

Financing Ecosystem-based Adaptation in Cities

A case study from Mexico

Photo credit: UNEP

The United Nations Environment Programme (UNEP) is helping cities in Latin America and the Caribbean to adapt to climate change with a project titled *Building climate resilience of urban systems through Ecosystem-based Adaptation (EbA) in Latin America and the Caribbean*. Funded by the Global Environment Facility, the project aims to reduce the vulnerability of communities to climate change in three cities - Xalapa (Mexico), Kingston (Jamaica), and San Salvador (El Salvador) using a practice known as 'Ecosystem-based Adaptation.'

Mexico, lying between the Gulf of Mexico and the Pacific Ocean, is a megadiverse country that hosts approximately 12% of the world's biodiversity. Mexico is highly vulnerable to the impacts of climate change, with extreme heat events projected to increase in the coming decades (Hicke *et al.* 2022). The country is prone to tropical cyclones, heat waves, extreme droughts and floods. These risks are exacerbated by environmental degradation and social inequalities, with 43.5% of the population living below the poverty line (Consejo Nacional de Evaluación de la Política de Desarrollo Social 2023).

Mexico was among the first nations to introduce climate legislation under the General Law on Climate Change in 2012. It submitted its first Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change in 2016, which was updated in 2020 and 2022. Mexico's NDC includes Nature-based Solutions and Ecosystem-based Adaptation (EbA) as transversal adaptation solutions. However, stalled progress under recent administrations threatens long-term climate action.

As the adaptation finance gap widens, a mixture of financial instruments is needed to finance EbA. This case study examines payments for ecosystem services as a potential long-term sustainable mechanism to finance EbA in Xalapa, Veracruz.



Project Title

CityAdapt: Building climate resilience of urban systems through Ecosystem-based Adaptation in Latin America and the Caribbean

Executing Agency

The Secretariat of Environment and Natural Resources of Mexico (SEMARNAT)

Project Timeframe

2017-2023

Key Figures

\$500,000	3.46km	4
Generated for ecosystem services through voluntary water fee	Riparian ecosystems restored	Infiltration gardens created with infiltration capacity of 33 mm/hr

Funding

USD 6,000,000
Supported by the Global Environment Facility's Special Climate Change Fund



Ecosystem-based Adaptation in Xalapa: “Care for the forest, care for the water”

Nearly 80% of Mexico’s population of 127 million live in cities, and nearly 30% live in mountainous areas (Balderas *et al.* 2021). Xalapa is the capital city of the state of Veracruz, a mountainous city approximately 1,400 metres above sea level. Xalapa has undergone rapid and unplanned urban development, with the metropolitan area expanding nearly tenfold between 1980 and 2010. This has affected the ecosystems, reducing the area of wetlands, forests and other green areas while putting increased pressure on infrastructure and essential services.

Xalapa suffers from both water scarcity and flooding due to inadequate water management and is highly dependent on a watershed in another Mexican state for its water supply. Xalapa City and surrounding municipalities face challenges in supplying water to a growing population. Women and girls are particularly affected by water scarcity because they often bear the responsibility for household water management. The time spent sourcing and collecting water leaves women less time to participate in other activities, such as education, work or recreation.

Despite receiving significant rainfall, Xalapa confronts “a water paradox”, explained Sergio Angón, National Project Coordinator for CityAdapt Mexico. “It can be flooding in Xalapa, but we open the tap, and there is no water because it’s not the rainy season in the catchment area where the water comes from.” Most (58%) of the water consumed by Xalapa City residents travels 60 km through an aqueduct from the Huitzilapan River in the neighbouring state of Puebla, while 38% comes from the nearby Pixquiac River. The

supply of clean water to the city directly depends on the health of the catchment ecosystems since they play a vital role in water provision, regulation and quality. The middle basin of the Pixquiac River also contains the most threatened ecosystem in Mexico - thamesophytic mountain cloud forest.

As part of the CityAdapt project, a vulnerability assessment of the Xalapa-Tlalnelhuayocan metropolitan area (CityAdapt 2022) helped to identify strategic priorities for EbA interventions to protect water resources, reduce risk of floods and landslides, and support climate change adaptation.

The EbA measures included riparian restoration along the Papas River and ecosystem restoration in Estropajo Hill, a strategically important natural area that acts as a buffer for climate-related hazards. The project supports increased infiltration of rain and floodwater into underground aquifers - nature’s natural storage infrastructure - and creates natural storage points for floodwater, reducing runoff to the city.

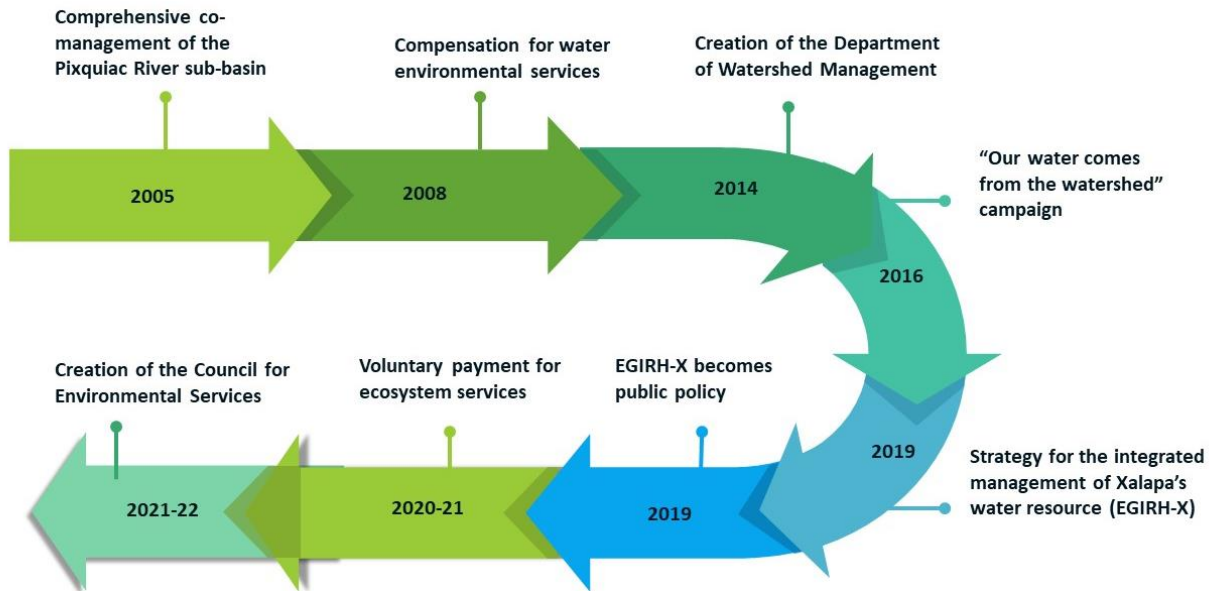
The restoration of the Papas River and the Estropajo Hill also complements grey infrastructure. It does this by reducing the amount of sediment that reaches urban stormwater collectors in lower watershed areas, saving maintenance costs for the city. Complementary adaptation actions developed by the project’s partners and counterparts include a tree planting scheme (“one tree per household”), installation of rainwater harvesting systems in schools and public buildings, agroforestry and silvopastoral management, and recovery of a natural urban wetland.

Financing Ecosystem-based Adaptation in Xalapa

The CityAdapt Mexico project was financed by the Global Environment Facility, with co-financing from national, municipal, and private sources:

- Municipal and national funds from the National Water Commission financed the construction of the Fernando Gutiérrez Barrios channel, a grey infrastructure solution (approx. US \$2 million)
- Xalapa City Council co-financed rainwater harvesting systems in public buildings (US \$92,760)
- The Gonzalo Río Arronte Foundation funded rainwater harvesting in homes (US \$100,000)
- Voluntary water fee scheme (US \$500,000)

Timeline of Financing Mechanisms for Nature-based Solutions in Xalapa, Mexico



Voluntary Water Fee

A source of co-finance for EbA came from citizens through a voluntary water fee scheme. A voluntary 2% charge was added to the water bills of Xalapa City residents for environmental services, specifically to conserve the watershed of the Pixquiac and Huitzilapan rivers that supply Xalapa's water.

The proposal for the water fee scheme emerged from Xalapa's strategy for Integrated Water Resources Management (IWRM), published in 2019. The IWRM strategy resulted from a participatory process involving the public sector, academia, and civil society organizations, building on more than 15 years of collective action to manage Xalapa's water resources and ecosystems.

In January 2021, the Xalapa Municipal Commission for Water and Sanitation approved the addition of a 2% voluntary fee to citizens' monthly water bills. A communications campaign "Water for everyone, forever" was launched to explain to citizens how the money would be directed towards nature conservation to build water resilience in Xalapa.

The Payment for Ecosystem Services (PES) scheme collected over US \$500,000 in its first year. Through the joint transdisciplinary governing body of the Environmental Services Council and the Municipal Commission for Water and Sanitation, the funds are being allocated to a series of interventions, both EbA and grey or hybrid infrastructure, that ensure the sustainable governance of natural resources at the watershed level. Through the PES scheme, 1,474 ha of the Pixquiac and 1,564 ha of the Huitzilapan watersheds are being restored through a series of EbA measures, addressing the key issue of water supply to the city, while

complementing it with other EbA interventions at the urban level.

In 2022, with a change in Xalapa's municipal government, the PES scheme was suspended by the new mayor. Isabel Garcia, Technical Advisor for CityAdapt Mexico, explained, "The 2% fee initiative is on pause for the moment. We are trying to maintain it, but the change in administration was surprisingly a big challenge". However, the Environmental Services Council created to guide the proper use of these resources continues to function.

Proceeds from the voluntary contribution are helping to scale EbA interventions, such as ecological restoration of riparian zones, soil conservation strategies, agroforestry, and silvopastoral management, as well as other water-efficient technologies, such as rainwater harvesting systems. These activities support the regulatory and provision services of watersheds that provide water for the city (Pixquiac River) while promoting connectivity between two natural protected areas Cerro de la Galaxia and the Archipelago of Forests in the Capital Region of the State of Veracruz.

The Municipal Government of Xalapa, the National Forest Commission, and the Government of the Veracruz State have signed a co-financing agreement to conserve more than 3,000 ha in the Pixquiac and Huitzilapan watersheds for five years. Each entity will contribute equally to compensate people who own property or live in the watershed in exchange for conserving the ecosystem. The success of the pilot CityAdapt project has been shared with other states and regions within Mexico and Latin America, generating interest and the potential for replication elsewhere. Xalapa's experience with a water use fee can offer lessons for cities

interested in embarking on EbA and evaluating potential finance options, while recognizing that every city is unique

and that EbA and financing solutions must be tailored to the context.

Lessons Learned

Lesson 1: Building resilience requires collaboration and a long-term vision for sustainability.

- The introduction of a PES scheme into legislation and conservation agreements between municipal and national government agencies is the result of sustained efforts involving multiple actors in Xalapa over more than 15 years. The CityAdapt project built on existing initiatives and a network of research institutions and civil society organizations in Xalapa with expertise in climate change adaptation, water management and livelihood interventions.
- The Xalapa case demonstrates the importance of the collaborative governance of natural resources, especially water resources. Different organizations participate in the Environmental Services Council to ensure resources are managed sustainably at the watershed level, beyond the municipal boundaries, a scale at which measures to mitigate climate change impacts such as droughts and landslides can have a bigger impact.
- The degree of replicability and sustainability of EbA depends largely on the enabling environment at the local level, where state and non-state partners can work together to respond to water resource challenges brought by climate change.

Lesson 2: PES can help to bridge the adaptation financing gap.

- Political awareness of EbA measures, costs and benefits is needed from the outset of projects. These enabling conditions were key in Xalapa's case to kick-start the PES fund and ensure buy-in from decision-makers. In less than one year, the 2% water fee collected US \$500,000 in much-needed finance to build resilience against climate change impacts.
- Beyond climate risks and eco-engineering approaches, climate risk assessments should factor in financial needs, as well as institutional, and

political implications of watershed level adaptation options. With this information, mechanisms like PES can be linked to a detailed financial plan that ensures a city's climate resilience.

- With the engagement and commitment of local experts in Xalapa, the project initiated a local financial mechanism to support adaptation. This shows how additional finance can be catalyzed when decision-making power is decentralized, and local government takes a leading role in EbA governance.

Lesson 3: Public communication, stakeholder engagement and political buy-in are key for the success of a PES initiative.

- Transparently communicating the costs and benefits of adaptation and financing strategies is crucial to build trust among stakeholders. This is especially important considering how controversial water taxes can be. Through collaborations with radio, TV and digital media channels, an outreach campaign explained the water fee initiative to citizens in Xalapa, raising awareness about the need for conservation and communicating the benefits of climate-resilient water management.
- Despite strong outreach activities, some groups contested how the scheme was implemented, requiring citizens to opt out rather than opt in. Xalapa's new mayor, appointed in 2021, suspended the initiative, citing the need for an internal review of the scheme. This illustrates the political dimensions of public water levies, the challenge for adaptation strategies to be dynamic amidst changing contexts, and the importance of factoring in equitable and rights-based approaches. As a result, policymakers and practitioners need to address the range of socio-political and economic issues related to climate variability and watershed management as part of outreach and communications campaigns.



Restored ecosystems in Xalapa.. Credit: UNEP



Rainwater harvesting system. Credit: UNEP

Sustainable Development Goals



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Further Resources

Website:
<http://www.cityadapt.com>

Project Factsheet:
[Ecosystem-based Adaptation in El Salvador, Mexico & Jamaica 2017-2022](#)

Stories:
[Banking on nature: a Mexican city adapts to climate change](#)

[With protective greenbelt, Mexican city hopes to fend off climate change](#)

Video:
[Climate action and the cloud forests of Mexico](#)

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