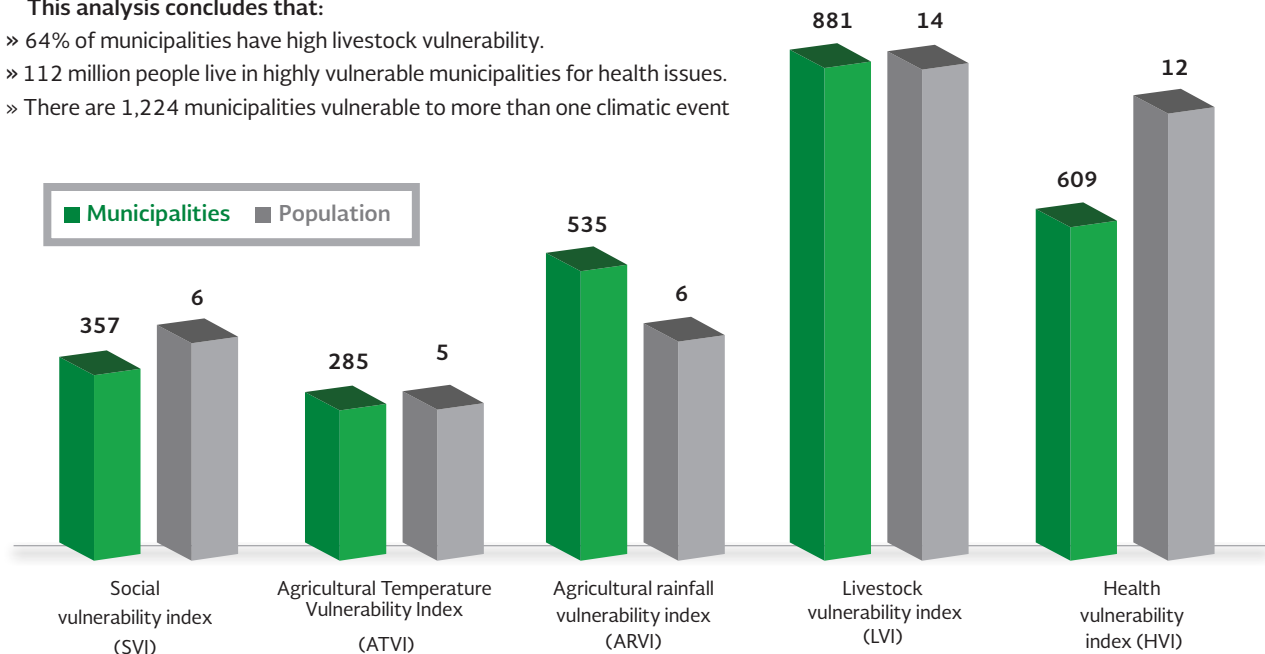


Figure 11. Vulnerability indexes by CENAPRED constructed with information from INEGI, SAGARPA, COTECOCA and SSA. Methodology from qbic, INECC and GGGI.

Population, if the most valuable good, is not the only value exposed to dangerous events. Strategic social and economic infrastructure is also exposed to catastrophic events, amongst which tropical cyclones, floods, and landslides stand out. An early assessment allows identifying that a substantial part of strategic assets are located in high danger zones. Figure 12 shows an analysis of strategic infrastructure in municipalities with a high risk of floods and landslides.

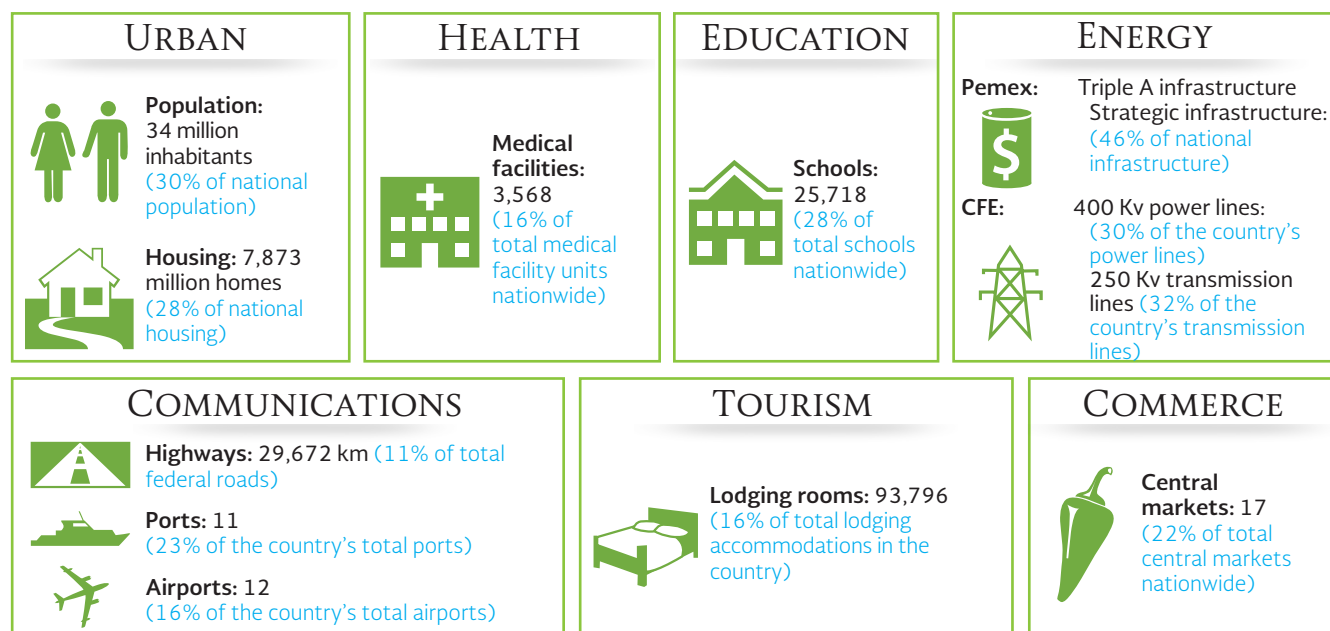


Figure 12. Climate projections by the Mexican Climate Modeling Network (CICESE, IMTA, CCA-UNAM, SMN, INECC), floods and landslide risks
Source: Mario Molina Center, risk values based on information from INEGI, National Climate Change Strategy, 10-20-40 Vision.

The present assessment is only a starting point for adaptation actions. The process for understanding the climate change impact on social and economic systems must continue. It is necessary to complement the list of climate events and understand the exposure of ecosystems and sectors.

As we improve the ability to understand the projected patterns of rainfall, temperature, and wind, amongst other elements related

to climate, new knowledge shall be incorporated into the design and establishment of specific lines of action for adapting to climate change. Adaptation must be carried out locally and thus it is important to consider in greater detail the regional conditions and impacts, and to involve states and municipalities in the development of local adaptation plans. For that to happen, local priorities, needs, knowledge, and capacity must be taken into account so that they empower people to plan and deal with climate change impacts.

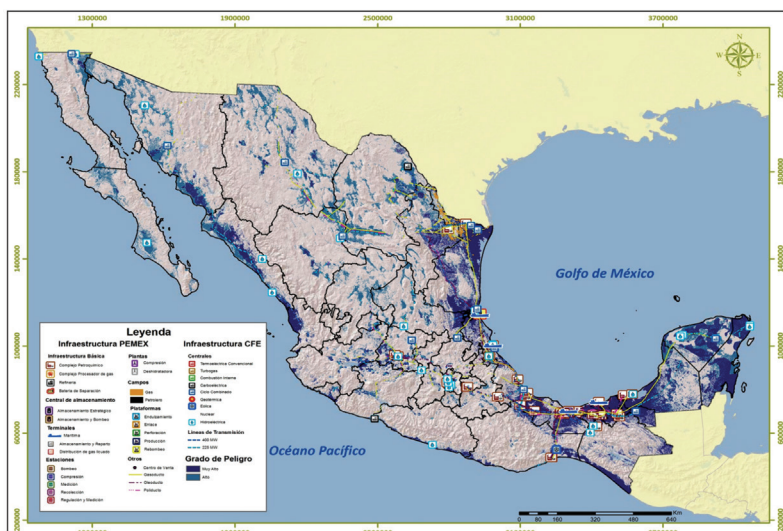


Figure 13. Energetic infrastructure in municipalities with high and extremely high risk of flooding.
Source: Mario Molina Center, 2013; based upon information from INEGI, PEMEX, CFE and SMN

6.2 STRATEGIC AXES AND LINES OF ACTION²⁵



A1 REDUCE THE VULNERABILITY AND INCREASE THE RESILIENCE OF THE SOCIAL SECTOR TO THE EFFECTS OF CLIMATE CHANGE

Mexico is especially vulnerable to climate change effects and in recent decades, some of them have already occurred, such as: decrease in water availability and presence of floods, droughts, and diseases such as dengue or acute diarrheic infections. According to geographical characteristics and socio-environmental, economic, and health conditions, the intensity of the problem may grow. The vulnerability assessment and the implementation of adaptation measures must be carried out locally, in response to specific conditions. This axis establishes lines of action that favor the conditions for vulnerability reduction and the increase of resilience of systems and population, contributing to a better quality of life.

LINES OF ACTION:

- ➔ **A1.1** To strengthen the identification and attention of zones, settlements, and social groups that are priorities for reducing vulnerability and increasing human settlement resilience in rural, urban, and coastal areas.
- ➔ **A1.2** To strengthen Integral Risk Management of population, including communication systems, early warning, local evacuation plans, and reduction and management of risk caused by extreme hydrometeorological events.
- ➔ **A1.3** To increase resources for disaster attention guaranteeing a greater proportion to prevention.
- ➔ **A1.4** To strengthen immediate and effective response mechanisms in zones impacted by the effects of climate change, as part of civil protection plans and actions.
- ➔ **A1.5** To strengthen the application of land-use regulations for diminishing irregular settlements until their eradication from endangered zones.
- ➔ **A1.6** To implement and strengthen public policies focused on guaranteeing water quality and quantity availability in zones considered as priorities due to scarcity probability related to climate change; emphasizing the strengthening eco-hydrological services provided by ecosystems.
- ➔ **A1.7** To ensure food security against climate threats by giving preference to integrated watershed management measures, biodiversity conservancy, and soil restoration, as well as other ecological support systems.
- ➔ **A1.8** To implement and strengthen public policies focused on reducing health risks associated with climate change effects, considering the most susceptible and sensitive groups because of their biological and health conditions.
- ➔ **A1.9** To design and strengthen public policies for protecting the population patrimony (housing, infrastructure, etc.) from climate change impacts.
- ➔ **A1.10** To increase and strengthen public policies focused on risk reduction of public health infrastructure.
- ➔ **A1.11** To design and include gender approach in social vulnerability reduction strategies.
- ➔ **A1.12** To implement and strengthen public policies for educating population on disaster risk management.
- ➔ **A1.13** To implement transparent and inclusive mechanisms for securing social participation in the design and implementation of climate change adaptation strategies, such as communal, district, municipal, and state councils focused on reducing social vulnerability.

²⁵ The building process towards an adaptation policy in Mexico has produced the three strategic axes contained in this section. They are based upon three key inputs: the first is the document *Marco de Políticas de Adaptación a Mediano Plazo* (Mid-term Adaptation Policy Framework in México) published by SEMARNAT in 2010; the second is the document *Adaptación al cambio climático en México: visión, elementos y criterios para la toma de decisiones* (Adaptation to Climate Change in Mexico: Vision, Elements, and Criteria for Decision Making) published by NIE in 2012; and finally, the third input comprises feedback from the 13 ministries that integrates the IMCC, as well as the opinion of key experts in this topic.



A2 REDUCE THE VULNERABILITY AND INCREASE THE RESILIENCE OF STRATEGIC INFRASTRUCTURE AND PRODUCTION SYSTEMS TO THE EFFECTS OF CLIMATE CHANGE

Climate change poses huge challenges to the adaptation of production systems. The characteristics and respective responses to its impacts will depend on the type of system: agriculture, forestry, exploitation of wildlife, aquaculture, fishing, industrial, extraction, tourism and strategic infrastructure. Likewise, they will depend on the risks exposure of the system. Each production system needs to take into account different aspects of climate change in order to increase its productivity and competitiveness. This axis presents lines of action that aim to strengthen resilience and reducing vulnerability in production systems and strategic infrastructure against climate change.

LINE OF ACTION:

- ➔ **A2.1** To develop and strengthen periodical vulnerability assessments for each production sector, and to divulge them with producers and decision-makers.
- ➔ **A2.2** To integrate climate change adaptation criteria in existing production programs.
- ➔ **A2.3** To ensure social participation through the creation of inter-municipal boards for defining and applying adaptation criteria in local production projects that require the collaboration between municipalities and the participation of local inhabitants.
- ➔ **A2.4** To design and strengthen tools for local risk monitoring, vulnerability analysis, and adaptation options for production sectors.
- ➔ **A2.5** To consider climate change scenarios in the determination of vocation and adaptation of land-use for the establishment of production activities.
- ➔ **A2.6** To encourage efficient and sustainable use of water resources in every production activity by periodically updating total water availability.
- ➔ **A2.7** To endow quality infrastructure, employ adequate techniques, and strengthen operational organisms for guaranteeing water availability in the food sector.
- ➔ **A2.8** To identify production opportunities presented in terms of climate change by elaborating local and regional adaptation strategies.
- ➔ **A2.9** To implement techniques and technologies in production sectors that foster efficient use of resources and manage climate change associated risks.
- ➔ **A2.10**
- ➔ **A2.11** To strengthen the existing strategic infrastructure (communications, transportation, energy, amongst others) considering climate scenarios.
- ➔ **A2.12** To incorporate climate change criteria into the planning and building of new production and strategic infrastructure.



A3 CONSERVE AND USE ECOSYSTEMS SUSTAINABLY AND MAINTAIN THE ECOSYSTEM SERVICES THEY PROVIDE

Mexico has a large ecosystem diversity that provides a vast quantity of environmental services to society (such as oxygen, water, fuels, and food). These ecosystems are seriously threatened by human activities, including the effects of climate change. The following lines of action aim to guide policies and instruments in order to sustainably exploit ecosystems; restore their ecohydrological functionality and the services provided to society, and therefore increase their resilience.

LINES OF ACTION:

- ➔ **A3.1** To encourage integrated land-use planning for reducing ecosystems vulnerability to climate change, considering sustainable use and management, protection, conservation and restoration, with emphasis on priority regions and watersheds.
- ➔ **A3.2** To guarantee restoration, connectivity, sustainable use, and conservation of ecosystems such as forests, jungles, coastal systems, oceans, riparian ecosystems, wetlands, and the biotic communities they keep, as well as their environmental services.
- ➔ **A3.3** To articulate by territory the variety of existent programs for fostering activities in order to stabilize agricultural-urban boundaries, as a way to reduce pressure over ecosystems and ensure their ecological functionality.
- ➔ **A3.4** To ensure that the vulnerability from ecosystems, biological communities, and priority species is included in climate change vulnerability atlases.
- ➔ **A3.5** To guarantee ecohydrological connectivity for the preservation of biodiversity and environmental services, the integrality of ecosystems, the conservancy of species, and the increase of their resilience in the face of climate change.
- ➔ **A3.6** To generate or modify legal and land-use planning instruments for the reduction of climate change vulnerability of ecosystems and biological communities, starting by implementing adaptation measures.
- ➔ **A3.7** To develop adaptation programs to maintain and increase surface and ground water availability, with a focus on integrated hydrographic watershed management.
- ➔ **A3.8** To establish and strengthen sustainable community management schemes for forest ecosystems.
- ➔ **A3.9** To increase the surface under reforestation and restoration of ecosystems with native species suitable for regional climate conditions.
- ➔ **A3.10** To strengthen attention to problems exacerbated by climate change, through integrated management of fire, and combating of plagues and diseases.
- ➔ **A3.11** To guarantee environmental protection of ecosystems from public works, industrial services and production projects (mining, textiles, cement, energy, agriculture, tourism, etc.), by incorporating climate change criteria in planning instruments, such as environmental impact and ecological land-use planning.
- ➔ **A3.12** To develop tools and create valuation schemes for ecosystem services in order to contribute to their conservancy and sustainable development.
- ➔ **A3.13** To create state funds for the restoration of the most degraded and vulnerable ecosystems, as well as for prevention and recovery of ecosystems that have been affected by extreme climate events.
- ➔ **A3.14** To establish and implement mechanisms for assessing the impact of locally implemented adaptation measures, as a means to ensure their effectiveness in the face of climate change.
- ➔ **A3.15** To strengthen environmental surveillance and protection bodies; to foster their cooperation and coordination, as well as to reinforce their inspection, vigilance, and execution capacities.
- ➔ **A3.16** To encourage social participation and training in processes that favor ecosystem adaptation to climate change, through the establishment of bodies such as citizens watchdogs for observatories of forest fires, plagues, phenological changes, amongst others.

6.3 CRITERIA FOR THE PRIORIZATION OF ADAPTATION MEASURES^[26]

Within the scope of this Strategy, a guide is provided for the selection, design and implementation processes of specific adaptation measures. Adaptation to climate change must be achieved through local processes; the design of measures to be developed will depend on the region and context of implementation. Assuming that resources will always be limited to face the magnitude of this challenge, it is necessary to strategically choose the measures to carry out.

This section provides criteria for guiding the prioritization of measures at the local level, in order to serve as tool for decision-makers. The main criteria to be considered for the selection of adaptation measures are described on the following page. The grading of prospected measures must part from a multi-criteria analysis that considers environmental, social, and economical perspectives. Each criterion could be assigned a different weight, according to its importance within a specific context, or new criteria might be added as needed.



Tlapachula flooding caused by Hurricane Stan/CENAPRED

²⁶ The present criteria have been built upon a series of environmental documents and methodologies, such as Alduce and Neri's *Adaptation Practices Utility Index* (2008); UNEP's *MCA4 Climate: A practical framework for planning pro-development climate policies*. (2011); the *Adaptación al cambio climático en México: visión, elementos y criterios para la toma de decisiones* by NIE (2012); the General Climate Change Law (2012), and the project *Construcción de una herramienta para la identificación y priorización de medidas de adaptación al cambio climático en México*, supported by GIZ in behalf of the BMU (s/f).

CRITERIA	DESCRIPTION
Attention to the most vulnerable population	The measure prioritizes supporting the population whose conditions make them most vulnerable to climate change effects.
Cross-cutting to policies, programs or projects	The measure is coherent and articulated with climate change policy instruments, such as the National Climate Change Strategy, State and Municipal Programs, Sector Programs of different government order, amongst others.
Prevention encouragement	The measure promotes planned adaptation based on a preventive approach and invests in prevention rather than reaction.
Sustainability in the use and exploitation of natural resources	The measure promotes sustainable exploitation of natural resources, including water, soil and biotic resources.
Conservation of ecosystems and their biodiversity	The measure considers conserving and restoring ecosystems and the services they provide, in order to increase climate change resilience and stop deterioration processes.
Active participation of target population and strengthening of adaptation capacities	The population involves actively and appropriates the measure, contributing with their knowledge and experience in each stage of the process.
Strengthening of adaptation capacities	The measure encourages strengthening individual and group or network capacities in matters of adaptation to climate change.
Feasibility	The measure considers institutional, financial, political, regulatory, technical and social capacities that will allow its implementation and sustainability
Cost-effectiveness or cost-benefit	The measure cost is low compared with its effectiveness or its benefits reducing vulnerability.
Coordination between actors and sectors	The measure promotes coordination between sectors and institutions from the three government orders, academy and civil society.
Flexibility	The measure can adjust in response to specific needs, and produces benefits under any climate change scenario.
Monitoring and evaluation	The measure includes a monitoring and evaluation proposal that contains strategic impact indicators focused on its fulfillment and effectiveness.

Chart 3. Aspects evaluated in the selection of adaptation measures.

Source: Own elaboration.

7. LOW-EMISSION DEVELOPMENT / MITIGATION

7.1 POLICY FOR CLIMATE CHANGE MITIGATION

To achieve sustainable and sustained economic development, characterized by low-carbon emission, the GCCL indicates that mitigation efforts should start with actions that have the greatest emission reduction potential at lower cost, and that simultaneously achieve environmental, social, and economic benefits. There are cost-effective opportunities for reduction of GHG emissions that result in considerable environmental co-benefits, such as improving energy efficiency. In the same sense, control of Short-Lived Climate Pollutants^[27] represents attractive economic opportunities for reduction of toxic compounds, which significantly influence the global temperature increase of the Earth. Actions for the prevention and control of SLCPs emissions simultaneously contribute to the mitigation of climate change in the short-term, and to the immediate improvement of air quality, generating positive effects in both public health and the conservancy of ecosystems comprised in the national territory. Thus, complementarily to GHG reduction

efforts and within the priority mitigation actions portfolio for the country, control of SLCPs is fundamental in this Strategy, as is conceptually shown in figure 14.

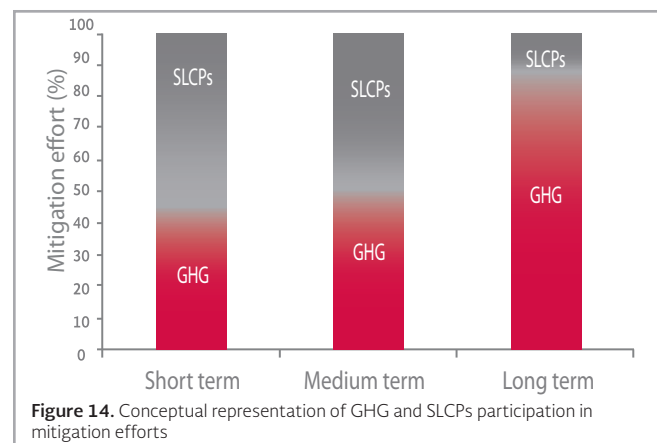


Figure 15 points out some characteristics of the mitigation actions that must be carried out immediately and in the long-term.

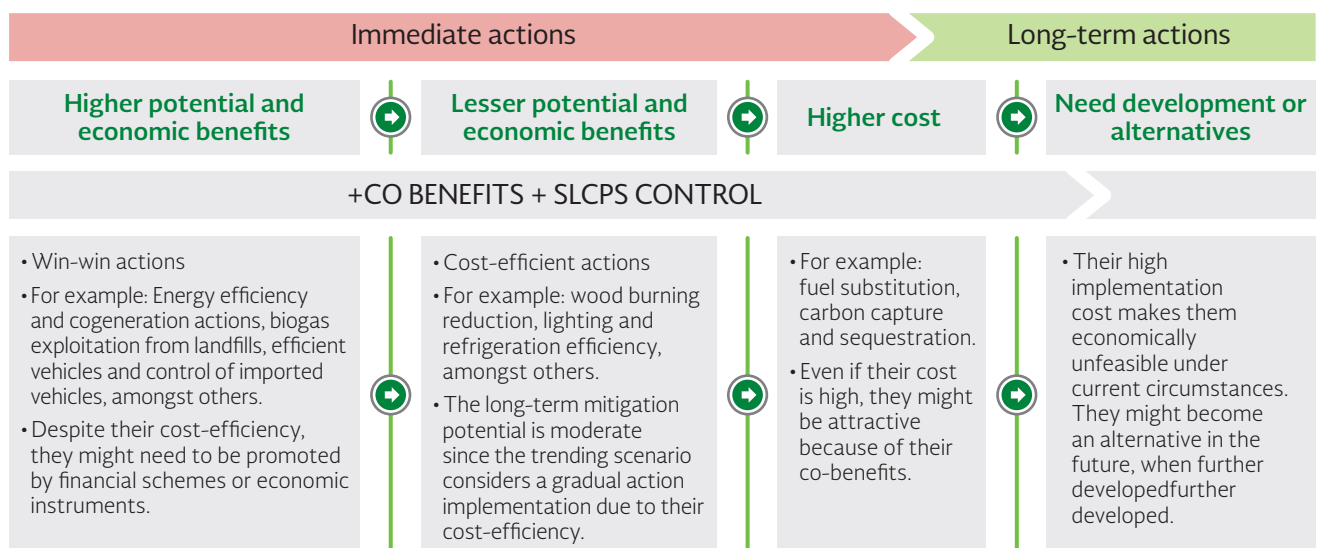


Figure 15. Execution terms for mitigation actions, in accordance with guidelines defined in the General Climate Change Law.
Source: Own elaboration

²⁷ Section 7.3 presents a diagnosis of SLCPs emissions in the country.

Chart 4 Main criteria for the identification of priority actions in the short, medium, and long-term

CRITERIA	DESCRIPTION
Mitigation potential	<p>➤ The quantity of emissions that can be reduced or avoided by implementing mitigation actions, compared to current trends and technologies.</p>
Marginal abatement cost	<p>➤ The economic impact per unit of equivalent carbon reduced from the implementation of mitigation actions. The marginal abatement cost is negative for mitigation actions, representing savings or economic benefits in a certain term. When actions have a cost, the marginal cost is positive.</p>
Environmental and social co-benefits	<p>➤ This criterion considers life quality benefits on the population, for example: access to renewable energy infrastructure in marginal communities; soil erosion decrease by reforestation programs, or harmful species reduction due to a better municipal solid waste management. Despite the difficultness for quantifying or valuing them, these benefits must be incorporated into the processes of measure selection.</p>
Health co-benefits	<p>➤ Some mitigation actions, generally associated to fossil fuels reduction, generate economic savings because of their positive health impacts. The actions focused on SLCPs reduction are a clear example of measures that contribute to improving air quality, and thus improve health.</p>
Increase in national productivity	<p>➤ There are other impacts over national productivity besides abatement cost, which should be considered regardless of the difficulty to quantify them. For example, the optimization of urban transportation routes, urban planning, and massive transportation projects reduce traffic congestion whilst diminishing travel times, vehicle operation costs, and increasing mobility efficiency of inhabitants</p>
Barriers	<p>➤ Financial, technological, regulatory, or social barriers might exist for the implementation of mitigation actions, which must be analyzed during the planning and action selection process, considering their feasibility and the ways to overcome them.</p>

Chart 4. Main criteria for the identification of priority actions in the short, medium, and long term

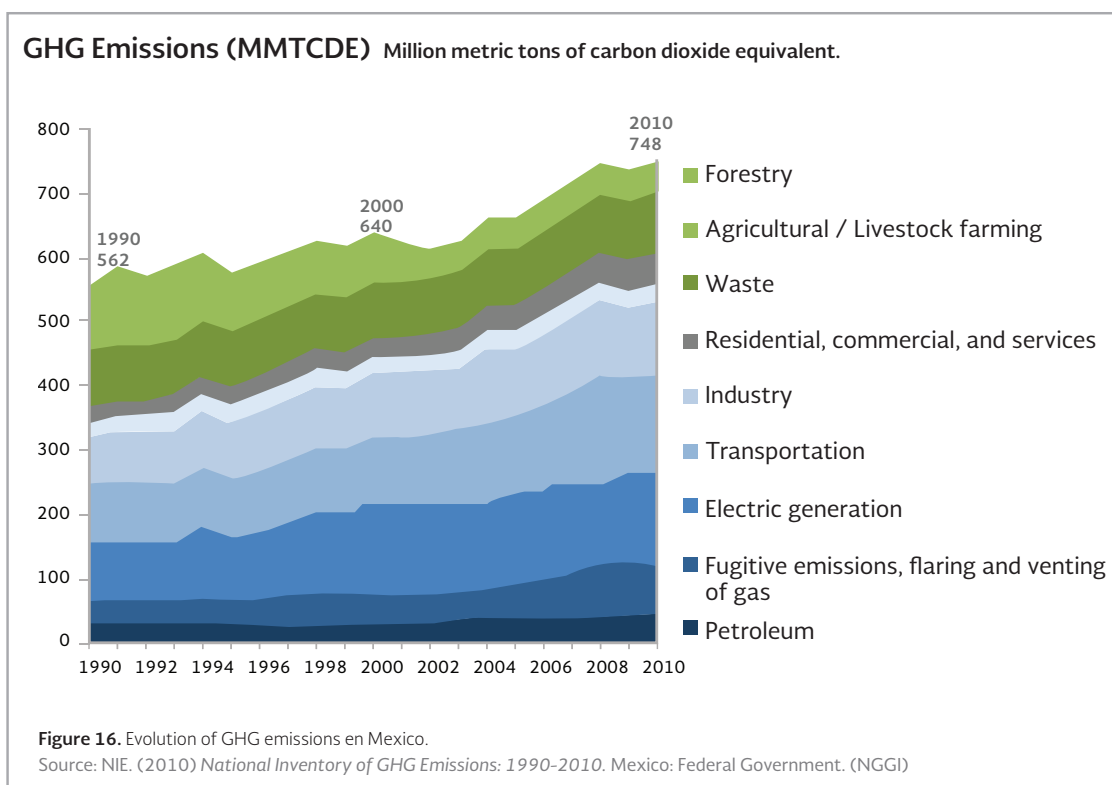
Source: Own elaboration²⁸.

²⁸ This list of criteria has been built from the provisions established in General Climate Change Law (2012) and in the Bases for Low-Emission Development In Mexico (NIE, 2012).

7.2 DIAGNOSIS OF GHG EMISSIONS

Emissions

In 2010, Mexico emitted greenhouse gases (GHG) equivalent to 748 million tons of CO₂ (MtCO₂e), to the atmosphere, this represents an increase of 33% compared to emissions registered in 1990 (figure 16). In the period 2001-2010, GHG emissions presented an average annual growth rate (AAGR) of 2.6%, whilst the GDP presented a 1.9% AAGR.



Emissions with higher increases are those that came from fugitive emissions, waste, and transport, with an AAGR between 1990 and 2010 of 5.3%, 5.1%, and 4.1% respectively. This is mainly due to the growth in per capita GDP, the urbanization presented during this period in Mexico, and the fast growth in the vehicle fleet (with an AAGR of 6.3% between 2004 and 2009).

The energy sector is the largest source of GHG emissions in Mexico, with an emissions growth of 58% and an AAGR of 2.3% between 1990 and 2010.

Figure 17 shows the breakdown of emissions by type of gas registered by the NGGI (2010), where emissions of CO₂ represent 65.9%, CH₄ the 22.3%, N₂O the 9.2%, and PFC, HFCs, and SFC the 2.6%. This amounts to a total 748.2 MtCO₂e.

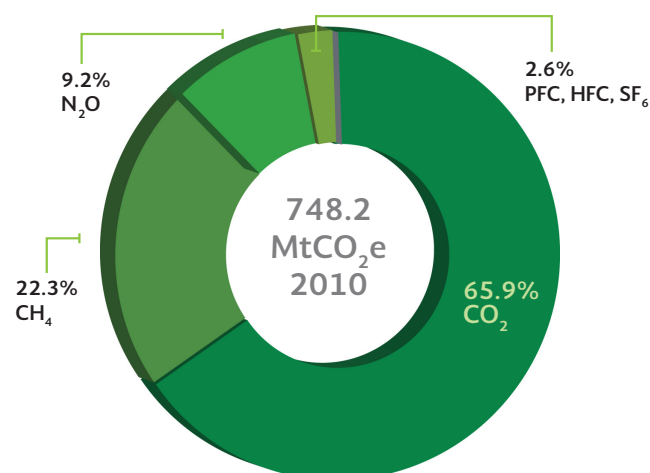


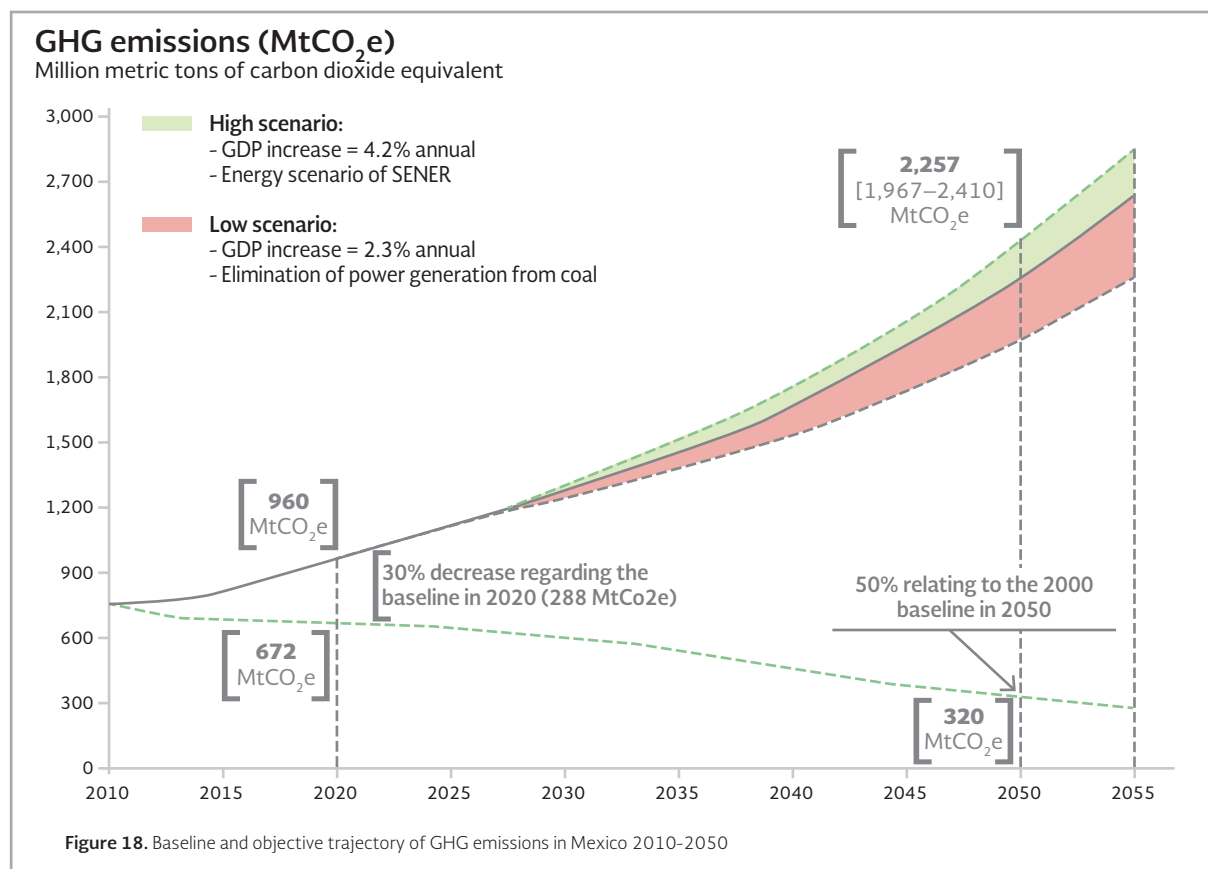
Figure 17. NGGI (2010) GHG emissions breakdown by type of greenhouse gas.

Source: NIE. (2010) *National Inventory of GHG Emissions: 1990-2010*. Mexico: Federal Government. (NGGI)

Baseline and objective trajectory of GHG emissions

The GHG emissions baseline for Mexico is a trend projection of GHG emissions in absence of mitigation actions. It is built upon data provided by the National Greenhouse Gas Inventory (NGGI), Sector Prospects^[29], and projected growth of both GDP and population.

The baseline assumes an annual average GDP growth of 3.6% consistent to National Energy Prospects (registered by SENER in 2012). According to this scenario, GHG emissions in Mexico would reach 960 MtCO₂e by 2020, 1,276 MtCO₂e by 2030, and 2,257 MtCO₂e by 2050. Uncertainty of baseline calculations in the medium and long-term might be considerable. Figure 18 also shows a range from high to low scenarios for the trending scenario.



This trending scenario is the starting point in the formulation of policies and actions to achieve the emission reduction goals in Mexico:

- » By 2020, abating 30% of emissions compared to baseline, and
- » By 2050, reducing 50% of emissions compared to those registered in 2000.

The trajectory that would allow the fulfillment of these objectives means that by 2020 the annual emissions should be reduced about 288 MtCO₂e and by 2050 total emissions should reach a maximum level of 320 MtCO₂e.

Mitigation potentials

A number of studies show significant GHG reduction potentials for the country. For example, the analysis of abatement cost curves performed in 2010 by the NIE shows a 2020 mitigation potential close to 261 MtCO₂e. Another exercise is shown in figure 19, evaluating different GHG reduction initiatives based on the same analysis^[30].

²⁹ SENER formulates prospects for the energy sector (petroleum, natural gas, LP gas, crude oil, renewable energies, and electric sector) and SAGARPA, those related with the farming sector

³⁰ For further detail consult the Methodological Annex available at: www.encc.gob.mx

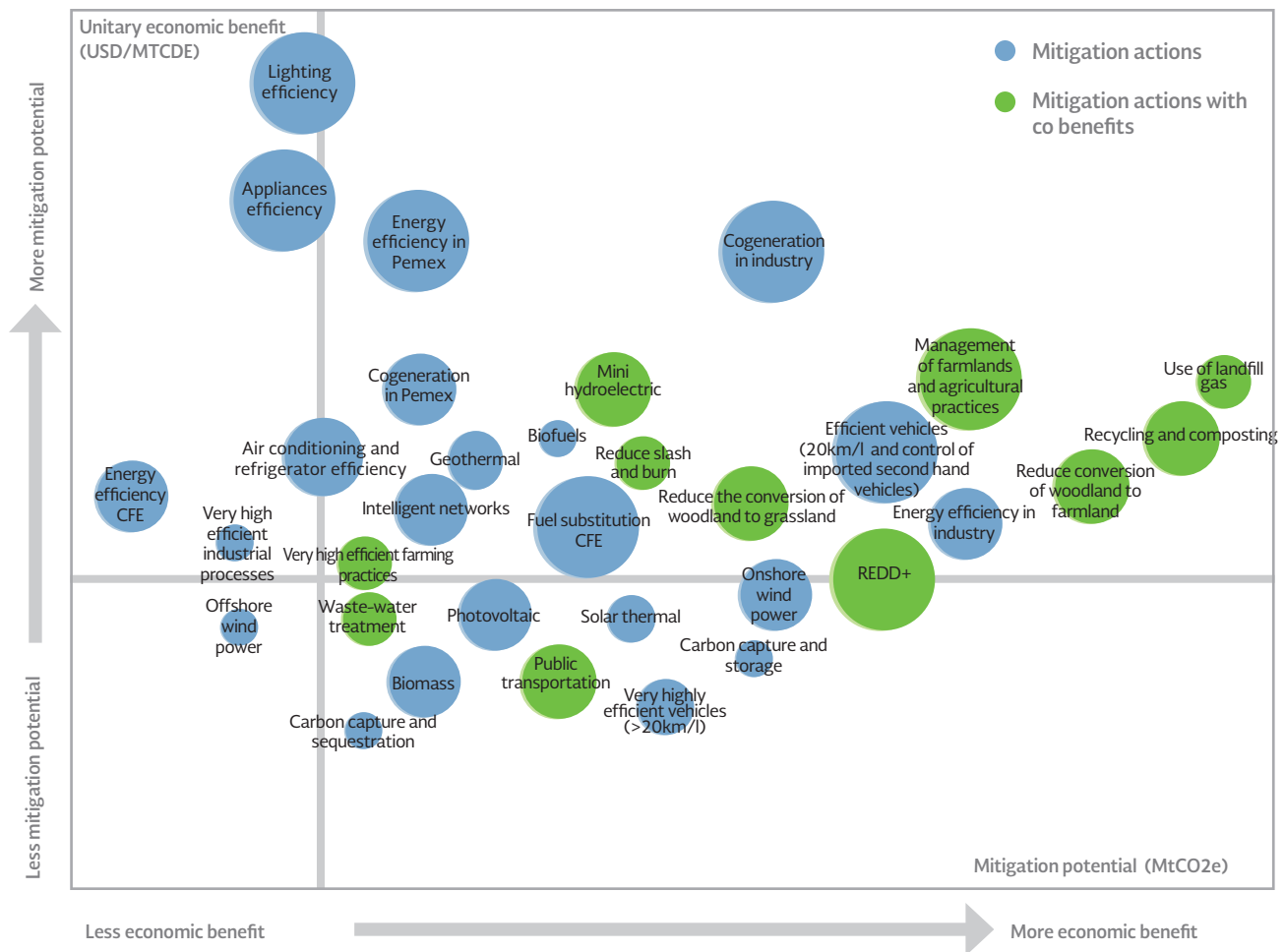


Figure 19. Matrix for mitigation actions in the medium term (2020-2050)
Mitigation actions with co-benefits

In this figure, the size of the circles represents the project feasibility given current conditions: the wider the circle, the higher the feasibility. Green-coloured circles indicate actions with co-benefits.

7.3 SLCPS EMISSIONS DIAGNOSIS

SLCPs, also known as short-lived climate forcers, include: methane, black carbon, tropospheric ozone, and some hydrofluorocarbons. These pollutants have important effects on climate and a shorter lifespan in the atmosphere than CO₂. The influence that each type of emission has on climate change is determined by calculating the radiative forcing (W/m²) of the gas or particle of interest.

Along with global efforts to reduce CO₂, action on SLCPS offers significant opportunities to tackle climate change in the coming decades, as discussed in section 2.1. Furthermore, these efforts provide significant co-benefits for public health in Mexico.

SLCPs are originated in several sources and behave in different ways:

- Methane has an atmospheric lifespan of approximately 12 years, but has a very high warming potential. Besides having a significant impact on warming as a GHG, methane is one of the precursors of tropospheric ozone, another SLCPs.

- Black soot particles or BC originate mostly from the incomplete burning of fossil fuels in industrial and transportation processes, as well as in small-scale processes such as brick-making, and burning of very diverse materials such as firewood, agriculture by-products, and urban and industrial waste. Although they can travel great distances, these particles have short atmospheric lifespans, measured in either hours or weeks. As methane, BC warms the atmosphere more intensely than CO₂. There exists evidence that the global warming potential of BC is very high. Some authors even place it as the second pollutant that contributes most to climate change, right after CO₂. In a 20 year period it contributes up to 3,200 times more than CO₂. Furthermore, BC contributes to reducing albedo and has a great impact on population health.

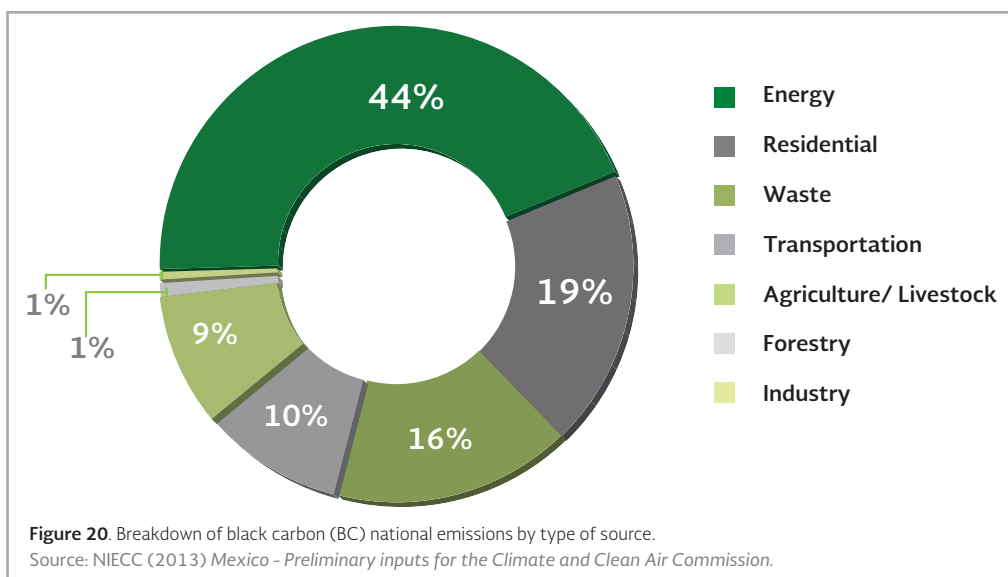
- Unlike other air pollutants, O₃ is not directly emitted. It is a secondary pollutant formed in the troposphere through complex photochemical reactions between Volatile Organic Compounds (VOCs), nitrogen oxides (NOx), carbon monoxide (CO), and CH₄, mainly. Ozone has a major impact on health, agriculture crops, and other ecosystems such as forests. In Mexico, tropospheric ozone levels in the two largest metropolitan areas exceed, for most of the year, the recommended levels for health protection^[32]. It is necessary that strategies for their control are focused on mitigating emissions of their precursors.

- Hydrofluorocarbons are a group of chemical products manufactured for their use in refrigeration and aerosols, amongst others. HFCs, even though they represent a small share of all GHGs, are rapidly growing in the atmosphere, and their radiative forcing is particularly high. The emission of these products could increase by almost twenty times over the next three decades unless necessary measures are taken to reduce their consumption^[33].

Emissions

Recent studies estimate that in 2010, Mexico emitted 0.0351 million tons of BC. Figure 20 shows the relative distribution of BC in 2010. The energy sector includes emissions originated by petroleum and gas, electric generation and fugitive emissions: It is the greatest contributor of emissions, with 44%, followed by residential emissions of wood burning, with 19%, waste with 16%, transportation with 10%, farming sector with 9% and forestry and industry with 1% each.

At the moment there is not a baseline of SLCP emissions expressed in CO₂ equivalent, since there is still no international scientific consensus over its conversion factors.



³¹ Bond, T.C., Doherty, S.J., Fahey, D.W., et al. (2013). Bounding the role of black carbon in the climate system: A scientific assessment. *In Journal of Geophysical Research: Atmospheres*

³² NIE. (2011). *Cuarto almanaque de datos y tendencias de la calidad del aire en 20 ciudades mexicanas (2000-2009)*.

³³ UNEP. (2011). *Short Lived Climate Pollutants*.

7.4 STRATEGIC AXES AND LINES OF ACTION



M1 ACCELERATE ENERGY TRANSITION TOWARDS CLEAN ENERGY SOURCES

Mexico has a great potential in energy generation through clean and renewable sources, and even when new possibilities have emerged for the exploitation of such sources with the participation of the private sector, such mechanisms have not been enough. The following lines of action aim to focus efforts in overcoming the main barriers that have stopped the complete immersion of renewable energies into the national energy system.

LINES OF ACTION:

➔ **M1.1** To strengthen the regulatory and institutional scheme, and the use of economic instruments in order to harness clean energy sources and more efficient technologies.

➔ **M1.2** To encourage power generation by using clean sources and more efficient technologies to replace fossil fuels, minimizing its environmental and social impact.

➔ **M1.3** To increase the penetration of renewable energies and to reduce energy losses by using smart grids and by the distributed generation in national electric system.

➔ **M1.4** To turn state-owned power enterprises into the central axis for fighting climate change, so they foster a strategy for the development of renewable energy and energy saving.

➔ **M1.5** To encourage participation of private and state-owned sectors in power generation through renewable energy sources and efficient cogeneration.

➔ **M1.6** To facilitate interconnections between power centrals and renewable energies in the regions of the country with greater potential and economic feasibility.

Wind power

➔ **M1.7** To encourage wind powered energy generation and profit from its terrestrial and oceanic potential to ensure technological, social, and environmental compatibility.

Photovoltaic

➔ **M1.8** To promote investment on photovoltaic systems in high potential regions of the country.

➔ **M1.9** To encourage distributed generation by using photovoltaic systems in industrial, residential, and service sectors.

Geothermal

➔ **M1.10** To promote technological development of geothermal energy schemes to reduce exploration risks and provide guarantees on the rights of resource exploitation.

Hydroelectric

➔ **M1.11** To harness the existent electric power potential by installing new large hydropower plants, only in zones where social and environmental impacts can be compensated. Likewise, to use water stored in these installations for other uses such as irrigation, protection against floods, water supply for cities, roads, sailing, environmental services, landscaping, and tourism.

➔ **M1.12** To encourage power generation in small, mini, and micro hydroelectric plants whose niche is in industrial self-sufficiency, productive activities in rural environment, and in those zones with high costs of interconnection to network, ensuring their ecological and social compatibility.

Nuclear

➔ **M1.13** To consider amongst the plans for diversification of generating facilities, the implementation of a nuclear program as a possible substitute to fossil fuel use, and solely if the program is selected for development.

Solar Thermal

➔ **M1.14** To encourage use of solar thermal energy, including its exploitation for water heating, services, industry, residential, and tourism sectors.



M2 REDUCE ENERGY INTENSITY THROUGH EFFICIENCY AND RESPONSIBLE CONSUMPTION SCHEMES

Energy efficiency, whilst resulting in savings, also contributes to reducing GHG emissions, supporting the goals of growth and competitiveness in the country. This axis aims to promote measures that accompany responsible energy consumption, resulting from changes in consumption patterns and technological improvements.

LINES OF ACTION:

- ➔ **M2.1** To promote energy efficiency and savings in the national energy system, and in each activity that conforms GDP.
- ➔ **M2.2** To harness the mitigation potential of actions with the inclusion of efficient cogeneration, energy efficiency in lighting, air conditioning, efficient refrigeration, and water heating.
- Consumption habits and Certification**
- ➔ **M2.3** To promote changes in practices and behavior of end users, primarily in residential, service, tourism, and industry sectors through economic instruments, energy efficiency and power saving campaigns.
- ➔ **M2.4** To promote and encourage the development of mechanisms to provide reliable and timely information to consumers on energy efficiency and GHG emissions, such as labeling and certification.
- ➔ **M2.5** To implement sustainable practices in the public and private sectors, using high efficiency standards and green procurement criteria.
- Most efficient technology**
- ➔ **M2.6** To increase energy efficiency of public and private passenger and freight transportation, by establishing Official Standards and logistic and technological improvement schemes, including modal shift for fuel consumption and emissions reduction.
- ➔ **M2.7** To reduce emissions through the modernization of vehicle pool, and removal and disposal of inefficient units.
- ➔ **M2.8** To execute projects of efficient water use in agriculture, including efficient irrigation systems, which in turn reduce energy consumption.
- ➔ **M2.9** To continue exploring carbon capture and sequestration technologies aimed at the implementation of projects, and to include its association with enhanced hydrocarbon recovery.
- Transformation processes**
- ➔ **M2.10** To promote high energy efficiency technologies, fuel substitution, industrial process redesign, and CO2 capture technologies in energy-intensive industries such as cement, steel, petroleum, chemical, and petrochemical industries.
- ➔ **M2.11** To reduce energy consumption and GHG emissions by executing energy efficiency projects derived from comprehensive energy audits in the petroleum, industrial, and electrical sectors.
- ➔ **M2.12** To reduce losses in power transmission and distribution by modernizing electric lines and substations as well as improving the distribution grid.
- Regulation and normativity**
- ➔ **M2.13** To adapt, and if necessary, design the legal and regulatory framework applicable to fuels in order to reduce GHG emissions, particularly those that are not currently regulated, such as fuel oil and marine diesel.
- ➔ **M2.14** To create a national system of mandatory vehicle inspection, including control mechanisms, as well as to review and adjust emission standards of the vehicle pool with the participation of the three orders of government to ensure high levels of efficiency in all additions to the national vehicle pool, including imported used vehicles.



M3 SHIFT TOWARDS MODELS OF SUSTAINABLE CITIES WITH MOBILITY SYSTEMS, INTEGRATED WASTE MANAGEMENT, AND LOW-CARBON FOOTPRINT BUILDINGS

Within the framework of this axis, a sustainable city is based upon an urban development model that is capable of regulating land-use, guiding it towards efficient mobility systems, low-carbon buildings, and integrated water and waste management. The policy is implemented fundamentally on a local scope.

LINES OF ACTION:

Sustainable urban development

M3.1 To increase planned and efficient land-use by diminishing urban expansion and guaranteeing the access to intra-urban land; to promote mixed land-use and vertical buildings; to privilege densification over the use of land reserves on the periphery; to integrate urban forests, and to define growth limits of cities.

Buildings

M3.2 To promote strengthening, adoption, and application of regulations, standards, and legislations for boosting saving and efficiency technologies of water, energy, gas, thermal isolation, use of renewable energy, and carbon capture practices (for example: green roofs, vertical gardens, and urban orchards) in new and existent buildings.

Mobility

M3.3 To encourage the evolution towards safe, clean, low-emission, accessible, and comfortable public transportation systems; by strengthening regional and national interconnectivity through the generation of multimodal efficient networks supported by the Federal Government, within an integral urban development and mobility policy that reduces travel times and distances.

M3.4 To develop transport regulatory entities with understanding of national and regional demand, in order to optimize transportation systems reducing travel times and distances.

M3.5 To encourage programs for reducing population displacements, such as: telework, housing exchange or leasing to bring people closer to their academic or work stations, collective transportation services for enterprises, flexible work schedules. In order to do so, diversifying and prioritizing urban services and equipment in inhabited areas with a mixed land-use.

M3.6 To promote efficient and low-emission transportation systems, and to modify the regulatory and pricing framework in order to foster reinvestment and continuous improvement.

M3.7 To generate incentives, infrastructure, and programs for favoring non-motorized transportation, articulated within integrated transportation systems, in which the pedestrian and the cyclist are given priority, creating immediate environmental and health benefits.

Integrated waste management

M3.8 To encourage the participation of the private sector in projects for waste separation, reutilization and recycling, development of biogas plants, water treatment plants, and establishment of recycling centers, previously developing and reinforcing mechanisms, regulations, and markets. This in order to encourage investment in this sector and as co-responsibility measure related to waste generation.

M3.9 To encourage new technologies and infrastructure for wastewater treatment, integrated solid waste management, and biogas energy exploitation; through co-investment schemes and economic instruments for facilitating self-funding of the operating costs and maintenance of new and existent infrastructure.

M3.10 To create regional bodies for the development of landfills and wastewater treatment with a long-term national and regional vision; to give certainty to projects with long development periods, and to profit from economies of scale, by adjusting the regulatory and pricing framework in order to encourage reinvestment and continuous improvement.

M3.11 To promote and develop state and municipal integrated waste management plans in accordance with the National Integrated Waste Management Program, which foster social participation in waste sorting and exploitation.

M3.12 To correct and promote pricing systems of recollection and disposal services in order to incentivize reinvestment in technological and logistic improvements, and the implementation of national and international best.

M3.13 To promote surveillance, inspection, and sanction actions as a base for complying with integrated waste management regulation.



M4 PROMOTE BEST PRACTICES IN AGRICULTURE AND FORESTRY TO INCREASE AND PRESERVE NATURAL CARBON SINKS

Forests are important carbon reservoirs; their destruction and degradation constitutes one of the most important emission sources globally. Simultaneously, their conservancy and sustainable management can contribute to increasing the quantity of carbon stored in them. On the other hand agriculture and livestock activities are key for alimentary security, but contribute to GHG emissions to a great extent. In this strategic axis, key lines of action are proposed within the agriculture and forestry sectors in order to encourage practices that reduce emissions and avoid policies that may diminish their mitigation scope. Applying a landscape-level approach on policies of large compacted areas such as biological corridors or watersheds, is key for deeply considering the conditions of its natural resources, their trends, the human influence, as well as conservancy, restoration and development opportunities.

LINES OF ACTION:

- ➔ **M4.1** To encourage local communities to sustainably plan the use of forest resources as a mechanism to incentivize preservation and conservancy of forests in order to reduce the deforestation rate and avoid land-use changes whilst protecting the natural assets.
- ➔ **M4.2** To strengthen the sustainable forest management and restoration of degraded forest ecosystems in order to guarantee the increase of carbon capture and storage.
- ➔ **M4.3** To promote the incorporation of forests into sustainable management and certification schemes in order to stop degradation and maximize the carbon capture and storage.
- ➔ **M4.4** To encourage programs for the preservation of forest ecosystems in priority regions in order to maintain carbon sinks, guaranteeing federal, state, and municipal intervention.
- ➔ **M4.5** To formulate and implement plans, programs, and policies for reducing deforestation and degradation of forests and jungles, within a REDD Strategy, which must include a sustainable rural development and landscaping approach, and observe social and environmental safeguards.
- ➔ **M4.6** To establish restoration, regeneration, or reforestation schemes for carbon capture and storage in Natural Protected Areas, as well as other instruments of land and terrestrial ecosystems conservancy.
- ➔ **M4.7** To implement land conservancy schemes that guarantee its integrity and increase carbon capture.
- ➔ **M4.8** To increase the establishment of agriculture, livestock and forestry production schemes with a greater mitigation potential, as well as environmental and social co-benefits, such as silvopasture agroforestry systems and linking of traditional knowledge with agriculture and livestock current problems.
- ➔ **M4.9** To encourage agriculture practices that preserve and increase carbon capture on soil and biomass, such as conservancy cultivation and productive reconversion which replaces monoculture with polyculture or perennial crops.
- ➔ **M4.10** To apply schemes that entail reducing emissions from the inadequate use of fire in forests and agriculture and livestock lands.
- ➔ **M4.11** To implement agriculture policies oriented to give a better use to fertilizers, rationalizing their use, producing and applying biofertilizers, as well as efficiently using nitrogenates.
- ➔ **M4.12** To implement efficient exploitation schemes for livestock waste management.
- ➔ **M4.13** To implement actions for energy efficiency and use of renewable energy in agriculture, livestock, and fishing projects, and encouraging biodigesters.
- ➔ **M4.14** To establish livestock production schemes that reduce emissions and capture carbon in grazing lands through appropriate livestock management, stocking rate, and planned grazing.
- ➔ **M4.15** To strengthen forest surveillance in order to avoid illegal logging and forest fire propagation, as well as to promote the establishment of community vigilance groups.



M5 REDUCE EMISSIONS OF SHORT-LIVED CLIMATE POLLUTANTS (SLCPs), AND PROMOTE CO-BENEFITS IN HEALTH AND WELL-BEING

This axis poses lines of actions for reducing SLCPs emissions, and thus, contributing to the reduction of climate change impacts regionally, as well as decreasing global warming trends in the short-term. Simultaneously, these lines of action will foster multiple benefits that include air quality, health, and crops improvement.

LINES OF ACTION:

- ➔ **M5.1** To promote regulation enactment of SLCP sources and uses.
- ➔ **M5.2** To hierarchize SLCP emission sources according to emissions magnitude, global warming potential, mitigation costs, and to develop abatement mechanisms.
- ➔ **M5.3** To accelerate the penetration of low global warming potential refrigerants in different sectors that include air conditioning, refrigeration, and foaming agents; reduction of leaks, HFCs management and adequate disposal.
- ➔ **M5.4** To strengthen best practice programs for refrigeration, recovery and final disposal of chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), and hydrochlorofluorocarbons (HCFCs).
- ➔ **M5.5** To strengthen regulation and programs for preventing and controlling forest fires, prescribed fire, and control of slash and burn practices.
- ➔ **M5.6** To implement sustainable exploitation schemes for forest biomass and agriculture waste.
- ➔ **M5.7** To implement clean transportation systems in freight corridors.
- ➔ **M5.8** To encourage the implementation of emission reduction and operational efficiency programs focused on operating, administrative, technological, and financial characteristics and needs of the owner-operator and small trucking.
- ➔ **M5.9** To promote open fires substitution for efficient, low-black carbon emission stoves, and to disincentive the unsustainable use of wood, emphasizing municipalities with high and very high level of marginalization.
- ➔ **M5.10** To encourage the use of technologies and fuels that reduce BC emission, such as particle filters and ultra-low sulfur diesel in internal combustion engines.
- ➔ **M5.11** To encourage BC emissions reduction in the medium and large scale industries by changing coke fuel, fuel oil, and diesel for low-black carbon emission fuels, and by implementing emission control systems and energy efficiency within processes.
- ➔ **M5.12** To encourage BC emissions reduction in the micro and small scale industries through productive reconversion, technological change, and energy efficiency in industries such as the brick industry.
- ➔ **M5.13** To eliminate open air burning in dumps, landfills, and in backyards.
- ➔ **M5.14** To establish MRV mechanisms in operations of methane burning and venting during gas and petroleum production, as well as to reinforce surveillance.
- ➔ **M5.15** To implement reduction actions of fugitive methane emissions, mainly from petroleum, gas, and mining exploitation, as well as from natural gas piping, processing, and distributing systems.
- ➔ **M5.16** To encourage electricity exploitation and generation projects from landfill and wastewater treatment plants biogas, and to avoid methane and VOC emissions to the atmosphere.
- ➔ **M5.17** To promote control of VOC emissions and tropospheric ozone precursors, in organic waste aerobic treatment (composting).
- ➔ **M5.18** To control VOC emissions in industrial sources, gasoline service stations, and from solvent use.
- ➔ **M5.19** To implement a measurement and accounting system for SLCP emissions, for tracking emission sources and monitoring and evaluating the effectiveness of implemented policies for SLCP emission reduction.

8. REVIEW, EVALUATION, AND ADJUSTMENT OF THE NATIONAL CLIMATE CHANGE STRATEGY

The Ministry of Environment and Natural Resources, with the participation of the Inter-ministerial Commission on Climate Change, will review the National Climate Change Strategy at least once every ten years in the matter of mitigation, and every six years in the matter of adaptation. In these reviews, forecast deviations from evaluated results, if any, must be explained. Likewise, the corresponding scenarios, projections, objectives, and goals will be updated.

Based upon these reviews and the evaluations results conducted by the NIECC Coordination for Evaluation and the Climate Change Council, the National Climate Change Strategy might be updated. The Special Climate Change Program and the State Programs must adjust to such updates. Under no

circumstance will the reviews and updates lessen the goals, projections, and objectives previously stated, nor will they encourage their reduction.

The IMCC may propose and approve adjustments or modifications to scenarios, trajectories, actions, or goals comprised in the National Strategy when: 1) new international commitments on the matter have been adopted; 2) new relevant scientific or technological knowledge is developed; c) required by environment, natural resources, economy, energy, sustainable transportation, health, and alimentary security policies; and 4) indicated by the evaluations results carried by NIECC Coordination for Evaluation.

GLOSSARY

ADAPTATION: Measures and adjustments to human or natural systems in response to actual or expected climate stimulus or their effects, which moderates harm or exploits beneficial opportunities.

ADAPTIVE CAPACITY: Combination of capabilities, resources, and institutions of a country or region that would allow implementing effective adaptation measures.

ADAPTIVE CAPACITY OF ECOSYSTEMS: The ability of ecosystems to adjust to climate change (including climate variability and extremes) in order to moderate potential damages, to take advantage of opportunities, and to face its consequences.

BASELINE EMISSIONS: Estimate of emissions, absorption, or capture of greenhouse gases or compounds associated with a baseline scenario. They exclude new abatement measures.

BASELINE SCENARIO: Hypothetical description of what could occur with the variables causing emissions, absorption, or capture of greenhouse gases and compounds.

BIODIVERSITY: The variability amongst living organisms of any habitat, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. This includes diversity within species, between species and ecosystems.

BIOFUEL: Fuel produced from organic matter or from vegetable combustible oils. Biofuel examples are: alcohol, black liquor from the paper manufacturing process, wood, and soybean oil.

BIOLOGICAL CORRIDORS: Geographic track that allows for the exchange and migration of species within one or more ecosystems. Its function is to maintain connectivity of biological processes in order to avoid the isolation of species populations.

CAPACITY BUILDING: Process for developing technical and institutional capacities in order to participate in all aspects of climate change adaptation, mitigation, and research.

CARBON DIOXIDE (CO₂): Gas that exists spontaneously and as a byproduct of burning fossil fuels originated in fossil carbon deposits, such as petroleum, gas or charcoal; burning biomass, or land-use changes and of other industrial processes. It is the anthropogenic greenhouse gas that most affects the radiative balance of the Earth.

CERTIFIED EMISSIONS REDUCTION: Emission reductions expressed in tons of equivalent carbon dioxide and achieved through activities or projects certified by any entity authorized for such effects.

CLEAN TRANSPORTATION: Transportation systems that adopt, technologies, and best practices strategies, and that are efficient and low-carbon emitters. Some examples of clean transportation projects would be: BRT, trolleys, light rail transit, suburban trains and subway systems ; integrated mass transport corridors; optimization of public transport routes; incorporation of stations and terminals, establishment of bike lanes and bicycle parking spaces in mass transport stations, as well as transit improvement measures such as intersections, signaling, and public parking.

CLIMATE ANOMALY: The difference between average temperature over several decades or more, and climate during a particular month or season.

CLIMATE CHANGE: Variation in climate attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and that is additional to the natural climate variability observed during comparable periods of time.

DANGER: Defined in relation with climate events occurrence such as temperature changes and rainfall, related phenomena (V.gr. tropical cyclones or droughts), as well as social and economic alterations derived from them (v.gr. agriculture outputs decrease or disease incidence increase).

DEFORESTATION: Loss of forest vegetation, due to natural or induced causes, to any other condition.

DEGRADATION: Process of reduction in the forest ecosystems capacity to provide ecosystem services as well as production capacity.

DESERTIFICATION: Land degradation of arid and semi-arid and sub-humid dry areas, provoked mainly by climate variations and human activities, such as excessive farming, grazing, deforestation, and lack of irrigation.

DISASTER RISK: Occurrence probability of severe alterations in the normal functioning of a society due to weather or climate events that interact with social vulnerability conditions.

DISASTER: Result of the occurrence of one or more severe and extreme disturbing agents, whether correlated or not, of natural or anthropogenic origin, that when happen over a specific time period and zone, cause damage of which magnitude exceed the response capacity from the affected community.

DROUGHT: In general terms, drought is a 'prolonged absence or marked deficiency of precipitation', a 'deficiency that results in water shortage for some activity or for some group', or a 'period

of abnormally dry weather sufficiently prolonged for the lack of precipitation to cause a serious hydrological imbalance’.

ECOLOGICAL CONNECTIVITY: The connection of ecological processes at several levels; including processes related to trophic relations, perturbation processes, and hydroecological fluxes.

ECOLOGICAL LAND-USE PLANNING: The environmental policy instrument whose objective is to regulate or induce land-use and production actions in order to achieve environmental protection and preservation, as well as the sustainable use of natural resources, based on their trends of degradation and use potentialities.

ECOSYSTEM: The basic functional unit of interaction between living organisms and between them and their environment, within a given time period and space.

ECOSYSTEMIC RESILIENCE TO CLIMATE CHANGE: The ability of an ecosystem to maintain its functions after being disturbed. One way for measuring resilience is by the magnitude of the disturbance required or an ecosystem to irrevocably move towards an alternative state. Resilience decreases the ecosystem sensibility to those changes.

ECOSYSTEMIC RESISTANCE TO CLIMATE CHANGE: It describes the capacity of an ecosystem to stay essentially unaltered despite environmental changes. Resistance decreases the ecosystem sensibility to those changes.

EMISSION SOURCES: Every process, activity, service, or mechanism that releases greenhouse gases or compounds into the atmosphere.

EMISSIONS: Release of greenhouse gases and their precursors and aerosols into the atmosphere, including, when applicable, greenhouse gas compounds, in a specific time period and area.

ECOSYSTEM SERVICES: Both tangible and intangible benefits generated by ecosystems, which are necessary to the survival of natural and biological systems altogether and provide benefits to humankind.

EXPOSURE: Presence of people, life, environmental resources and services, economic, social, or cultural infrastructure or assets; which may be damaged in diverse ways.

EXTERNALITIES: The positive or negative impacts caused by the provision of a good or service that affects third parties. Externalities occur when the cost paid for a good or service is different from the total cost of the economic, social, environmental, and health damages and benefits involved in its production.

FOREST MANAGEMENT: The process comprehending the group of actions and procedures whose objective is the planning,

cultivation, protection, conservation, restoration, and exploitation of ecosystem services and resources of a forest, subject to the consideration of ecological principles, whilst observing the ecosystem integrity and resources interdependence and without undermining the production capacity of ecosystems and existent resources.

GREEN ECONOMY: An economy that must improve welfare and social equity, and simultaneously reduce significantly the environmental risks and ecological scarcities. In its most basic form, a green economy is a low-carbon emitter and efficiently uses its natural resources.

GREEN SHOPPING: This concept refers to the use of consumer power for benefiting the environment by buying products that have a lesser impact on the environment (environmentally friendly). It considers environmental and social factors, as well as total costs associated with every purchase, taking into account the product lifecycle: the materials from which products are made; their precedence; their manufacturing process, and the way for their disposal. It also means taking in account the real need of the consumer for the product.

GREENHOUSE COMPOUNDS: Greenhouse gases (GHG), their precursors and particles which absorb and issue infrared radiation to the atmosphere.

GREENHOUSE EFFECT: Greenhouse gases effectively absorb the infrared radiation issued by the surface of the Earth, by the atmosphere itself. Atmospheric radiation is issued in every direction, particularly towards the surface of the Earth. Because of that, greenhouse gases retain heat within the surface-troposphere system. This phenomenon is known as Greenhouse Effect.

GREENHOUSE GASES: Those gaseous constituents of the atmosphere, both natural and anthropogenic, which absorb and emit infrared radiation.

HYDROMETEOROLOGICAL OR CLIMATE EVENT: Those events that might be considered dangerous if the vulnerability and exposure conditions turn them into a threat.

INTEGRATED RISK MANAGEMENT: The group of actions directed towards the identification, analysis, evaluation, control, and reduction of risks, considering them by their multifactorial origin and in a permanent formulation process that involves the three government orders, as well as the sectors of society. This facilitates carrying out actions aimed to create and implement public policies, strategies, and procedures integrated to the achievement of sustainable development guidelines that fight against the structural causes of disasters, and that also strengthen the resilience or resistance capacity of society. It involves the stages of: risk identification and the information, prevision, prevention, mitigation, preparation, aid, recovery, and rebuilding process.

INVENTORY: A document that contains the estimate of anthropogenic emissions by source and absorption by sinks.

MITIGATION: The application of policies and actions aimed at reducing emissions at the source or improving the sinks of greenhouse gases compounds.

NATURAL RESOURCE: A natural element susceptible to be used for the benefit of humankind.

PRESERVATION: The group of measures and policies to maintain the conditions that propitiate evolution and continuity of ecosystems and natural habitats, as well as to conserve viable species populations within their natural environments, and the biodiversity components out of their natural habitats.

RADIATIVE FORCING: Variation of net irradiance, expressed in W m⁻², (downward minus upward) at the tropopause, due to a change in the external causes of climate change; for example, a variation in the concentration of carbon dioxide or of solar radiation.

REFORESTATION: Induced establishment of forest vegetation in woodlands.

RENEWABLE ENERGIES: Those that harness the energy usable by humankind, that are naturally regenerated, and therefore periodically or continuously available. They are: a) wind; b) solar radiation, in all its forms; c) the movement of water in both natural and artificial channels; d) oceanic energy in all its forms: tidal, thermal, waves, from marine current, and from salinity gradients; e) geothermal heating; f) bioenergetics, determined by the Bioenergetics Promotion and Development Law, and g) any others that are determined by the Ministry of Environment and Natural Resources.

RESILIENCE: The capacity of natural and social systems to recover from or withstand the effects of climate change.

RESISTANCE: The capacity of natural or social systems to prevail in the face of climate change effects.

RESTORATION: The group of activities aimed at recovering and reestablishing conditions that propitiate evolution and continuity of natural processes.

RETURN PERIOD: Estimated number of years that will take an event to recur.

RISK ATLAS: A dynamic document, whose risk assessments in vulnerable regions or geographic zones consider current and future climate scenarios.

RISK REDUCTION: Preventive intervention of individuals, institutions, and communities that allows to eliminate or reduce

the adverse impact of disasters, through preparation and mitigation actions. It considers risks assessment and vulnerability analysis; resilience and response capacity; development of a civil protection culture; public commitment and development of an institutional framework; implementation of environmental protection measures; land-use and urban planning; critical infrastructure protection, alliance generation, development of financial instruments and risk transfer; and development of alert systems.

RISK: Probable damage or losses over an damageable agent, resulting from the interaction between its vulnerability and the presence of a disturbing agent.

SHORT-LIVED CLIMATE POLLUTANTS: Substances, such as methane, black carbon, tropospheric ozone, and several hydrofluorocarbons (HFCs), having a significant short-term impact on climate change, and a relatively short lifespan in the atmosphere, compared to carbon dioxide and other gases.

SUSTAINABLE DEVELOPMENT: The process that is evaluable through environmental, economic, and social criteria and indicators, aimed to improve life quality and people productivity, based on appropriate measures for preserving ecological balance, environmental protection, and responsible use of natural resources, without compromising the needs fulfillment of future generations.

SUSTAINABLE USE: The utilization of natural resources observing ecosystem integrity and carrying capacity of the ecosystems from which those resources came from, for indefinite periods.

TONS OF CARBON DIOXIDE EQUIVALENT: Measurement unit of greenhouse gases, expressed in tons of carbon dioxide.

VULNERABILITY: The level to which a system is susceptible or unable of withstanding the adverse effects of climate change, including climate variability and extreme phenomena. Vulnerability is measured in function of the nature, magnitude, and speed of the climate variation to which a system is exposed, its sensibility and adaptation capacity.

REFERENCES LIST

- "Climate anomaly". (s/f). In *Meteorology Glossary of the American Meteorological Society*. Available at: http://glossary.ametsoc.org/wiki/Climate_anomaly
- "GISS Surface Temperature Analysis". (s/f). EUA: Goddard Institute for Space Studies. Available at: http://data.giss.nasa.gov/cgi-bin/gistemp/nmaps.cgi?year_last=2013&month_last=4&sat=4&sst=3&type=anoms&mean_gen=0112&year1=1981&year2=2012&base1=1951&base2=1980&radius=1200&pol=reg
- Bond, T.C., Doherty, S.J., Fahey, D.W., et al. (2013). Bounding the role of black carbon in the climate system: A scientific assessment. In *Journal of Geophysical Research: Atmospheres*. Available at: <http://onlinelibrary.wiley.com/doi/10.1002/jgrd.50171/pdf>
- CENAPRED and Desinventar. (s/f). Accountancy of existent files in the Mexican base of historical disasters inventory. Cyclones, tropicals, floods, intense rainfall, heat waves, and droughts were considered.
- Earth System Research Laboratory. (April, 2013). *Trends in Carbon Dioxide*. Hawaii. USA: National Oceanic and Atmospheric Administration. Available at: <http://www.esrl.noaa.gov/gmd/ccgg/trends/>
- CECADESU. (2009). *National Study on Climate Change Perception*. Mexico
- CECADESU. (2010). *National Study on Climate Change Perception*. Mexico
- CECADESU. (2011). *National Study on Climate Change Perception*. Mexico
- CECADESU. (2012). *Assessment on Climate Change Social Perception*. Mexico
- Fedorov A.V., Brierley, C.M., Emanuel, K. (February 25th, 2010). "Tropical cyclones and permanent El Niño in the Early Pliocene". *Nature*. Vol. 463: pp. 1066-1070. Available at: <http://www.nature.com/nature/journal/v463/n7284/full/nature08831.html>
- General Civil Protection Law*. (June 6th, 2012). In Diario Oficial de la Federación. Mexico.
- General Climate Change Law*. (June 6th, 2012). In Diario Oficial de la Federación. Mexico. Available at: <http://www.diputados.gob.mx/LeyesBiblio/pdf/LGCC.pdf>
- General Law on Ecologic Equilibrium and Environmental Protection*. (January 28th, 1988). In Official Journal of the Federation. Mexico.
- General Law for Sustainable Forestry Development*. (February 25th, 2003). In Official Journal of the Federation. Mexico.
- Green, B.H., Simmons, E.A. and Woltjer, I. (1996). Landscape Conservation: Some Steps Towards Developing a New Conservation Dimension. *A draft report of the IUCN-CESP Landscape Conservation Working Group*. UK: Wye College.
- Intergovernmental Panel on Climate Change. (2012). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. Switzerland. Available at: <http://ipcc-wg2.gov/SREX/>
- International Energy Agency. (2012). *CO Emissions from Fuel Combustion*. Paris, France: OECD/IEA.
- Law for the Exploitation of Renewable Energies and Financing Energy Transition*. (November 28th, 2008). In Official Journal of the Federation. Mexico.
- Lüthi, D., Le Floch, M., Bereiter, B., et al. (May 15th, 2008). "High-Resolution carbon dioxide concentration record 650,000-800,000 years before present". *Nature*. Vol. 453: pp. 379-382. Available at: <http://www.nature.com/nature/journal/v453/n7193/pdf/nature06949.pdf>
- National Institute for Ecology and Climate Change. (2012). Bases for Low-emission Development in Mexico. Mexico: Federal Government. Available at: <http://www.ine.gob.mx/descargas/dgipea/ine-ecc-ec-02-2012.pdf>
- NIE. (2010) *National Inventory of GHG Emissions: 1990-2010. Mexico: Federal Government*. Available at: www2.ine.gob.mx/publicaciones/libros/685/inventario.pdf
- NIE. (2011). *Fourth almanac of air quality data and trend in 20 mexican cities (2000-2009)*. Available at: <http://www2.ine.gob.mx/publicaciones/>
- [consultaPublicacion.html?id_pub=652](http://www2.ine.gob.mx/publicaciones/consultaPublicacion.html?id_pub=652)
- NIE. (2012). *Adaptation to Climate Change in Mexico: Vision, Elements, and Criteria for Decision Making*. Mexico: Federal Government. Available at: http://www2.ine.gob.mx/publicaciones/consultaPublicacion.html?id_pub=683
- Pachauri, R.K. y Reisinger, A. [publication directors]. (2007). *Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Switzerland: IPCC.
- Project *Elaboration of tool for identifying and prioritizing measures of climate change adaptation in Mexico*, financed by the German Cooperation for Development (GIZ).
- Rockström, et al. (September 24th, 2009). "A safe operating space for humanity". *Nature*. Vol. 461: pp. 472-475. Available at: <http://www.environment.arizona.edu/files/env/profiles/liverman/rockstrom-et-al-liverman-2009-nature.pdf>
- Secretariat of the Convention on Biological Diversity (2006). Guidance for Promoting Synergy Among Activities Addressing Biological Diversity, Desertification, Land Degradation and Climate Change. Canada: Technical Series.
- SEMARNAT. (2012). *Fifth National Communication to the UNFCCC. Mexico: Federal Government*. Available at: <http://www2.ine.gob.mx/publicaciones/download/685.pdf>
- Shindell D., J. K., Vignati, E., Van Dingenen, R., et al. (January 13th, 2012). "Simultaneously mitigating near-term climate change and improving human health and food security". *Science*. Vol. 335: pp. 183-189. Available at: <http://www.sciencemag.org/content/335/6065/183.full>
- Solomon, S., Qin, D., Manning, M., et al. [editors]. (2007). *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, RU y Nueva York, EUA: Cambridge University Press.
- The World Bank. (2012). Turn Down The Heat, why a 4°C warmer world must be avoided. Available at: http://climatechange.worldbank.org/sites/default/files/Turn_Down_the_heat_Why_a_4_degree_centrigrade_warmer_world_must_be_avoided.pdf
- UNEP. (2011). *Short Lived Climate Pollutants*. Available at: <http://www.unep.org/ccac/ShortLivedClimatePollutants/tabid/101650/Default.aspx>
- United Nations Environmental Programme. (2011). *MCA4 Climate: A practical framework for planning pro-development climate policies*. Available at: http://www.mca4climate.info/_assets/files/FINAL_MCA4report_online.pdf
- United Nations Environmental Programme. (2011). *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication – Synthesis for Policymakers*. Available at: <http://www.unep.org/greeneconomy>
- United Nations Information Center. (2000). "Desertificación". Available at: http://www.cinu.org.mx/temas/des_sost/desert.htm
- United Nations Organization. (1992). *United Nations Framework Convention on Climate Change*. Available at: <http://unfccc.int/resource/docs/convkp/convsp.pdf>
- United Nations Organization. (1998). *Kyoto Protocol of the United Nations Framework Convention on Climate Change*. Available at: <http://unfccc.int/resource/docs/convkp/kpspan.pdf>
- Wiedmann, T., Minx, J. (2008). "A definition of 'Carbon Footprint'". In *Ecological Economics Research Trends*. EUA: NovaScience Publishers: pp. 1-11.
- Worboys, G. L., Francis, W. L., y Lockwood, M. J. (2010). *Connectivity conservation management: a global guide (with particular reference to mountain connectivity conservation)*. USA: Earthscan.

ACRONYMS AND ABBREVIATIONS

AAGR	Average Annual Growth Rate
BC	Black Carbon
BMU*	Federal Environmental Ministry (Germany)
C3	Climate Change Council
CCA-UNAM*	Center for the Sciences of the Atmosphere, National Autonomous University of Mexico
CFCs	Chlorofluorocarbons
CH4	Methane
CICESE*	Center for Scientific Research and Higher Education, Ensenada, Baja California
CO2	Carbon Dioxide
CO2e	Carbon Dioxide Equivalent
COP	Conference of the Parties of the UNFCCC
COTECOCA*	Technical Advisory Committee for Determining Rangeland Coefficients
FPA	Federal Public Administration
GCCL	General Climate Change Law
GDP	Gross Domestic Product
GHG	Greenhouse gases
GGGI	Global Green Growth Institute
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (German International Cooperation for Development)
HCFCs	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
IMCC	Inter-Ministerial Commission on Climate Change
IMTA*	Mexican Institute of Water Technology
INEGI*	National Institute of Statistics, Geography and Informatics
IPCC	Intergovernmental Panel on Climate Change
MRV	Measurement, Reporting, and Verification
MtCO2e	Million Tons of Carbon Dioxide Equivalent
M&E	Monitoring and Evaluation
N2O	Nitrous Oxide
NAMA	Nationally Appropriate Mitigation Action
NCCS	National Climate Change System
NGGI	National Greenhouse Gas Inventory
NIE	National Institute of Ecology (now known as NIECC)
NIECC	National Institute of Ecology and Climate Change
NPA	Natural Protected Area
NOAA	National Oceanic and Atmospheric Administration
O3	Ozone
PJ	Petajoule

REDD+	The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (including conservation of forests, sustainable management, and increase in reserves or carbon storage)
SCCP	Special Climate Change Program
SAGARPA*	Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food
SCT*	Ministry of Transportation and Communications
SE*	Ministry of Economy
SECTUR*	Ministry of Tourism
SEDESOL*	Ministry of Social Development
SEGOB*	Ministry of the Interior
SEMAR*	Secretariat of the Navy
SEMARNAT*	Ministry of Environment and Natural Resources
SENER*	Ministry of Energy
SEP*	Ministry of Public Education
SHCP*	Ministry of Finance and Public Credit
SLCPs	Short-Lived Climate Pollutants
SSA*	Ministry of Health
SRE*	Ministry of Foreign Affairs
SVI	Social Vulnerability Index
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VOCs	Volatile Organic Compounds

* For their abbreviation in Spanish

** For their abbreviation in German