Letter of Endorsement by the Government of Mexico
Secretariat of Finance and Public Credit

08th August 2022

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: afbsec@adaptation-fund.org
Fax: 202 522 3240/5

Subject: Endorsement for the Project **"Restoration of Lake Texcoco through resilient actions".**

In my capacity as General Director in process of being appointed as designated authority for the Adaptation Fund in Mexico, in the absence of an appointed authority, I confirm that the above national project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Mexico.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the Mexican Institute of Water Technology (IMTA) and executed by the **National Water Commission**.

Sincerely,

Laura Elisa Aguirre Téllez
Director General
Secretariat of Finance and Public Credit
(Unit of Public Credit)
+52 55 3688 1873
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Regular Project Cover Letter

Secretariat of Environment and Natural Resources
Mexican Institute of Water Technology

08th August 2022

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: afbsec@adaptation-fund.org
Fax: 202 522 3240/5

Subject: Endorsement for Project **"Restoration of Lake Texcoco through resilient actions"**

In my capacity as Director General of the National Implementing Entity for the Adaptation Fund in Mexico, I am pleased to send the above project for the consideration of the Board for the upcoming 39th Meeting.

The project contains crucial elements for adaptation in the country, as stated in the content. If approved, the project will be executed by the **National Water Commission**.

Sincerely,

Dr. Adrián Pedrozo Acuña
Director General
Mexican Institute of Water Technology

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board
Secretariat 1818 H Street NW
MSN N7-700
Washington, D.C.,
20433 U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category: **Regular project**

Country/ies: **Mexico**

Title of Project/Programme: **Restoration of Lake Texcoco through resilient actions**

Type of Implementing Entity: **National Implementing Entity**

Implementing Entity: **Mexican Institute of Water Technology**

Executing Entity/ies: **National Water Comission**

Amount of Financing Requested: **US$ 6,434,050** (in U.S Dollars Equivalent)

Project / Programme Background and Context:

Introduction

Mexico City, capital city of Mexico, was built on Lake Texcoco, which required a process of draining it. When the Spaniards arrived in the 16th century, Tenochtitlan was located on six lakes and was a small city, which were unified during the rainy season and constituted Lake Texcoco. This body of water was the most important in the hydrological system of the Valley of Mexico (the area that comprises the lake system) and measured 2,000 square kilometers.

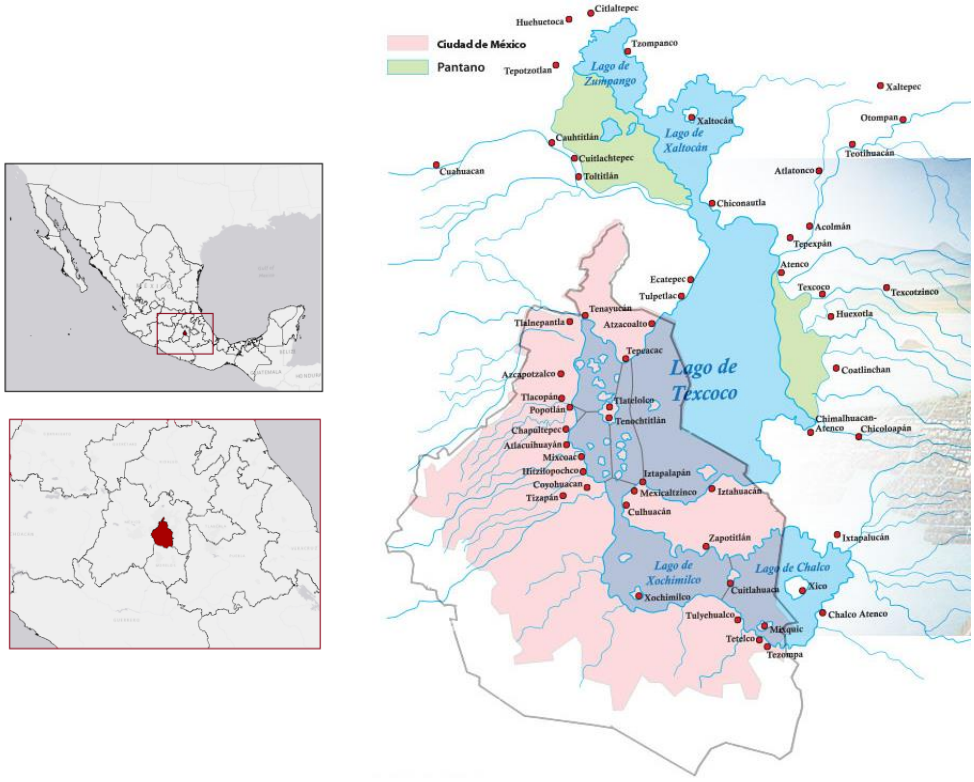

Figure 1. Extent of the Valley of Mexico and its five water bodies: Lagoon Zumpango, Lake Xaltocán, Lake Texcoco, Lake Xochimilco, and lake Chalco, from north to south), and Mexico City location and boundaries. Source: National Autonomous University of Mexico

During pre-Hispanic times the city was protected by a levee that regulated the entrance of water, but it was destroyed during the conquest. In 1555 Mexico City suffered a great flood, so the levee was rebuilt. However, floods were still a problem. For this reason, the first engineering work aimed at draining the city was the Tajo de Nochistongo, a water outlet designed by Enrico Martínez in the 17th century. The expansion of Mexico City continued and the proximity to the lakes continued to cause flooding in inhabited areas. During Maximilian's government, a final solution to the situation was sought, with the construction of the Great Drainage of the Valley of Mexico and the network of collectors and sewers. However, it was not until the Porfiriato (the period during which Mexico was under the totalitarian control of Porfirio Díaz, from 1876 to 1911) that the project was completed. The work was inaugurated on March 17, 1900.

With these works, Mexico City's climate was modified and a deep environmental modification took place. However, since these were gradual changes, they were not perceived. The Great Drainage was not the solution either, since flooding continued and caused subsidence and landslides, a consequence of the extraction of water from the aquifers.

Nowadays, it rains on average more days each year than in London; however, Mexico's capital is under water stress. The problem lies in the temporal distribution of these rains: while in December it rains only one day on average, from June to September not only the frequency of rainfall increases, but also the intensity. Practically twice as much water falls in Mexico City every time it rains. For example, on an average rainy day in June, some 7 million cubic meters of water can fall, enough to flood the city by almost 9 centimeters. But it does not rain equally everywhere: in areas with high and medium-high socioeconomic status (Álvaro Obregón, Cuajimalpa, Magdalena Contreras, Miguel Hidalgo and Tlalpan), the average rainfall is 40% higher than in the rest of the city and double that recorded in areas with a low level (Gustavo A. Madero, Iztacalco, Iztapalapa and Venustiano Carranza). Ironically, most of the neighborhoods considered "high flood risk" by the Mexico City Water System (SACMEX) are in the north and northeast of the city, where rainfall is low. Because they are at lower altitudes, they receive large amounts of water in a short period of time.

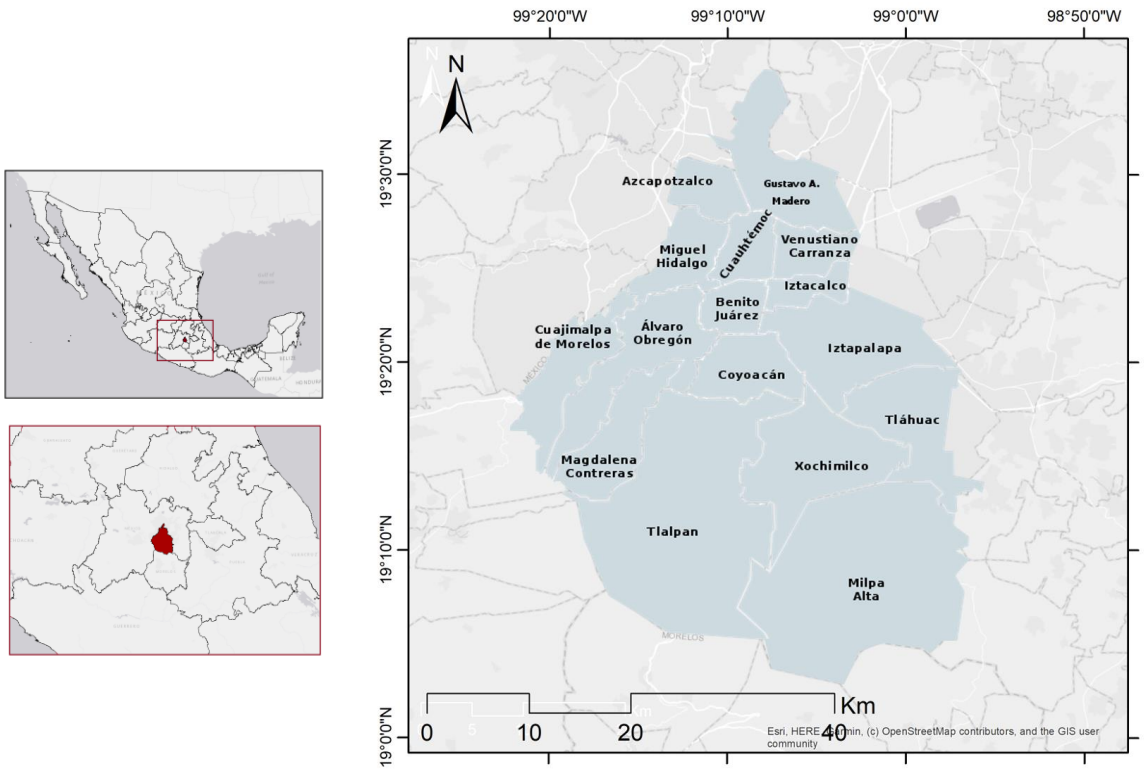

Figure 2. Location of Mexico City's municipalities

Despite this risk, Mexico City International Airport (Aeropuerto Internacional de la Ciudad de México, AICM) is located in the municipality of Venustiano Carranza, in the nort-east of the city. The main operational problem it faces is the saturation of airspace, due to the fact that its two runways do not meet the international standard of distance

required for simultaneous operations. The rapid increase in passenger and cargo transportation caused the AICM to reach its technical limit of its operations, making its capacity to meet demand insufficient. To solve this, a proposal for a new airport started to be drafted in 1990, and was named the Texcoco Airport or Mexico City New International Airport (Nuevo Aeropuerto Internacional de la Ciudad de México, NAICM), a civil airport in the Federal Zone of the Lake Texcoco, which is actually in a neighboring state: State of Mexico

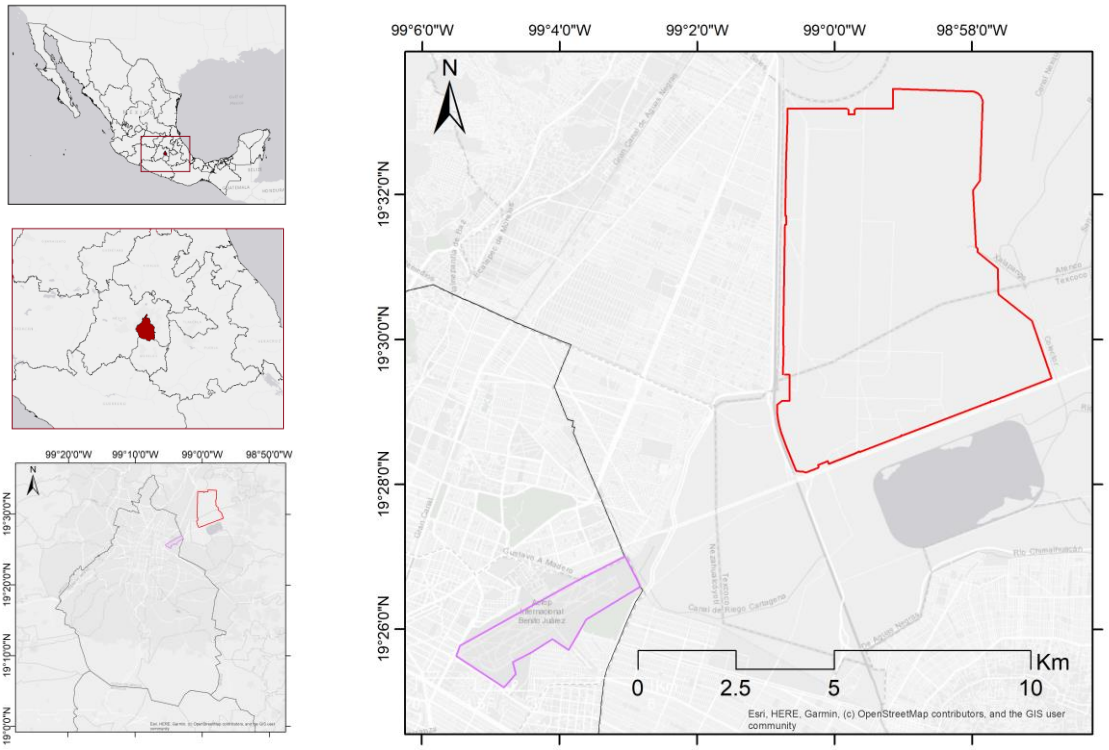

Figure 3. Location of Mexico City New International Airport (NAICM, in red) and the current Mexico City International Airport (AICM, in pink).

The storm drainage system for the NAICM consists of 11.3 kilometers of embankments, 9.3 km of canals and three pumping plants, and would help prevent flooding of the land while the new airport is being built, with a capacity of 800,000 cubic meters. To contribute of a proper drainage, several canals also serve as waterways that derive all flows outside of the NAICM perimeter. The project set the terminal building (an X-shaped construction) in the lower left corner of the perimeter.

<u>The airport and its transformation into a Natural Protected Area</u>

However, the NAICM project did not go ahead due to ecological and social controversies derived of its construction, namely: deficiencies in the water supply in the area, the risk of the area disappearing as a resting place for migratory birds, and the planting of more than 264,000 plants of five non-endemic species that, in addition to being invasive, belong to a type of leaf that would put the area at risk of fire. Additionally, there was a perceived lack of information on the process of buying and selling land to the *ejidatarios*

(land owners) for the hydraulic project, their exclusion from the profits of the investment because once they sell the land, they can no longer profit from it, and the public bids for construction to private companies has been interpreted by certain sectors of society as a land grab from the communities surrounding the NAICM.

Following its cancellation, by the end of 2021, the federal government declared the area where the NAICM would be as the Ecological Park Lake Texcoco (Parque Ecológico Lago de Texcoco, PELT). The purpose what two-fold: to recover an area that was originally part of the hydrological system (see Fig. 1) and to transform in into a park embedded in a protected area. In March 2022, the area surrounding the PELT was declared Natural Protected Area (Área Natural Protegida, ANP) by the federal government.

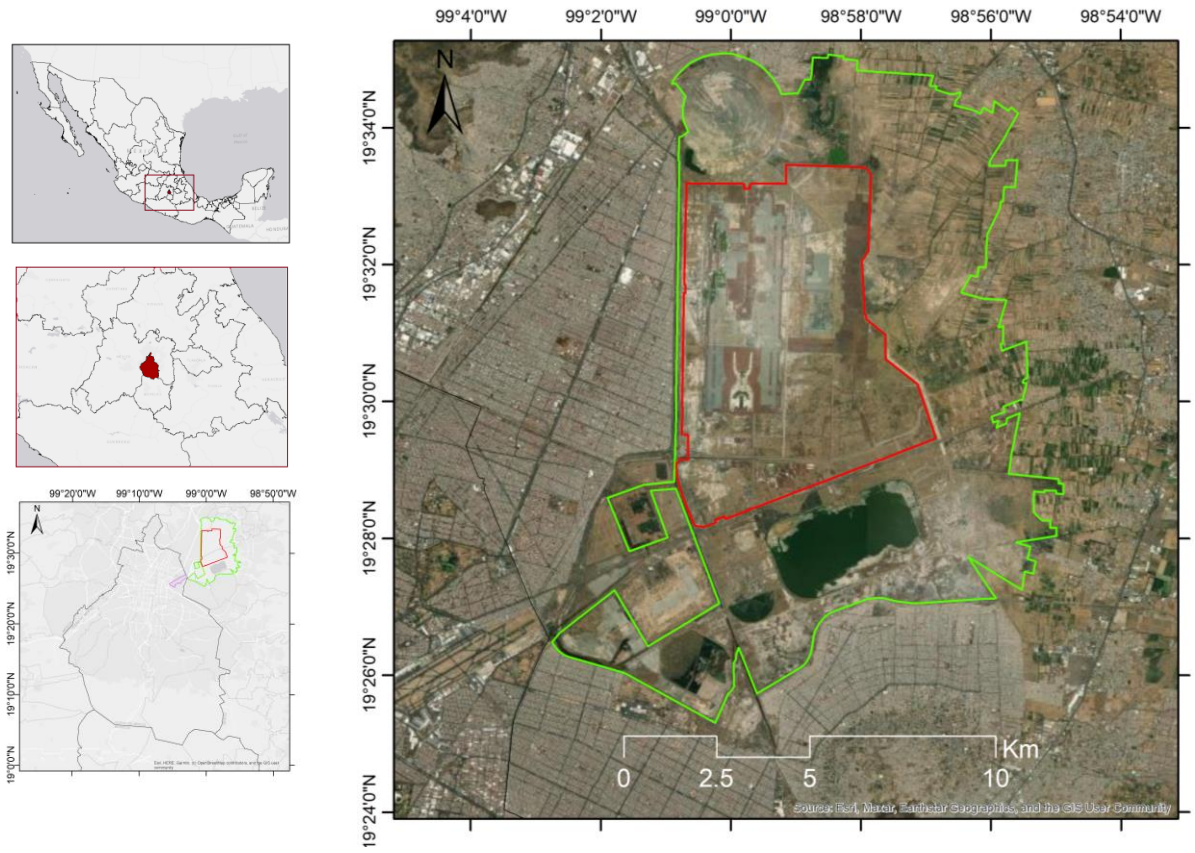

Figure 4. Extent of the Ecological Park Lake Texcoco (PELT, formerly NAICM, red) and the Natural Protected Area Lake Texcoco (ANP, green)

The Natural Protected Areas (Áreas Naturales Protegidas, ANPs) guarded by the federal government are natural spaces that conserve their original state or have not been significantly altered by human activities. Natural Protected Areas are open to any person or group of people who wish to learn about the biological wealth they treasure and carry out recreational activities in these territories, which generates economic resources for the communities settled in them, while involving them in the care of natural resources.

Lake Texcoco as such no longer exists; its drying up took several centuries. At present

there is a small extension of what was once Lake Texcoco, it is estimated that it covers an area of 10,000 hectares of the original wetland and yet it still maintains its function as a vital site for breeding, wintering, feeding and resting of various species of birds.

The lakes of region (see Fig. 1) are isolated, vast terrains separate them, to the north of Lake Texcoco the marshes prosper, the water is losing extension. By 1856, Lake Texcoco had 350 km^2 left, at the beginning of the 19th century it was 267 km2, and in the 1960s it was only 160 km^2. The current remainder is only 10 km^2 and corresponds to Lake Nabor Carrillo, which in the end is an artificial lake. The marsh San Juan and the Xalapango Lagoon have recently been recovered by the residents of Atenco, and it is worth mentioning that birds and turtles can already be observed in their natural environment. To reverse this process, several artificial wetlands have been created to carry out their functions: contain the waters of the rivers that flow there, prevent flooding and atmospheric contamination, as well as recharge the aquifers and prevent the city from sinking. The largest of them all is Lake Nabor Carrillo, also home to some 200,000 birds (see section “Hydrology” for location of water bodies).

Drying up of the lake has resulted in the disappearance of many of the species representative of its flora and fauna, especially mammals that have been the object of indiscriminate hunting, such as deer and other wild animals, as well as many of its birds. The area of Lake Texcoco contains representative ecosystems that are the habitat of more than 250 species of flora and more than 370 species of fauna, and more than 10 species of fungi and mosses of which 48 are under some category of protection according to the Mexican official law (Norma Oficial Mexicana, NOM) NOM-059-SEMARNAT-2010, which refers to environmental protection.

There are several characteristics that make Lake Texcoco a suitable ANP, such as its location in an active volcanic region and the presence of large closed basins. The area is home to ecosystems of terrestrial and aquatic halophilic vegetation and marshes, as well as bodies of water linked to the wildlife and human life cycle. Lake Texcoco is considered the most important body of water in the Mexico Basin, as it is the only water and climate regulating basin in the eastern part of the State of Mexico. It is of vital importance for the Valley of Mexico, both for flood control and for sanitation and drinking water supply. The ANP aims at creating a natural space to safeguard the fauna and flora of the region, and to provide a public space for environmental and cultural recreation. This space incorporates nature, culture and infrastructure: a Cultural Ecology. The goal is to reclaim the site as the most important piece of green infrastructure in the valley, as this infrastructure will be able to reconcile the city with its geography.

Presentation of the project

Comprehensive management of the resource is required, through increasing water productivity in the agricultural sector, improving the quality of life of the population, expanding the coverage of services, promoting efficient use and reuse, consolidating a water information system, encouraging the participation of society in the management of the resource, and strengthening national and local capacities to face the effects of hydrometeorological risks. Water is an irreplaceable natural resource for life; however, human activities have deteriorated its quality and diminished its reserves.

This project aims at restoring the environmental resilience of a natural area while promoting sustainable economical activities, encouraging the participation of local communities, and reducing flood risk. These activities will take place in large areas of Mexico City and municipalities in the State of Mexico (Texcoco, Atenco, Chimalhuacán, Ecatepec de Morelos and Nezahualcóyotl). This will prevent annual losses of great socioeconomic value.

By improving the area's environmental conditions, biodiversity will be promoted and boosted, recovering species of fauna and flora in the process of extinction, maintaining and protecting existing species, and increasing migratory birdlife to more than 300,000 individuals of 134 different species.

The Lake Texcoco Project is an option and an example in the search for medium- and long-term solutions to rescue and preserve resources and the environment. The project is the first model of environmental recovery in the country, considering that it has become one of the most significant refuges for migratory birds in winter and an important source of income to local communities that make the most of water bodies for sustainable food production. The population will also benefit from natural wastewater treatment sites (wetlands) and are strongly involved in the design of the proposed structures. These benefits, in addition to the scientific aspect, have an important impact on the recreational and tourist aspects, which can be used by the local inhabitants.

Geographic and Environmental background

Climate

The predominant climate within the ANP corresponds to two denominations according to the Koppen classification (Koppen, W. 1948).

The first and most predominant one is semi-arid (BS) temperate, with warm summer. Maximum temperature reaches 30 °C to 32 °C between April and June. At the beginning of the rainy season, the days are cooler and maximum temperatures remain between 26 °C and 29 °C from July to October. In the cold season, the maximum temperature varies from 26 °C to 28 °C. In January, the minimum temperatures in the area vary between -3 °C and 5 °C; from October to March, they remain at values close to 0 °C. During the rainy season, minimum temperatures range from 7°C to 10°C.

The second, which occurs in the northwestern portion of the ANP boundaries, has a dry, temperate and temperate sub-humid climate (Cw) in the portion bordering the municipalities of Chiconcuac, Chautla and the southeastern portion of Tezoyuca. With an average temperature of 15.1°C, an extreme maximum of 33.5°C and a minimum of 11.0°C. Rainfall reaches 256.2 millimeters in August, and the minimum recorded amount of precipitation is 2 millimeters in February.

On the other hand, evaporation in the area of the former Texcoco lake was the highest in Mexico. The maximum daily evaporation was 68.51 mm, recorded in May 1990.
1990. Taking into account the high temperatures and the frequency and duration of the winds that favor evaporation, evaporation has been measured in annual values of up to

2453.8 mm, with an average of 1,500 mm per year. Evaporation in the area of former Lake Texcoco shows the greatest losses in March, April and May, gradually decreasing until December, when it increases again.

The National Weather Service (Servicio Meteorológico Nacional, SMN) makes available national climatological information from 1900 to date, where updated information is revised by the National Water Comission's (Comisión Nacional del Agua, CONAGUA) Catchment Organizations (Organismos de Cuenca) and Local Directorates (Direcciones Locales), which involves approximately 55 million daily records of rainfall in 24 hours and minimum and maximum temperature, reported by about 5,500 climatological stations, and for those with records older than 10 years, the calculation of climatological averages, extreme values and monthly statistics is performed.

Climatological data was extracted for the ANP Lake Texcoco, regarding temperature, precipitation and evaporation.

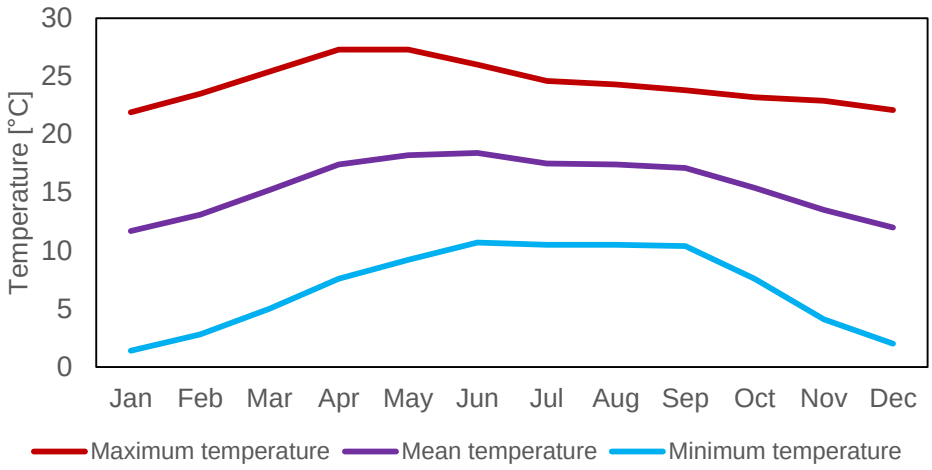

Figure 5. Average temperatures in Lake Texcoco derived from data 1981-2010

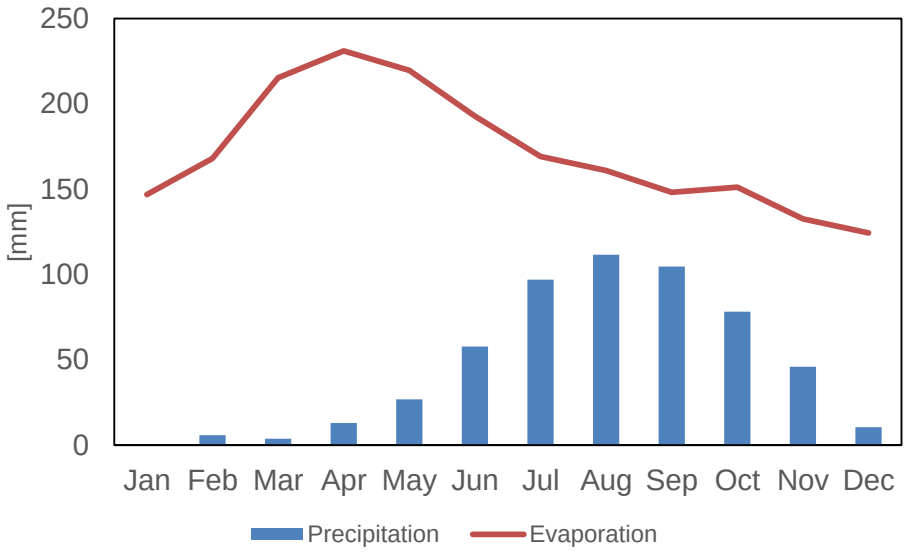

Figure 6. Average Precipitation and Evaporation in Lake Texcoco derived from data 1981-2010

Soil and topography

The ANP is located between 2,240 and 2,260 meters above sea level and is bordered by different elevations to the north, from east to west by the Sincoque, San Sebastián, Xalpan, and Hueipoxtla hills, the Acayucan hill, and the Tezontlalpan and Pachuca Mountain ranges. To the south, from east to west, it is bordered by the Popocatepetl, the Chichinnautzin and Ajusco mountain ranges and the mountain of the crosses. To the east, from north to south, by the Pachuca Mountain range, the Tecajete, San Gabriel Xihuinco, Tlalzalán, Tláloc, Telapon, Papayo hills and the Iztaccíhuatl and Popocatépetl volcanoes. Finally, to the west, from north to south, it is bordered by the Sierra de Tepotzotlán mountain range, the lower mountain range, the upper mountain range and the Sierra de las Cruces. It is also located within a lake plain resulting from volcanic activity.

The soils in the basin are saline, gleyic or saturated with water and harden easily, so that when they dry out, they cause heavy rains of sand, which is why many of the areas have been paved.

Formerly a lake, the area is heavily subjected to subsidence, and the lake sediments of the soil are highly heterogeneous. This is why numerous topography studies have been carried out. However, the terrain elevations have to be constantly rectified to check slopes and water flow directions.

Fauna and vegetation

Within the ANP, 74 families, 219 genera and 319 species are found. Of these, 170 genera and 253 species are biodiversity native to Mexico, while 59 genera correspond to Mexican native biodiversity, while 59 genera and 59 species have been introduced to this territory as a result of different historical interventions. The flora recorded for the ANP represents 1.1% of the native plant species within Mexican territory. This can be considered a significant figure taking into consideration that the ANP spans over only approximately 0.0071% of the national continental territory

The ANP flora provided them with elements such as tules or weeping willow, which today are part of their wetlands, as well as ahuehuetes, ahuejotes and other trees with which local communities make their rafts for crops. They also had a lot of algae on the shores.

Regarding the fauna of the lake, it is represented by fish such as anchovies or ajolotes, amphibians and many migratory birds, such as coots, herons, chichicuilotes, ducks and small mammals such as rodents, among others.

Hydrology

Lake Texcoco is located within one of the 37 Hydrological Regions of Mexico, Hydrological Region no. 26 "Pánuco", with a surface area of 97,195.727 Km^2 from its source in the Valley of Mexico to the mouth of the main channel in the Gulf of Mexico.

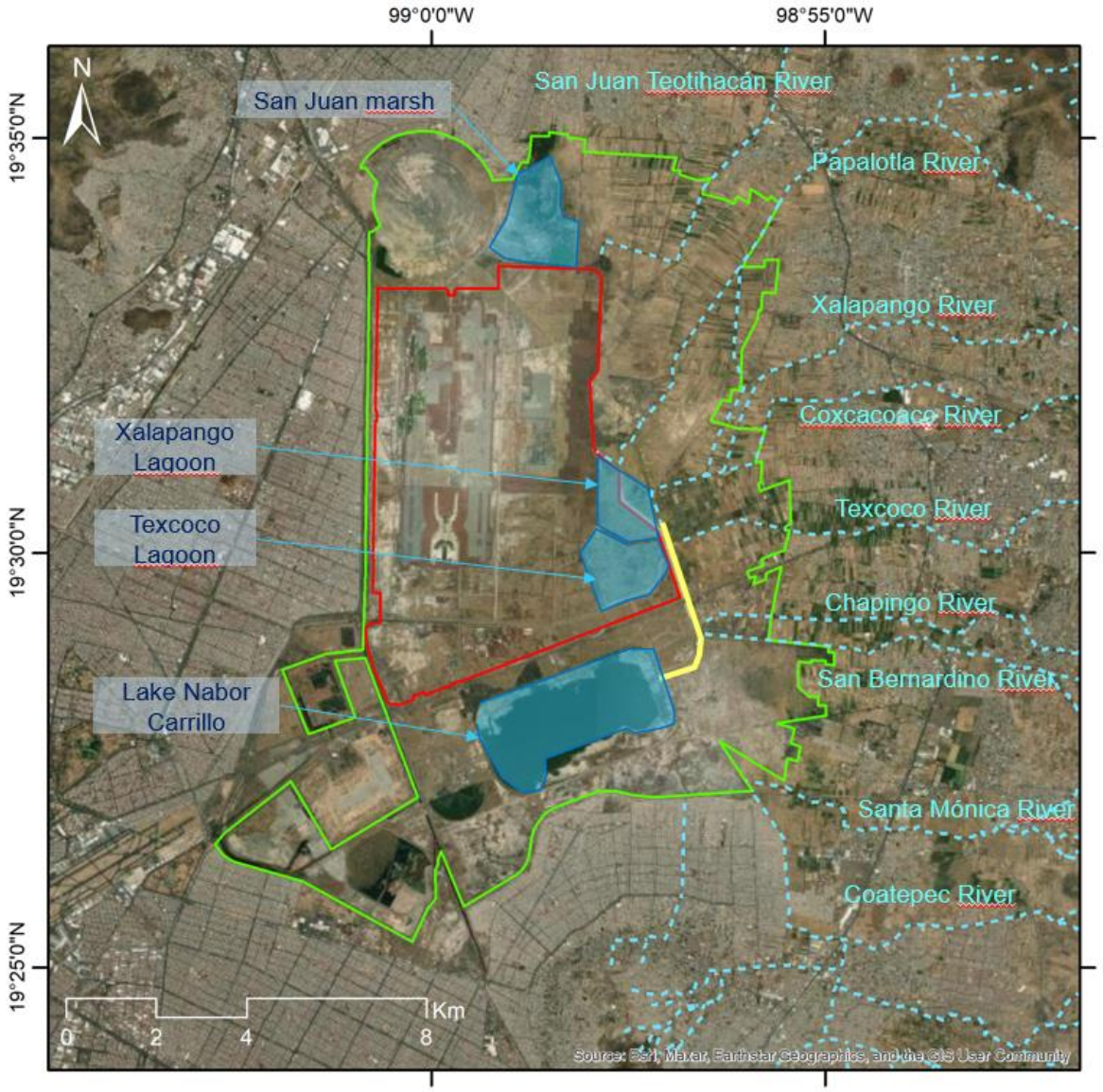

Figure 7. Overview of the area of interest: Boundary of the Ecological Park Lake Texcoco (Parque Ecológico Lago de Texcoco, PELT, in red), boundary of the Natural Protected Area Lake Texcoco (ANP, green), the nine main rivers that discharge within the ANP polygon (blue, dotted lines) and four of the water bodies (blue, polygons) in the present proposal.

Currently, there are 9 rivers that discharge within the perimeter of ANP Lake Texoco (San Juan de Teotihuacán, Papalotla, Xalapango, Coxcacoaco, Texcoco, Chapingo, San Bernardino, Santa Mónica and Coatepec) and 4 small lakes, which together with Lake Nabor Carrillo give a volume of 25.9 million m^3. For a return period of 50 years, this is the same capacity as that of the drainage system of the Valley of Mexico.

Geohydrologically, the Texcoco aquifer belongs to the Cuautitlán-Pachuca aquifer, both overexploited and unavailable.According to the latest update, published in the Official Journal of the Federation (Diario Oficial de la Federación, DOF) on September 17th 2020, the Texcoco aquifer has an overexploitation or deficit of 111.23 million cubic meters per year and the Cuautitlán-Pachuca aquifer has a deficit of 188.69 million cubic meters per year.

Climate change in the Lake Texcoco

Current climate variability and vulnerability

Due to Valley of Mexico's latitude (19°30'), its climate is essentially tropical, although the heat characteristic of the tropics is tempered by the high altitude of the Valley of Mexico. The area where Mexico City is located, south of the Mexican Altiplano, is west of the semi-permanent North Atlantic anticyclone (Bermuda-Azores) whose seasonal displacements determine to a great extent the climate of the Valley and, in general, of almost the entire country.

During the dry season, from mid-May to mid-October, an anticyclonic circulation generally prevails over the region: in the winter the jet stream, from the west, at 200 mb, moves southward, passing somewhat to the north of Mexico City, so that in the upper troposphere, the winds over the capital blow from the west or SW with strong intensity. It is at this time when the polar air masses descend from North America, which sometimes cause strong temperature drops in the Valley.

In the middle of winter, the axis of the high-pressure area located over the U.S. moves southward resulting in an intensification of the westerly flow over Mexico. The subsidence of the air, associated to the anticyclonic circulation, originates in Mexico City a great frequency of clear skies and temperature inversions, superficial and at altitude. The disturbances that travel in the form of troughs within the westerly wind current cause variations in pressure, and the corresponding change in wind direction over the Valley of Mexico. The intensification of the wind in the passage of these troughs causes the formation of dust storms (“tolvaneras”), mainly in the region neighboring the old Lake Texcoco.

The lack of properly paved roads in the region means that during the dry season the winds from the plains blow clouds of dust from the unpaved roads; during the rainy season, poor drainage causes frequent flooding. A part of this region has, as already seen, a semi-arid climate (BS). The scarcity of rainfall and the high insolation typical of this climate cause a greater amplitude of the thermal oscillation.

Rainfall scarcity and the high insolation characteristic of this climate cause greater diurnal thermal oscillation. Frosts are more frequent here and solar radiation is more abundant and intense. In short, this is the least favorable region from the point of view of climate and soil. The high groundwater level, which sometimes rises to the surface, the low compressive strength of the soils and the high salt content increase construction and drainage costs.

The Valley of Mexico is part of a highly vulnerable and severely damaged ecosystem, since its subsystems (water, soil, air) are in a critical state; for example, the problem of water availability and quality and air pollution are among the most recurrent in social concerns and even in the government's own agenda.

The physical characteristics of the Federal District, its productive activities and the daily life of its population make its links relevant and have significant consequences for climate change, so it should be considered a center emitting large volumes of

greenhouse gases and a space vulnerable to floods, heat waves and droughts, among other climatic phenomena that visibly affect its ecosystem and the population living there.

Expected climate change impacts (precipitation, temperature)

In Mexico, adaptation to climate change is a process that has been established in the General Law on Climate Change, in the Special Program for Climate Change 2021-2024, and for which Mexico, at the international level, established its Nationally Determined Contributions, and has signed its adhesion to the Paris Agreement, which is an effort to establish the issue of adaptation to climate change as a global objective.

In 2012, the Center for Scientific Research and Higher Education of Ensenada, Baja California (Centro de Investigación Científica y de Educación Superior de Ensenada, CICESE), the Mexican Institute of Water Technology (Instituto Mexicano de Tecnología del Agua, IMTA) and the Center for Atmospheric Sciences (Centro de Ciencias de la Atmósfera, CCA-UNAM), in coordination with the National Institute of Ecology and Climate Change (Instituto Nacional de Ecología y Cambio Climático, INECC), with funding from the Global Environment Facility (GEF) and administered by the United Nations Development Program (UNDP), carried out the study "Update of Climate Change Scenarios for Mexico as part of the products of the Fifth National Communication". In this study, a regional analysis of the historical period and the projections of 15 global circulation models (GCM) for the near future (2015-2039) and far future (2075-2099) for Mexico was carried out using information from the Coupled Model Intercomparison Project Pahse 5 (CMIP5), and were used in the 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

The following effects are mainly observed: temperature increase, higher minimum temperatures, intense rainfall and droughts. The increase in temperature presents a high degree of variability, since in recent years the heat waves in the spring period ranged between 33°C and 35°C. In urban areas, this is associated with the so-called "heat island", which derives from the characterization of cities as bubbles or domes of warm air as a result of the fact that much of the natural soil has been replaced by buildings, sidewalks and asphalt streets, which leads to a reduction in evaporation sources and drier city air at certain times of the day, causing temperatures to rise higher in some areas than in others.

Some of the effects of temperature increases are reflected in reduced water availability, increased costs and health services due to the incidence of malnutrition, diarrhea, and cardiorespiratory and infectious diseases, as these increases may indirectly affect air quality in the city as a result of dry periods, delayed rainfall and increased solar radiation. Biodiversity may also be affected by the stress to which plants are subjected. This is particularly noticeable in Mexico City's conservation land, which provides refuge to more than 2,500 species of flora and fauna that are immersed in an extensive range of unique ecosystems and habitats, and are home to 2% of the world's biodiversity and 12% of Mexico's flora and fauna species.

Another consequence related to increases in temperature is that its minimums are high, i.e., there are fewer cold days and frosts. This leads to a relative decrease in human

morbidity and mortality related to low temperatures, although on the other hand, such phenomena may increase the scope and activity of some pests and diseases, since, for example, the period during which certain mosquitoes can exist in the city will increase.

On the other hand, one of the most visible effects of global climatic variations will continue to be the increase in precipitation, 78% of which occurs during the months of June to September, in an average of 82 days and is linked to floods and landslides that cause various problems in terms of water supply, distribution, quality, and the removal of rainwater and domestic and industrial wastewater, with negative consequences on the quality of life of the inhabitants and the urban function itself. The physiographic characteristics of the Valley of Mexico, combined with irregular human settlements and other social vulnerability factors, such as precarious housing in risk areas, make extreme hydrometeorological phenomena a constant threat to the population living in these areas. In the Valley of Mexico there are more than 24 thousand people distributed in 168 at-risk sites.

The last effect related to climate change is drought, which leads to a decrease in crop yields, damage to building foundations due to soil shrinkage, a decrease in the quantity and quality of water resources, and an increased risk of forest fires. With regard to agriculture, which is practiced mainly in the Federal District's conservation land, water scarcity increases its vulnerability, especially in the ejidos and communities in the south of the city. Likewise, the growth of the urban sprawl on conservation land has repercussions on the reduction of infiltration into the aquifer and adds to its overexploitation.

This is undoubtedly relevant considering that the water problem in the Valley of Mexico is one of the most pressing and documented. Tensions between catchment and consumption areas are evident, and the effects of climate change will eventually aggravate the persistent problem of water management. For this reason, the care and definition of policies to rescue and protect Mexico City's conservation land are essential, since one of its main functions is to act as a carbon sink; it is also fundamental for the maintenance of the hydrological cycle of the Mexico Valley basin because it includes the most important areas for aquifer recharge: it is estimated that it provides between 60 and 70% of the water consumed in the city.

If the current dynamics of urban growth and changes in land use continue, the environmental goods and services provided by conservation land will be diminished and its contribution to climate change mitigation will be reduced. For this reason, it is important to consider social aspects, urban planning and land management, since the prevalence of human settlements in unsuitable areas is determined, among other factors, by the scarcity of accessible land for low-income housing and the high cost of housing.

Socioeconomic and development context and situation

As stated previously, the area of the ANP lies within the State of Mexico, and comprises five municipalities.

Table 1. Area per municipality within the ANP Lake Texcoco

Municipality	Total area (Ha)	Area within ANP Lake Texcoco (Ha)
Atenco	8 707.00	6 605.00
Chimalhuacán	5 409.66	346.36
Ecatepec de Morelos	15 523.10	104.22
Nezahualcóyotl	6 289.96	353.99
Texcoco	42 557.52	6593.81
TOTAL (Ha)		14 000.38

In Mexico, population surveys are carried every ten years, being the most recent one in 2020 (carried out just before the pandemic, in March).

Table 2. Dissagregated population for the five municipalities within the ANP

Municipality	Total population	Men	Women
Atenco	75,489	37,052	38,437
Chimalhuacán	705,193	344,571	360,622
Ecatepec de Morelos	1,645,352	798,549	846,803
Nezahualcóyotl	1,077,208	519,922	557,286
Texcoco	277,562	134,940	142,622

The population for these five municipalities is expected to grow. According to the State Population Council (Consejo Estatal de Población, COESPO), the expected population for 2030 is as follows:

Table 3a. Projected population for the municipalities of the State of Mexico within the ANP (0-9 years old)

Municipality	Total population	Total population		Children (0-9)	
		Male	Female	Male	Female
STATE	18,887,349	9,222,192	9,665,157	1,313,467	1,268,029
Atenco	73,574	36,325	37,249	5,382	5,281
Chimalhuacán	745,251	367,025	378,226	60,649	58,240
Ecatepec de Morelos	1,886,944	930,671	956,273	116,788	111,220
Nezahualcóyotl	1,318,836	634,153	684,683	75,143	71,774
Texcoco	284,437	137,972	146,465	17,035	18,211

Table 3b. Projected population for the municipalities of the State of Mexico within the ANP (10-19 and 20-29 years old)

Municipality	Total Population	Teenagers (10-19)		Young adults (20-29)	
		Male	Female	Male	Female
STATE	18,887,349	1,433,202	1,379,820	1,460,969	1,435,574
Atenco	73,574	5,945	5,845	5,794	5,493
Chimalhuacán	745,251	62,482	60,187	63,095	62,953
Ecatepec de Morelos	1,886,944	135,610	126,974	149,063	139,616
Nezahualcóyotl	1,318,836	86,306	83,872	99,466	96,593
Texcoco	284,437	20,179	20,206	22,445	20,978

Table 3c. Projected population for the municipalities of the State of Mexico within the ANP (30-59 and 60+ years old)

Municipality	Total Population	Adults (30-59)		Seniors (60+)	
		Male	Female	Male	Female
STATE	18,887,349	3,706,768	4,022,090	1,307,786	1,559,644
Atenco	73,574	14,455	15,354	4,749	5,276
Chimalhuacán	745,251	143,221	154,132	37,578	42,714
Ecatepec de Morelos	1,886,944	386,900	414,228	142,310	164,235
Nezahualcóyotl	1,318,836	259,112	288,072	114,126	144,372
Texcoco	284,437	57,711	62,336	20,602	24,734

Comprehensive research on the main actors and the disputes that have arisen from the NAICM (airport). As stated in section “The airport and its transformation into a Natural Protected Area”, the initial construction of the NAICM involved conflicts with the ownership of the land with local communities and inhabitants in the proximity where the airport was going to be located. Further on, as the NAICM (airport) was transformed into an Ecological Park (Parque Ecológico Lago de Texcoco, PELT) within the ANP (Natural Protected Area), the dispute continues to revolve around the rights to the land that surrounds the PELT (see Fig. 4 for location of the relevant boundaries). Local communities are interested both in owning agricultural land, but also in the restoration of the ecosystem within the ANP. These demands are well considered within the scope of the present proposal. An overview of the main social actors involved and the conflicts that have arisen with the declaration of the PELT and the ANP is shown below.

Table 4a. Conflicts involving social actors in the ANP, in reverse chronological order

Social Actors	Government	Name of organization of social actors	Members of academia	Date	News article header	Source	Confronted parties			Actors involved in conflict resolution
Land ownners in San Cristóbal Nexquipaya, en Atenco	Federal Government	Peoples' Front in Defense of the Land (Frente de Pueblos en Defensa de la Tierra, FPDT)		09/03/2022	Disguised dispossession in Texcoco	https://www.elfinanciero.com.mx/opinion/lourdes-mendoza/2022/03/09/despojo-disfrazado-en-texcoco/	Peoples' Front in Defense of the Land and Federal Government	vs	Landowners in Atenco	Federal Government
	Secretariat of Environment and Natural Resources									Secretariat of Environment and Natura Resources
Five land owner groups from the municipalities of Nezahualcóyotl, Ecatepec, Chimalhuacán, San Salvador Atenco y Texcoco										National Commission of Natural Protected Areas
	National Commission of Natural Protected Areas									
Landowners from Atenco y Texcoco	Federal Government			21/04/2022	Landowners demand restitution of allegedly expropriated lands	https://www.elsoldetoluca.com.mx/local/lago-de-texcoco-ejidatarios-piden-la-restitucion-de-	Federal Government	vs	Atenco and Texcoco. Landowners of the communities of Nexquipayac, Acuexcomac, Atenco, La	
Acuexcomac, Atenco, La Madero, Huexotla, Tocuila, San Felipe and their neighborhoods.										
Landowners siding with the right wing political party PRI		Peoples' Front in Defense of the Land		21/04/2022	Ejidatarios opposing ANP in Texcoco take over San Salvador Atenco mayor's office	https://www.proceso.com.mx/nacional/2022/4/21/ejidatarios-	Peoples' Front in Defense of the Land	vs	Landowners siding with the right wing political party	
Exmembers of the right wing political party PRI	Federal Government	Peoples' Front in Defense of the Land in Atenco		13/03/2022	Caciques sabotage natural protected area in Texcoco	https://www.jornada.com.mx/notas/2022/03/13/sociedad/caciques-sabotean-area-natural-protegida-en-texcoco/				
Excandidate for PRI for Atenco										
Exlocal leader in Tocuila										
Alleged landowner in Nexquipayac, related to Santiago López										
Head of municipality in Atenco during the first construction works of the NAICM										
César Sánchez, member of the right-wing political party PRI	Secretariat of Environment and Natural Resources	Peoples' Front in Defense of the Land in Atenco		24/02/2022	Conflictos ejidales frenan Área Natural Protegida en Texcoco	https://piedepagina.mx/conflictos-ejidales-frenan-area-natural-protegida-en-texcoco/				
Los Oaxacos community group	Secretariat of Urban Development in the State of Mexico									
José Alejandro Santiago López, political actor	National Commission of Natural Protected Areas Mexico									
Adrián Ruiz Méndez, Regional Coordinator for PRI, leading the movement against the declaration of the ANP										
Landowners of Atenco										

Table 4b. Conflicts involving social actors in the ANP, in reverse chronological order

Social Actors	Government	Name of organization of social actors	Members of academia	Date	News article header	Source	Confronted parties			Actors involved in conflict resolution
Farmers from Atenco, Nexquipayac, Tocuila and Tepetlaoxtoc	Secretariat of Environment and Natural Resources	Peoples' Front in Defense of the Land		12/07/2020	Atenco farmers demand restitution of NAICM lands	https://www.jornada.com.mx/notas/2020/12/07/estados/gobierno-retoman-dialogo-con-campesinos-de-atenco/				
Community representatives from Atenco, Nexquipayac y Acuexcomac	Federal Government									
Felipe Álvarez, representing the agricultural area of Nexquipayac.	Subsecretary of Democratic Development, Social Participation and Religious Issues of the Secretariat of									
	Chief of the Agricultural Procuracy									
	National Water Commission and representatives of Human Rights									
San Nicolás Tlaminca, coordinator of agricultural area	Mayor for the MORENA left-wing political party		Autnomous University of Chapingo	13/09/2017	NAICM accused of polluting the water	https://www.eluniversal.com.mx/metropoli/edomex/acusan-que-por-naicm-se-contamina-el-agua	Urbanum and Chief of the agricultural parcels	vs	San Nicolás Tlaminca	
			Researcher in soils from the Autonomous University of							
	National Water Commission and representatives of Human Rights	Plan de Ayala Local Community		23/11/2016	Organizations foresee lack of water due to NAICM	Testigo	National Water Commission	vs	National Coordinator of Plan de Ayala	
	Secretariat of Communications and Transport	Political party PRD		31/10/2016	Irresponsable, falta de claridad e información sobre el NAICM: PRD	Testigo				
Inhabitants of Texcoco and Atenco	Mexico City Airport Group			25/10/2016	Lack of clarity and information on NAICM irresponsible: PRD	Testigo				
	National Water Commission									
	Secretary of Communications and Transport									
	Federal Government	Peoples' Front in Defense of the Land		23/10/2016	Today, as 15 years ago, land is not for sale, warns FPDT in Atenco	Testigo				
	Federal Government									
		Peoples' Front in Defense of the Land in Atenco	Ambientalists Foreign scientists and representatives of NGOs Agroecology Department of the Autnomous University of	14/08/2016	Vandana Shiva calls on capital city residents to oppose the airport in Texcoco	Detalle				Ambientalists Foreign scientists and representatives of NGOs Agroecology Department of the Autnomous University of Chapingo and

Table 4c. Conflicts involving social actors in the ANP, in reverse chronological order

Social Actors	Government	Name of organization of social actors	Members of academia	Date	News article header	Source	Confronted parties		Actors involved in conflict resolution
	Mexico City Airport Group			16/05/2016	NAICM foundation slab to go out to tender	Testigo			
	Mexico City Airport Group			16/05/2016	Tender for NAICM building slab is published	Testigo			
Inhabitants of Chimalhuacán	Federal Government Secretariat of Federal Government Federal Procuracy	Leader of the social movement National leader of the Coalition of Urban and Rural Democratic Organizations		12/05/2016	Residents ask for fair treatment for NAICM land	Testigo	Federal government	Inhabitants of the municipality of Chimalhuacán	
	Mexico City Airport Group			25/04/2016	NAICM Runways 2 and 3 bidding process launched	Testigo			
	Federal Government	Leaders of the Peoples' Front in Defense of the Land in Atenco		05/04/2016	"Eruviel Law", retaliation against Atenco	Testigo			
	Corporate Director of Infrastructure of Mexico City Airport Group			24/03/2016	First stage of NAICM to be completed by 2018	Detalle			
	Federal Government Government of Mexico City Undersecretary of Finance and Public Credit Secretary of Communications and Transport	Civil NGO "Ciudad Posible", lead by former chief of the National Water Commission	Senator of the political party MORENA	16/03/2016	Dispute over land triggers NAICM crisis: specialists reject alternative bids	Detalle	Government of Mexico City	Federal government	
Atenco		Peoples' Front in Defense of the Land		09/03/2016	NAICM construction goals are not seen; in Atenco warns of environmental damage	Detalle			
Atenco				08/03/2016	Five ejidatarios from Atenco put NAICM on edge: SCT usurped 200 hectares, they accuse	Detalle			

Economic activities

Table 5. Percentage of main activity per economic sector carried out per municipality

	Atenco	Chimalhua-cán	Ecatepec de Morelos	Nezahual-cóyotl	Texcoco
Agriculture, animal breeding and exploitation, forestry, fishing and hunting	**3.2**	**0.1**	**0**	**0**	**1.2**
Industry	6.2	4.9	48.5	5.9	14.4
Mining	0	0	0	0	0.3
Generation, transmission and distribution of electricity, water supply and piped gas supply to the final consumer	1.9	2.5	1	1.4	1.2
Construction	0	0	26.6	0.6	6.2
Manufacturing industries	4.4	2.4	20.9	3.9	6.8
Services	**86.1**	**90.6**	**47**	**89.6**	**79.9**
Commerce	58.7	39.6	18.7	27	43.5
Mass media information	0.5	0.2	4.6	1	0.3
Financial and insurance services	0	12.4	4.5	1.8	0
Real estate and rental services of movable and intangible property	6.3	12.8	4.7	26.1	11.8
Professional, scientific and technical services	0.5	0.2	0.3	1	0.4
Business support services and waste management and remediation services	0.7	0.5	1.4	1.2	0.7
Educational services	1.1	2.9	2.5	7.8	9.7
Health and social assistance services	7	2.8	1.7	7.2	4.1
Cultural and sports entertainment and other recreational services	0.3	0.3	0.3	0.6	0.1
Temporary accommodation and food and beverage preparation services	2.7	2.4	1	2.7	1.4
Legislative, governmental, law enforcement, international and extraterritorial organization activities	5.1	5.4	2.8	5.3	4.8
Net product taxes	4.5	4.5	4.5	4.5	4.5

The study region is a peri-urban area, so agriculture has lost importance as an economic activity, it is no longer the main source of employment, it is losing surface area to housing and production processes tend to satisfy urban demand.

The area is being lost to housing and the productive processes tend to satisfy urban demand, so the new systems are for market purposes.

Despite this, corn and traditional production prevails with new marketing and employment schemes.

According to a study in 2015, ten types of production systems were identified within the Atenco-Lake Texcoco region:

- Diversified orchards
- Diversified agriculture
- Multi-activity producer
- Agribusiness
- Tomato greenhouses
- Small livestock fattening
- Flower greenhouses
- Dairy cattle rancher
- Medium cattle fattening
- Large cattle feedlot

The different producers have production systems with areas of less than 4 hectares, which are consistent with the sizes of land allocated by endowment in the region. The cultivation of flowers, oats and corn-pumpkin represent a greater percentage of the production area. Within the breeding system, the multi-activity producer has a greater diversity of livestock, highlighting that the species with preference of use are cattle, pigs and sheep. From the analysis of the concentrate of the characteristics of the different systems present in the region, there are important elements such as:

- Access to land in limited areas for these production systems, since most of them are developed in areas of less than 1 ha.
- There is a lower degree of technology adoption and on the other hand, the pluriactivity related to technological innovation and self-management.
- There are production systems such as diversified orchards and pluriactive producers, which have diverse activities in search of satisfying their basic reproductive needs, and other more capitalized production systems that have managed to intensify productive resources through technological innovation, as is the case of dairy production systems, cattle fattening and greenhouses.

However, the impact of the urban sector on agriculture is evident: there is a progressive growth of this sector, with greater strength in recent decades; the customs of urban life have a greater internalization in everyday life, as consumers prefer agro-industrialized products, packaged from shopping malls, thus, they have decreased the sale of products from farmers. While producers in the area continue to maintain traditional management, which is losing the ability to sell their production.

The study area is a clear example of the historical process where ejido activity is a product of peasant movements and the struggle for land, which has allowed access to

land; however, agricultural policies exclude peasant economies, and for this reason, a struggle for survival in the countryside can be observed.

Land use has been changing as the objectives established for each stage of the recovery project are met. But it is obvious that the primary use of the land is associated with the need to recover and preserve this environment in order to reduce pollution problems in the Valley of Mexico. Currently, the land is being used for the existing hydraulic infrastructure in the area, which controls the discharge of wastewater from the southeast of Mexico City and the tributary rivers of the Lake's sub-account.

Scope of intervention

Legal and environmental framework of the proposed activities

The Special Climate Change Program (Programa Especial de Cambio Climático, PECC) 2021-2024 in Mexico contains a set of short- and long-term actions that will reduce the risks for the population and the city's economy in the face of the potential impacts of climate change.

It is pertinent to consider that this type of actions can operate at two levels: the first through capacity building, which is achieved through the creation and dissemination of information on vulnerability and the conditions necessary to support it, ranging from the understanding of the potential effects attributed to climate change to the creation of options for its implementation (studies on impacts and regulation). The second level refers to the implementation of appropriate strategies, which is essential to help reduce or exploit the opportunities that may exist in practice. However, for both premises to materialize, it is necessary to solve fundamental situations, for example, those related to the existence of irregular settlements in the city, which put human life and also the balance of ecosystems at risk, which is why approaches related to territorial ecological order and urban planning are urgent.

As a result of the preventive nature that in theory should characterize adaptation measures, these are divided in the program into two groups: components associated with early warning (hydrometeorological, epidemiological, forest fire monitoring, attention to vulnerable people), and medium-term response components, focused on micro-watershed management (soil and water conservation, agricultural production), agricultural monitoring of transgenic crops, implementation of pilot plots and implementation of green roofs.

Of the adaptation components mentioned in the PECC, the following stand out: fire-fighting and prevention, soil conservation, water, natural resources, reforestation, sustainable agriculture, micro-watershed management, epidemiological surveillance, health protection and prevention; it also reports actions to benefit the poor and vulnerable population, civil protection actions, protection against meteorological risks, actions to favor biodiversity, environmental services, and communication and education actions.

There are four components to this project, which are elaborated further on in the following sections. They are devised to work altogether within a Natural Protected Area

to restore the environmental resilience of the land, as well as to provide a space for dialogue for the landowners and ensure that the economic activities will be reinstated to procure quantifiable social benefits in a sustainable manner, considering the climate threats that region is subjected to.

Barriers to potential solutions

Feminist political ecology recognizes the different responsibilities of men and women in the management of natural resources, as well as the fact that access to and control over them is marked by gender inequalities. It also brings to the center of the analysis the consequences of women's exclusion from decision-making spaces, as well as gender discrimination in legislation.

The gender analysis of land grabbing focuses on two elements: the exclusion of women from decision-making processes, in the assemblies where the freehold and sale of land was approved, and the violation of women's right to agricultural patrimony as stipulated by law, in the agrarian legislation. The use of feminist political ecology made it possible to highlight the differentiated impacts and the role of women in the resistance, and to show that land grabbing is not only carried out by the State and capital, but also by community structures that reproduce gender inequality, concentrating wealth and decision-making in the hands of the majority of men.

On the other hand, there conflicts involving the construction of the Mexico City New International Airport (NAICM) with diverse social, economic, environmental and political dimensions. Farmers were involved in the social movement, as well as student groups, workers, urban organizations, environmental and human rights groups, and even organizations defending housing and urban development also participated, as shown in Tables 4a, 4b and 4c.

In general in Mexico, urban development megaprojects in large metropolitan areas are not included in the planning and financing instruments of the municipalities. This matter can be complex, due to the participation of the different levels of government and the form of government itself. The conflict dimension is fundamental in any social movement.

Project / Programme Objectives:

The main objective of the present proposal is to strengthen the resilience of local communities through the implementation of sustainable actions to restore a natural area with a crucial potential in adaptation to climate change.

The sub-objectives include:

- Field monitoring on the terrain and wetlands to ensure that the activities carried out are aligned with the physical characteristics of a former lake bottom.
- Enhance the environmental restoration the Natural Protected Area Lake Texcoco through the design and implementation of structures that could promote water ponding in strategic sites
- Promote sustainable and climate resilient livelihoods to enhance community

based, climate smart agricultural practices

Project / Programme Components and Financing:

Project Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
1. On-site characterization of topography and bathymetry	Considering the soil conditions, the most important output is the accurate mapping of the area of interest to provide base information to determine in-site characteristics such as slope, possible flow accumulation direction and points.	1.1 Lidar flight over the areas with wetland potential to better characterize terrain conditions, as well as obtaining bathymetry data on site	200,000
		1.2 Map creation. Processing of the information gathered using Lidar technology to create an accurate 2D representation of the terrain, and therefore its use concerning planning and precise delimitation of boundaries, storage capacities and potential barriers of its adequate functioning.	100,000
2. Watershed monitoring network	Accurate numerical representations of any projected scenarios through continuous timeseries of meteorological variables and continually measured topography levels. The information gathered can be used for numerical modelling of water ponding scenarios under different return periods. The use of the most updated and	2.1 Hydrometeorological monitoring of the relevant variables to ensure that the precipitation rates are well considered when calculating storage volume as well as water volume to be used on land.	200,000
		2.2 Land subsidence monitoring derived the type of soil and previous conditions of the terrain (lake bottom). Monitoring is crucial to	440,000

	detailed information is crucial for any assessment of changes in the initial viability of actions to be implemented	determine the rate at which changed can be expected in the terrain to adjust all desk and field operations accordingly, and propose new structures (such as pumps) to correct the hydrological behavior of the area	
3. Natural wetlands restoration	Creation of several artificial wetlands to contain the waters of the rivers that flow there, prevent flooding and air pollution, as well as recharge the aquifers and prevent the city from sinking. The recovery will result in the recovery of the ecological environment, recharge aquifers, and provide security and protection for the surrounding population.	3.1 Expansion of San Juan marsh to recover the environmental services, such as home for many endemic flora and fauna species, as well as sustainable economic activities carried out by the local communities	1,800,000
		3.2 Controlled weir of Canal Colector to promote a considerably large pond in a waterway that was projected to drive all flows outside of the ANP. These canals were built during the first stage of the construction of the airport.	940,000
4. Nature-based descentralized wastewater treatment	To ensure sustainable water security for the population by promoting a system that avoids the purchase of water from private third parties at high costs and with unknown quality, which is done indiscriminately, causing a deterioration in the social wellbeing	4.1 Construction of wastewater treatment wetlands to make the most of the environmental capacity of recovered spaces, enhancing a natural water treatment process	1,750,000
		4.2 Connections to existing sewage networks to divert wastewater flows into	500,000

	of the most vulnerable population.	de adequate infrastructure.	
5. Total Project/Programme Cost			5,930,000
6. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)			504,050
Amount of Financing Requested			**6,434,050**

Projected Calendar:

Milestones	Expected Dates
Start of Project/Programme Implementation	First semester of 2023
Mid-term Review (if planned)	First semester of 2025
Project/Programme Closing	2026
Terminal Evaluation	2026

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

Component 1. On-site characterization of topography and bathymetry

Outcome 1.1 Lidar flight

This remote sensing tool (Light Detection and Ranging (Lidar) will be implemented, taking advantage of its ability to perform topographic and bathymetric surveys. However, it is foreseen that it is not always possible to have a complete coverage (wall to wall) of data for the area of interest. Therefore, a phased sampling mechanism will be implemented, procuring that all the information will be gathered within two months.

The information obtained will be used in a better representation of the study area, always with the participation of the local communities and considering their knowledge of the area. This two-way transfer of knowledge will help strengthen the Executing Agency as project coordinator in an area with a conflictive past. The expeditious and transparent communication with the inhabitants of the region, specifically with the representatives of the local communities, will facilitate the inclusion of these communities in the decision-making process. Regarding the identified actors that have participated in some social conflict, it is proposed to hold dialogue tables where they can discuss issues about the state of the area, the topography obtained with Lidar and the possible implications. This will allow a better implementation of works, since the detailed knowledge provided by remote sensing tools will promote better studies on the implication of climate variability in the site.

An airborne Lidar service will be contracted, which refers to a laser scanner embedded in an airplane and during the flight that creates a 3D point cloud model of the landscape. With this, a digital elevation model will be obtained, replacing photogrammetry. One of the advantages of this airborne system in the field of remote sensing is that it can capture larger areas, as an aircraft can acquire swaths of 3 to 4 km wide in a single pass. Another important advantage compared to photogrammetry is the ability to filter out vegetation reflections from the point cloud model to create a digital surface model that represents ground surfaces such as rivers, roads and cultural heritage sites, which are hidden by trees.

In terms of bathymetry, the mapping will be done using an aerial survey sensor that penetrates the water. This survey using Lidar will implement a technology with a traditional laser system that reflects off the surface of the water and the ground. This laser is complemented with a green laser that travels through the water column. The two different pulses will be analyzed to establish water depths and elevations of the shoreline or water body boundary. The bathymetric information derived from the survey is crucial near the

shore of a water body, as it is also used to locate objects on the bottom of the water body of interest.

Should the need arises the survey will be locally completed with traditional bathymetry and topography.

Outcome 1.2 Map creation

Los datos provenientes de sensores con capacidad de derivar información de la estructura del dosel en tres dimensiones, pueden usarse para generar información que, una vez calibrada y validada con datos de campo, es sumamente útil para la caracterización numérica de un sitio.

El resultado de un vuelo LIDAR es una colección densa de puntos con coordenadas conocidas. Esta información se puede procesar con un Sistema de Información Geográfica para eliminar aquellos puntos de ruido que existen en la nube de puntos y otros procesos. Por ejemplo, clasificar los puntos Lidar en suelo y en puntos que no corresponden al suelo. Esta metodología funciona realmente bien en terrenos naturales como montañas, colinas, campos o bosques.

La información también permitirá la creación de curvas de elevación. Este mapa es uno de los elementos más importantes en un mapa de orientación. Con esto se obtendrá la morfología del terreno donde no importa las altitudes absolutas sino las relativas. La curva de nivel puede servir también para calcular curvas de capacidad de almacenaje en las celdas (de la Componente 3) e incidir directamente en el diseño general de los bordos.

El mapeo involucra la obtención de un modelo digital de elevación (DEM) a partir de una nube de puntos Lidar y luego crear un ráster de mapa de sombras que es visualmente más intuitivo para los fines de presentación, y que es más manejable para fines de modelación numérica.

Esta componente incluye actividades y eventos para construcción de capacidades a través de compartir conocimientos y experiencias. Esto llevará la creación de sinergias con los actores sociales que ya se han identificado para fortalecer los programas en campo y fortalecimiento de la capacidad adaptativa.

Component 2. Watershed monitoring network

In Lake Texcoco, the information systems are designed to improve the existing information networks, as well as to make available to the communities the relevant information to make appropriate decisions on climate and weather risks, and to support decision making by landowners. Furthermore, by involving communities in the monitoring of variables, there is an improvement in their technological capabilities and a transfer of knowledge. In other words, the direct beneficiaries of both the monitoring and the implementation of actions are directly involved in the process of obtaining data in the field. This dynamic is expected to be replicable and scalable if this project can be expanded.

Outcome 2.1 Hydrometeorological monitoring

The monitoring network will have the following purposes:
- Feed hydrological, climatic, agrological, geotechnical and environmental models.
- Estimation of water supply
- Provide inputs for climate change and climate variability studies.
- Monitoring of climate variables over time
- Provision of early warnings

The network will consist of stations for measuring meteorological variables, flow measurement, and subsidence rate:

1. Rainfall networks are logically composed of rain gauges that exist or are placed in a territory and are used for the evaluation of precipitation in an area or basin. They are designed according to the relief, since in flat areas rainfall is more homogeneous, but in mountainous areas a higher density of rain gauges is needed since there is greater variability in precipitation. From the point information of the rain gauges it is possible to estimate how rainfall has been produced throughout the basin, in terms of position and magnitude. These estimates are used in hydrometeorological models used in water resources analysis.

2. In order to monitor the hydrometeorological variables to predict a flash flood, the necessary equipment such as sensors, consisting of rain gauges, radars and satellite sensors are installed, which together are called hydrometeorological stations. These stations continuously monitor the various parameters, which are recorded and transmitted to a control center at the same time. The hydrometeorological stations are distributed along the hydrographic basins forming the Hydrometeorological Networks.

The possibility of placing a rain gauge at the gauging station will be evaluated in order to expand the precipitation observation network with the same data collection platform.

Outcome 2.2 Land subsidence monitoring

A relief monitoring network will quantitatively verify any indication that any region is being affected by subsidence, i.e., the appearance of faults or cracks in the ground, conditions that have been observed in the Xalapango Lagoon. Sometimes subsidence can vary from millimeters to meters and in periods of time ranging from hours to years. Its main triggering factors are natural and sometimes accompanied by anthropogenic activities.

The purpose of this component is to quantify the development of regional subsidence in unconsolidated lithologies (such as lacustrine and fluvial-lake materials, deposited on ancient geological faults or abrupt paleo-relief) that give rise to differential subsidence. The activities of this composite will determine the rate of subsidence of certain sections of the same area, and determine whether this subsidence is accelerated and different from the normal subsidence subsidence subsidence that exists in the region, which would cause steep slopes.

The monitoring work on this phenomenon is based on measuring the ground level and its descent over periods of time. The interest and usefulness of the monitoring lies in The

interest of this research project consists of measuring the fringe of affectation of the differential subsidence, and measuring the possible existence of a lateral component. All this through the comparison of the point clouds obtained in each monitoring, and deformation vectors in the buildings, streets and sidewalks affected by subsidence.

Component 3. Natural wetlands restoration

Outcome 3.1 Expansion of San Juan marsh

The works of this component will consist essentially in the conformation of protection curbs along the entire perimeter of each required cell, formed with material from the site and/or product of the area's drainage, with the purpose of forming barriers through the construction of trapezoidal section curbs with material from the site and/or product of the area's drainage, to create various receiving bodies "reservoirs and/or cells" for the retention, capture and regulation of the flow of water that runs off from the Acolman, Tizayuca, Chiautla and Texcoco areas, mainly in the rainy season, being in this season when the greatest contribution is generated and thus avoid the loss of the vital resource, which was originally poured and rested in the area.

Derived from the above it is intended to recover the natural hydraulic and ecological environment of the area, which over the years has been extremely degraded, mostly by human action, this due to natural desiccation and mainly induced desiccation, due to the alteration and movement of trajectory of the nearby natural streams, which generates that the water reservoirs and/or wetlands that have existed naturally for many years are disappearing and thus eliminating and destroying the fauna and native vegetation.

In addition, these cells will have as a second purpose, although not the main one, to control floods generated during rainy seasons, helping to mitigate flooding in the population centers near the study area, and also serve as natural bodies of water infiltration. Once the project is completed, the cells will have the capacity to capture and retain the water generated by the natural runoff that flows into the area, restoring the natural ecological balance of the area and guaranteeing the integrity of the population.

On the other hand, this work will prevent the ecosystem from continuing to be affected and damage the hydrological and hydraulic functioning that has been damaged in recent years, thus improving the living and social conditions of the aforementioned population centers, which have been affected by the alterations made.

Notably, this type of berm is a traditional management practice which has been in use by the local communities for decades and perhaps centuries (see Fig. 8). We hereby propose to strengthen and increase this practice with adequate supervision from wildlife and engineering experts to ensure proper execution and safeguarding of both ancestral knowledge and existing ecosystems.

Figure 8. Existing planted berm in the San Juan marsh.

The cells created will allow the storage and retention of rainwater in an area of approximately 1000 hectares, which is within the municipality of Atenco; this area is one of the most affected areas in recent years due to natural and induced desiccation. These cells are an instrument to achieve the restoration of the hydrological functioning of the area because they contribute to:

- Return hydroecological vocation to this lake territory in order to safeguard the permanence of important water reservoirs for the benefit of the inhabitants of the basin.
- Recover and increase the regulatory and storage function that the area has performed at the level of the Valley of Mexico Basin through the Recovery of Water Bodies.
- Determine the maximum potential hydrological storage function in each of the zones of the APRN Lake Texcoco, recovering in each case its storage and regulation viability.
- With the Recovery of Water Bodies, through the Conformation of Cells, it is intended to protect, restore and promote the sustainable use of ecosystems through a sustainable management that includes wetlands, rivers and lagoons.
- This action will increase the capacity to regulate the flow of the rivers in the east. The construction of the NAICM involved preventing the waters of the eastern rivers from entering the PELT (formerly NAICM); therefore, the Recovery of Water Bodies will regulate the excess flow of the San Juan Teotihuacán, Papalotla, Xalapango, Coxcacoaco and Texcoco rivers; It will also regulate the levels of the bodies of water within the Lake Texcoco area and will discharge surplus water to control possible flooding in the region

<u>Outcome 3.2 Controlled weir of Canal Colector</u>

When construction began on what was originally the New Mexico City Airport (NAICM), the

water bodies of the Xalapango and North Texcoco Lagoons and part of the San Juan marsh were drained by the construction of a collector canal located outside the perimeter fence of the NAICM. The nine eastern rivers discharge into the collector canal that carries these waters out of the Natural Protected Area. This situation is intended to be reversed by means of the control structure to retain that volume and contribute to the recovery of that body of water. It is worth mentioning that this is specifically a request from local communities to be able to take advantage of part of the hydraulic infrastructure built and use it as retention works for the recovery of Lake Texcoco.

It is of vital importance to build the Control Structure Collector Channel for the retention and storage of this volume and with this to return its historical-hydric vocation to this body of water for the benefit of the municipalities of Atenco, Texcoco, Ecatepec de Morelos to guarantee the survival of the Ecological Park of Texcoco (PELT) and the Natural Protected Area of Lake Texcoco; as well as to regenerate the region ecologically and productively and preserve the last body of water as a historical vestige of the cultural identity of the region.

Component 4. Nature-based decentralized water treatment

Outcome 4.1 Construction of wastewater treatment wetlands

It is proposed to construct a series of wastewater treatment wetlands, a maximum of 10 facilities, with a total installed capacity of up to 10 L/s resulting from the sum of the unit flows. The wetlands will be designed and installed to recover water of a quality suitable for reuse, in accordance with applicable regulations, for specific uses in the communities, such as irrigation of green areas, sports fields, or the creation of ornamental spaces (fountains, artificial lakes, etc.).

Those constructed wetlands will be located along the eastern rivers discharging into the Natural Protected Area, following criteria including identified current raw water discharges, community inputs, availability of land and ease of connection to the current drainage network and discharge water body. The actual treatment ponds will be designed to achieve the desired water quality standard, taking into account the quality of the raw sewage. It will likely be a combination of vertical and lateral subsurface flow filters connected in series, planted with local wetland vegetation. This will prevent the contamination of the Protected Area with invasive species and provide additional ecosystems for protected fauna. Local communities will be involved in both the planning, design and operation of the constructed wetlands.

Once the sites where the constructed wetlands will be installed have been agreed with the local communities, the main objective is to produce treated water of a quality suitable for irrigation of green areas, based on current regulations. The wetlands will consist of a pre-treatment system to remove large solids, sand, and gravel, followed by an anaerobic tank to remove organic matter and help homogenize the flow. The next stage of treatment will consist of a vertical and a horizontal subsurface wetland arrangement, or exclusively vertical subsurface, depending on the topography of the site. Water disinfection is also required, and if land is available, treatment would continue with maturation ponds to control pathogenic microorganisms. In the event that the land is not sufficient, disinfection should be carried out by adding chlorine tablets.

The plant species to be selected are native to the region and, as far as possible, the plant

diversity will include both ornamental and non-ornamental species with the intention of generating a commercially valuable by-product (flowers) as part of the routine maintenance of the systems.

Outcome 4.2 Connections to existing sewage networks

The constructed wetlands will be connected to existing sewer network in order to direct the raw water to the created water treatment facilities. This will include the planning, design, tender, construction and acceptance of the extensions of the sewer networks. This consists in a series of underground pipes connected by manholes, and, if necessary, sewer pumping stations.

B. Describe how the project / programme provides economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gebrinder considerations. Describe how the project / programme will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

	Environmental benefits	**Social benefits**	**Economical benefits**
Component 1. On-site characterization of topography and bathymetry.	The selected technique is the least invasive in general, it reduces the number of personnel participating in the field (the planning and evaluation work will be done at the desk), its execution takes less time throughout the project, and the use of new technologies facilitates data collection and transformation.	By having detailed information of the site conditions, the well-being of producers and employees is improved. Also, environmental improvement through field information leads to improved environmental conditions and better quality of life due to the consumption of healthy food, provision of food for self-consumption, improvement in health.	The investment made for this component is optimal for a detailed survey because the areas to be characterized are of interest and are well defined and planned. With this, field costs will be reduced, both in processing and execution in general, allowing greater profitability and in turn greater utility.
Component 2. Watershed monitoring network	Knowing the environmental status of a project's surroundings is an applicable procedure in any of	Provide information and technical elements to evaluate the social impact and suggest actions to guide and	A permanent monitoring system allows to verify its performance under different operating conditions, thus

	its operational phases. It informs about the status of the indicators, so that corrective actions can be initiated in case of a possible outbreak. If well developed, it is an early warning system.	develop a plan for the adequate inclusion of the needs of the local communities.	ensuring that data collection can be continuous and will not require additional financial investments other than calibration and maintenance of the instruments.
Component 3. Natural wetlands restoration	Ensure the permanence of important water reservoirs, as well as the recovery and increase of the regulatory and storage function that the area has performed at the level of the Valley of Mexico Basin through the Recovery of Water Bodies.	The area will be protected for the benefit of more than 150,000 inhabitants living in the municipalities of Atenco and Texcoco, mainly, and the spaces will be recovered for public use.	Improvement in the quality of life of the local inhabitants, preserving their heritage and promoting productive activities and creating better local and regional development opportunities. Increase in the value of homes.
Component 4. Nature-based decentralized water treatment	Natural wastewater treatment systems that will contribute to the aesthetic improvement of the area through the vegetation associated with the wetlands themselves,	Micro-environments with vegetation cover are generated, which help in the treatment of wastewater and are even likely to attract local fauna.	to have through the treated water that will be used to irrigate green areas or sports fields and, with the proposal of the plant diversity, they will be able to have a sustained production of flowers as a marketable by-product

C. Describe or provide an analysis of the cost-effectiveness of the proposed project / programme.

The present project will contribute greatly to the restoration of the enviromental services and sustanable economical activities in the Lake Texcoco. The components proposed are aligned with the some of the sustainable Development Goals, such as SDG6 Clean Water and Sanitation by implementing nature-based wastewater treatment services, SDG8 Decent Work and Economic Growth by enhancing the economical capacity of the local communities

and SDG11 Sustainable Cities and Communities by ensuring that the outcomes are put in place in a sustainable framework. Given the nature of the benefits also for the local flora and fauna, SDG14 and SDG15 are also taken into account, and finally SDG is also considered given the constant feedback among all social actors involved.

Regarding this last point, a pillar of this project are the knowledge exhange mechanisms that will enhance the dissemination of information to and from local communities and institutions. This constant loop ensure that planning processes have a local approach. Better decision-making is also encouraged in this scenario because local representatives and inhabitants will participate and contribute to the conversation regarding resilience and adaptation in their economic activities, and also in water management. This exchange of information is projected to reduce field work related costs, and will promote a platform for implementing and disseminating best practices and lesson learned.

The cost-effectiveness of the proposal is ensured by designing, assessing and supervising only sustainable interventions (therefore decreasing the probability of climate change-realted losses and costs); implementing appropriate operational procedures that will consider local knowledge and expertise to better frame the proposed actions (and consequently decreasing costs along capacity building); and prioritizing and executing potential non-conceptual modifications that have a robust resilience and sustainability component

Expected outcomes will be aligned with current legislation to address environmental, social and economical issues within local comunities whose vulnerability stems from the lack of organization with government organizations and therefore better design, planning and execution of their proposed adaptation strategies. Furthermore, constant monitoring of the area will provide crucial inputs to evaluate variability: the weather stations that are included in the costs will collect data that will allow an assessment of the climatic patters that could affect the severity of the forecasted atmospheric systems, and subsidence monitoring will provide an in-depth description on the interaction of the recently recovered water bodies and the soil. The allocated resources will directly reflect in the enrichment of the current national network and be a prototype of a local weather stations network that could be reproduced in other areas that also involve the restoration of the environmental sevices and the strengthening of sustainable economic activities. Similarly, specific institutional capacities involve active participation of the local communities and government institutions to effectively and timely integrate the considerations of each organization. The consistent engagement of all actors will derive in a better resource management of the environment by ensuring that all actors participate during the implementation of the project.

D. Describe how the project / programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national adaptation plan (NAP), national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

The Special Climate Change Program 2021-2024 is the instrument for implementing actions for Mexico to face the negative impact of climate change, and is the government's guiding program on the subject. The adaptation actions of this proposal are aligned with the objectives, strategies and goals to address climate change by defining priorities in terms of

adaptation and mitigation; as well as the assignment of responsibilities, execution times, coordination of actions, results and cost estimates. Specifically, Priority Objective 1 "To reduce the vulnerability to climate change of the population, ecosystems and their biodiversity, as well as productive systems and strategic infrastructure by promoting and strengthening adaptation processes and increasing resilience" and its priority strategies are being met, for example:

Priority Strategy 1.2.- Promote the integrated management of the country's water resources considering aspects of water quantity and quality that ensure equitable access for the population and productive sectors, as well as the maintenance of environmental services.

Priority Strategy 1.7.- To develop and strengthen adaptive capacities to address climate change in the three levels of government and civil society sectors, considering traditional knowledge, local capacities and the best available scientific knowledge.

The planned adaptation objectives are also contained in the General Law on Climate Change. By aligning with current legislation, this project highlights the responsibility to reduce the vulnerabilities of the population, biodiversity, productive sectors and infrastructure. It also considers cross-cutting strategies that support processes to strengthen food security and water resource management in the context of climate change.

Additionally, the present project is aligned with the “2024 vision” of the National Development Plan 2019 – 2024, that aims at “achieving self-sufficiency in [agriculture and livestock activities]”. The Plan also endorses projects towards “the integral preservation of flora and fauna will have been guaranteed, a large part of the national territory will have been reforested and rivers, streams and lagoons (…); sewage treatment and proper waste management will be generalized throughout the country and environmental awareness and the conviction of caring for the environment will have spread throughout society.

E. Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

This proposal is closely aligned with a federal-level initiative to recover not only natural spaces with high potential to increase adaptive capacity, but also to involve local communities in decision-making for the resolution and prevention of subsequent social conflicts, even in areas that have had histories of confrontation or political abandonment.

Given that the Executing Entity is the authority in Mexico dedicated to granting concessions for the adequate use of water in the country, it is guaranteed that the actions implemented will be carried out within a legal and technical framework that closely follows federal requirements. Additionally, the participation of the National Commission of Natural Protected Areas (CONANP) as an advisor, who is also a government institution, is contemplated. This ensures compliance with national and local standards. Both organizations (the Executing Entity and CONANP are decentralized bodies of the Ministry of the Environment and Natural Resources, whose policy is based on environmental and social actions with long-term impact, considering climate change scenarios.

The implementation of this project, considering both national standards for the execution of environmental works and the social participation of stakeholders from local communities, represents a contribution to the improvement of guidelines at the local and federal level. The best practices derived from this exercise will be incorporated into the participation mechanisms, which will be integrated into the uses and customs of the local communities to ensure the sustainability of the actions implemented.

F. Describe if there is duplication of project / programme with other funding sources, if any.

So far, there are no resources of any other kind dedicated to the actions proposed in this proposal. There has been previous and ongoing investment by the federal government within the Natural Protected Area, but these resources are not dedicated to the actions (direct or complementary) that are proposed here, but are exclusively for environmental improvement actions, or corrective measures without a clear adaptation or gender component.

If there are additional resources from the government that are allocated to these objectives, it will be reported and it will be justified why the requested resources are crucial for the fulfillment of the actions.

G. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

The four components of the project are designed to work in conjunction with local knowledge. As will be mentioned later in section H., the participation of local community representatives was crucial to initiate the work of defining objectives, areas with greater potential, or areas neglected by current federal projects (due to lack of resources). In this sense, field visits also helped to bring the Executing Agency closer to the beneficiaries, and continuous meetings were held during project design. This process is based on the dissemination of available information from the technical point of view and the local point of view, for continuous feedback.

By implementing the project's actions within a framework of constant dialogue with the beneficiaries, the exchange of information and lessons learned is encouraged, since the process will not be a one-way process, in which the Executing Agency will carry out the actions and quantify the beneficiaries at the end, but rather the beneficiaries will accompany the evaluation of the progress and efficiency of the actions.

It is expected that, during the dialogue tables for the evaluation of the project's progress, the stakeholders involved in the execution of the works will be able to talk to each other, and that there will be an effective communication mechanism that will allow for the adequate dissemination of ideas and concerns throughout the implementation of the project.

H. Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy and Gender Policy of the Adaptation Fund.

One of the key aspects of this project was the mapping process of social actors involved not only in the proposed solutions, but also in the social conflicts derived from the construction of the airport, whose area is now the Texcoco Lake Ecological Park. During the process of delineating the project components, several field visits were made to the area of interest, where the groups involved belong to the Executing Entity, the Implementing Entity, the National Commission of Natural Protected Areas and members representing the communities whose main interest is the recovery of green spaces and bodies of water. In other words, their demands, needs and points of view on conflicts have been taken into account since the first field reconnaissance for the definition of actions.

Local communities are a fundamental and necessary actor for the project components to be considered successful and sustainable. The inclusion of these groups ensures that the needs of the beneficiaries are adequately considered in the execution of the project stages. The spaces for dialogue that are contemplated throughout the implementation of the actions will encourage the participation of women at the discussion tables, giving a voice to the native peoples of the region, and ensuring that they are appropriately represented. How women's participation is being encouraged will be monitored through periodic indicators (e.g., updating the mapping of actors and representatives, including name and gender). The full proposal will include a more detailed description of this item).

I. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

The Lake Texcoco region is crucial to the hydrology of the Valley of Mexico. The bodies of water that are part of the system have been almost completely drained, so the project aims to recover ecosystem services and thus the adaptive capacity of communities that are closely related to the proper functioning of the ecosystem.

This project is developed within the framework of an existing coordination of actors to implement structural and non-structural measures, i.e., there are more actions focused on the restoration of Lake Texcoco sponsored by the federal government. However, none have the adaptation component that this project presents, given that the budget for such actions is limited. This is why the request for resources is based on the high potential for promoting adaptation to climate change in the region, by financing actions with a positive long-term impact. In addition, the resources will allow for social, environmental and gender risk assessments, an aspect that is not normally considered in the action plans that are financed with resources from the country, given that the priority is the implementation of actions and not so much the disaggregation of beneficiaries.

The Mexican government would greatly benefit from the implementation of actions that have crucial elements of gender equality and environmental justice. This project is intended to serve as a milestone and example for other actions within federal programs, as it has a high impact in a priority area for the government.

J. Describe how the sustainability of the project/programme outcomes has been taken into account when designing the project / programme.

The four components of the project are designed to work in synergy, feed each other, and

lead to the achievement of the aforementioned deliverables. Additionally, it is intended to reach a state of sustainability and resilience through the restoration of an ecosystem that was significantly modified due to human action.

Sustainability will be achieved through the fulfillment of the four components:

The first component aims to better understand the area and create baseline information for complementary numerical modeling and scenario simulation studies. This ensures that the objectives will be based on the best available information, thus supporting decision-making that can have a positive impact in the long term. In addition, this component contemplates the promotion of the use of the best available technology, thus ensuring that the information gathered is reliable and can be added to the knowledge of local communities.

The second component refers to the monitoring of relevant variables that could modify the effectiveness of the implemented actions. By continuously monitoring the status of both meteorological and ground conditions, it is ensured that each stage of project implementation will be based on the results of detailed analyses. With this, the actions carried out will be supported by updated information, and additional actions can be taken in case any irregularities are detected. This ensures that deliverables are sustainable in the long term, as the project is based on continuously measurable and verified conditions.

The third component has a crucial element of sustainability, as it is one of the actions for the restoration of Lake Texcoco. With the implementation of the dikes and the control structure, it will be possible to avoid the outflow of water from the perimeter of the Natural Protected Area (which is precisely the objective of the canals when the airport was built: to take the flows out of the area). This will allow water to back up in strategic areas for the region's flora, fauna, and economic activities. It is important to mention that the economic activities are carried out on a small scale (carried out by local communities, following traditional practices) and therefore do not involve anthropogenic modification or damage to the ecosystem. This can be assured because the activities depend on the well-being of the flora and fauna.

The fourth component is about integrating the urban area surrounding the Natural Protected Area in a sustainable manner that favors local communities. The wastewater flows that form part of the inlets of the water bodies will be treated through the implementation of wetlands, which are designed with sufficient capacity to function even under climatic variability. In case there is a modification in the operating conditions, this will be reflected in the information derived from the monitoring.

Finally, it can be assured that the knowledge and skills, as well as the current capacities of the communities will not only be respected but also considered in the evaluation of the efficiency of the implementation of the components.

K. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	The project is aligned with federal laws and priorities of the current administration. Moreover, the Executing Entity is a decentralized body of the government, so its intervention is auditable and therefore has to adhere strictly to current regulations	No further assessment is required.
Access and Equity	The project is designed to provide benefits to the local communities, disregarding their gender.	Further risk assessment is required. The full proposal will include a mechanism for the identification of barriers for access and equity, as the social actors involved have been identified, and disaggregation by sex is yet to be updated.
Marginalized and Vulnerable Groups	No marginalized groups have identified, but vulnerable group could exist, apart from the actors already mapped	Vulnerability can stem from differences in the implementation arrangements between the Executing Entity and the local groups. Periodical dialogue spaces will be put in place to inform the progress and to receive feedback from both parties.
Human Rights	As stated in the Social and Environmental Policy of the Fund, during the consultations and participation in the dialogue spaces, the Executing and Implementing Entities will ensure that the conversation, deals and conclusion will consider the strict alignment to the Universal Declaration of Human Rights. Minute meetings will be taken each session to leave testimony if this.	No further assessment is required.
Gender Equality and Women's Empowerment	During the implementation of the project, both men and women will be provided with the same opportunity to participate in consultations and monitoring of	No further assessment is required.

	progress. The benefits are projected to arrive to all population, regardless of their gender. Participation of women will be encouraged and monitored	
Core Labour Rights	All interactions will take place in the framework of the 1998 International Labor Organization Declaration of Fundamental Principles and Rights at Work. Freedom of association will be highly encouraged, child labor as well as compulsory labor will not be tolerated. Finally, the project will be carried out strongly considering the social actors' occupation, and most of them fed the design of this project.	No further assessment is required.
Indigenous Peoples	In Mexico, the National Institute of Indigenous Coomunities is a highly active government organization that could be consulted for the environmentally sustainable development of the project.	Lack of participation of indigenous groups. A complaint mechanism could be put into place, as well as establish a framework to ensure fair participation of at least one representative of these groups-
Involuntary Resettlement	Voluntary or involuntary resettlement is not considered in this project	No further assessment is required.
Protection of Natural Habitats	The project does not have any component where any existing habitats will be modified. Furthermore, the National Commission of Natural Protected Areas (Comisión Nacional de Areas Naturales Protegidas, CONANP) is among the actors involved in the assessment of the implementation of the project.	In case the proposed structures are reprojected, CONANP will be made aware and could be consulted.
Conservation of Biological Diversity	Following the Protection of Natural Habitats section (see above), no project components have been identified as a risk to local biological diversity	In case the proposed structures are reprojected, CONANP will be made aware and could be consulted.
Climate Change	Heavy machinery will be used during the construction of the berms.	A qualitative risk assessment will be carried out to ensure that there is no significant or unjustified greenhouse gas emissions.

Pollution Prevention and Resource Efficiency	The full proposal will include a detailed description of the berms to be built, which are projected to be made from leftover rock material left behind derived of the construction of the airport. This will avoid using materials from far away sources, thus preventing unnecessary waste and pollution	No further assessment is required.
Public Health	Arrival of wastewaters could involve a health risk if not derived properly. However, the proposed wetlands are designed to receive the flow that is currently wastewater.	A mid-term monitoring could include an assessment of the capacity of the wetlands.
Physical and Cultural Heritage	No physical cultural resources, cultural sites, and sites with unique natural values are mapped within the area	No further assessment is required.
Lands and Soil Conservation	The project involves a change in the landscape by the construction of berms, however, no fragile soil has been identified in the area, and the structures do not entail soil erosion or degradation	No further assessment is required.

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[2]

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

Laura Elisa Aguirre Téllez *Director General* *Secretariat of Finance and Public Credit* *(Unit of Public Credit)*	Date*: 8th August 2022*

B. Implementing Entity certification

Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board and prevailing National Development and Adaptation Plans in Mexico, in line with the Special Programme on Climate Change, as well as federal programmes and priority projects. The project is subject to the approval by the Adaptation Fund Board, commit to implementing the project in compliance with the Environmental and Social Policy and the Gender Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project.	
 **Dr. Adrián Pedrozo Acuña** Director General Mexican Institute of Water Technology	
Date: 8th August 2022	+52 777 329 3600 direccion_general@tlaloc.imta.mx
Project contact person: Carlos J. García Fernández Galicia (General Manager of Construction)	
Email: carlosj.garcia@conagua.gob.mx Telephone: 55 3488 8485	

6. Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities