Netherlands Enterprise Agency

TERMS OF REFERENCE

Ecological restoration of La Laguna de Zapotlán, México

Project code: PVW525NB0X

Date: 9 April 2025

CONTENTS

1. INTRODUCTION

This assignment is financed through the Partners for Water Program, executed by the Netherlands Enterprise Agency (RVO), part of the Netherlands Ministry of Economic Affairs and Climate. The Partners for Water program is commissioned by the Ministry of Infrastructure and Water Management on behalf of the Interdepartmental Water Cluster. The ultimate aim as formulated in the Netherlands International Water Ambition, is to increase water security and water safety in the world of humans, plants and animals, and optimize the Dutch contribution to this aim.

In its Thematic Approach, Partners for Water 2022-2027 gives specific attention to the uptake and implementation of Nature Based Solutions (NBS) for increased water safety and security, including the Water-Biodiversity-Food nexus. The main objective of this nexus approach is to contribute to realizing sustainable food production systems under the condition of water security for all life on earth (including humans), restoration of biodiversity and combating climate change.

The interconnectedness of water, biodiversity, and agriculture poses complex challenges, increasingly with the additional burden of climate change, that require international cooperation and a holistic approach. In the nexus approach, it is recognized that biodiversity-rich ecosystems, including healthy living soils, deliver essential services that form the foundation of water and food security. Something that is embedded in international policy on the nexus by the Netherlands Ministry of Agriculture, Fisheries, Food Security and Nature. Four principles guide the Nexus approach: (1) using a landscape approach and regional cooperation, (2) making future-proof choices, (3) centering water and soils in spatial planning, and (4) building on existing knowledge, policies and frameworks.

In this context, the Partners for Water team closely works together with the Embassy of the Kingdom of the Netherlands in Mexico City (LAN Mexico) to contribute end strengthen opportunities that arise in the WBF nexus. Since 2023, LAN Mexico and Partners for Water work together to provide support to the dynamic collaboration on water security in La Laguna de Zapotlán. Local stakeholders, partially united through a transition committee (as a stepping stone to reactivate the *Comision de Cuenca*), have defined the priorities they would like to collectively work on in the upcoming years. These priorities form the basis of this assignment.

The transition committee is composed of the following members and is able to support the consortium with information, facilitation and cooperation:
- Municipality of Zapotlán El Grande
- Patronato de Nevado de Colima (NGO, beneficiary of part 1 in 'Scope of work')
- JIRCO - Junta Intermunicipal de Medio Ambiente para la Gestión Integral de la Cuenca del Río Coahuayana
- CDAAJ - Consejo de Desarrollo Agropecuario y Agroindustrial de Jalisco
- DIMA A.C.
- Ciudadanos y productores agroalimentarios Unidos por la Laguna A.C.
- Comisión de Cuenca de la Laguna de Zapotlán / CUSUR Centro Universitario del Sur.

2. PROJECT CONTEXT

Introduction of La Laguna de Zapotlán
La Laguna de Zapotlán sub-basin, located in the state of Jalisco in Mexico, hosts a thriving system for agricultural activities, among which the production of avocado, berries, and agave. The climate and the natural resources of the region make it very attractive for agriculture and, due to the competitive market for these crops, farmland continues to expand. Currently, approximately 50% of the landscape territory is used for agriculture. The rapid expansion in recent years of activities in fragile and natural areas has also affected the forests, biodiversity and ecosystem quality. In particular the Laguna de Zapotlán, a Ramsar site, is threatened.

Although the Laguna de Zapotlán sub-basin is considered part of the larger Lake Chapala water basin, it is actually a closed system (endorheic watershed), meaning that its rivers and streams converge to the inner lake of the basin, the Laguna de Zapotlán. The catchment of the landscape is again subdivided into 9 smaller micro-basins. The total area of the landscape is about 46,015 ha. Another main element characterizing the landscape is the Colima mountain range that bounds the landscape in the south, which is a Protected Area in the category of National Park that houses endemic populations such as *Abies colimensis*. The range exists of two volcanic peaks: the inactive Nevado de Colima reaching 4,330 meters high, and the (very) active Volcán de Colima reaching 3,830 meters. The volcanic activity has provided the region with rich soils.

The current total population in the landscape is around 132,000 people, spread over 2 main municipalities, Zapotlán el Grande and Gomez Farias, covering respectively the southern and northern part of the landscape. Additionally, around 40,000 seasonal workers come to the region during harvest season. Most people

(~90%) live in the main urban centers in the landscape: Cuidad Guzman located south of the Laguna de Zapotlán and the smaller San Sebastian del Sur in the north.

La Laguna de Zapotlán is a sweet water lake at 1,497 meters above sea level and is located in the lowest part of the landscape, and it stands out for hosting a considerable number of threatened and endangered species such as the Mexican long-tongued bat, the milk snake, whipsnake, and Mexican pine snake. The lake is also an area of refuge for an average of 25,000 waterfowl. Since 2005, this lake is formally designated as a priority area to be protected under the RAMSAR wetlands convention. The lake is also an important corridor for migratory birds from North, Central and South America, especially from November to March.

For the population and activities in the landscape, the lake is a key water reservoir, as well as a water body receiving nearly 34,000 m3 of treated, but also increasingly untreated, urban wastewater. Its maximum capacity is 27,000,000 m3 with an average area of 13.7 km2 and depth of 4.5 meters, corresponding to a volume of approximately 20,000,000 m^3, that is, 74% of its capacity.

Challenges in the Laguna de Zapotlán landscape

Uncontrolled expansion of agricultural activities since 2010, deforestation, erosion, forest fires

The rapid expansion of monocultures led to uncontrolled growth into vulnerable areas, including deforestation on slopes and the clearing of forests for accommodating plantations of avocado, agave and berries. The local, federal and state governments have insufficient capacity for inspecting lands and monitoring deforestation. The removal of natural vegetation affects soil quality and structure which, in turn, makes it is more susceptible to erosion in occasions of high precipitation. Another consequence is more incidence of forest fires from the reduction in water infiltration and humidity in the remaining vegetation.

Effects on water quality, lack of infiltration, insufficient aquifer refill

Water from precipitation flows downstream, though natural and agricultural lands, bringing to the lake sediments (sludge) and contaminants from agricultural activities and other land uses. According to local sources, 8.5 tons of solids are deposited in the laguna per day. The municipality Zapotán Caroline Grande has a decentralized operating agency for the supply of drinking water and wastewater treatment services. This agency operates two water treatment plants: treatment plant no. 1 for the urban area (97% of the total population) with an activated sludge system that processes 3,832,853 m3 annually, and treatment plant no. 2, a vertical flow constructed wetland for the treatment of wastewater in another location for 900 inhabitants with the capacity to treat 56,765 m3 annually. The wastewater treatment plants are outdated and don’t treat sufficiently the increased volume of wastewater, resulting in 30% to 50% of residual water flowing directly into the lagoon. Water quality concerns also persist due to residues from life stock and agricultural chemicals. Increasingly, local residents are reporting health issues which are thought to be linked to water quality problems.

Despite being a protected Ramsar area, the lake suffers with much proliferation of water lily and tule due to nutrients flowing into the lake. Water lily has covered up to 75% of the lake in previous years, while 30% of coverage is the maximum accepted. The government, fishermen and volunteers assist with removal of water lily. Aside from the mechanical removal invested to mitigate this problem.

Water availability

Currently, 75% of the available water is used for agricultural purposes. 73% of the underground water in the municipality of Zapotlán el Grande is used by agriculture. In the broader context, there is a race against time for the water basin to adequately recover from its negative water balance, with a deficit of 26 mm3 for the year 2020 and 31 mm3 for 2023. The more groundwater is extracted, the faster the layer of fossil water (salted) is reached. The excessive sedimentation throughout the rivers and channels down to the lake prevents water to infiltrate effectively, which has implications to the refill capacity of the local aquifer.

Flooding of urban and agricultural areas bordering the Laguna de Zapotlán

The past years have shown an increase of the surface area of the lake, probably due to sediments (including sludge) accumulating in the bottom of the lake as a result of runoff in seasons of high precipitation and the increased use of groundwater (flowing back into the lake). According to local farmers, over 500 hectares were affected by floods since 2022.

Lack of coordination between initiatives and commitment to collective action

Water governance is another challenge expressed by various stakeholders in the Laguna de Zapotlán landscape. Local actors - including farmers, NGO's, local government and private sector - are well aware of the problems in the landscape, though they realize that collective awareness of the causality of drivers and impacts within the broader community needs to be improved. In addressing the current environmental challenges, various actors are individually undertaking actions within their own mandates and capabilities. Though driven by the best intentions, to increase broader synergies and impacts within the landscape, and really address the drivers of environmental degradation, these actions could benefit from more alignment, prioritization and coordination.

Other challenges pertain to the enabling environment

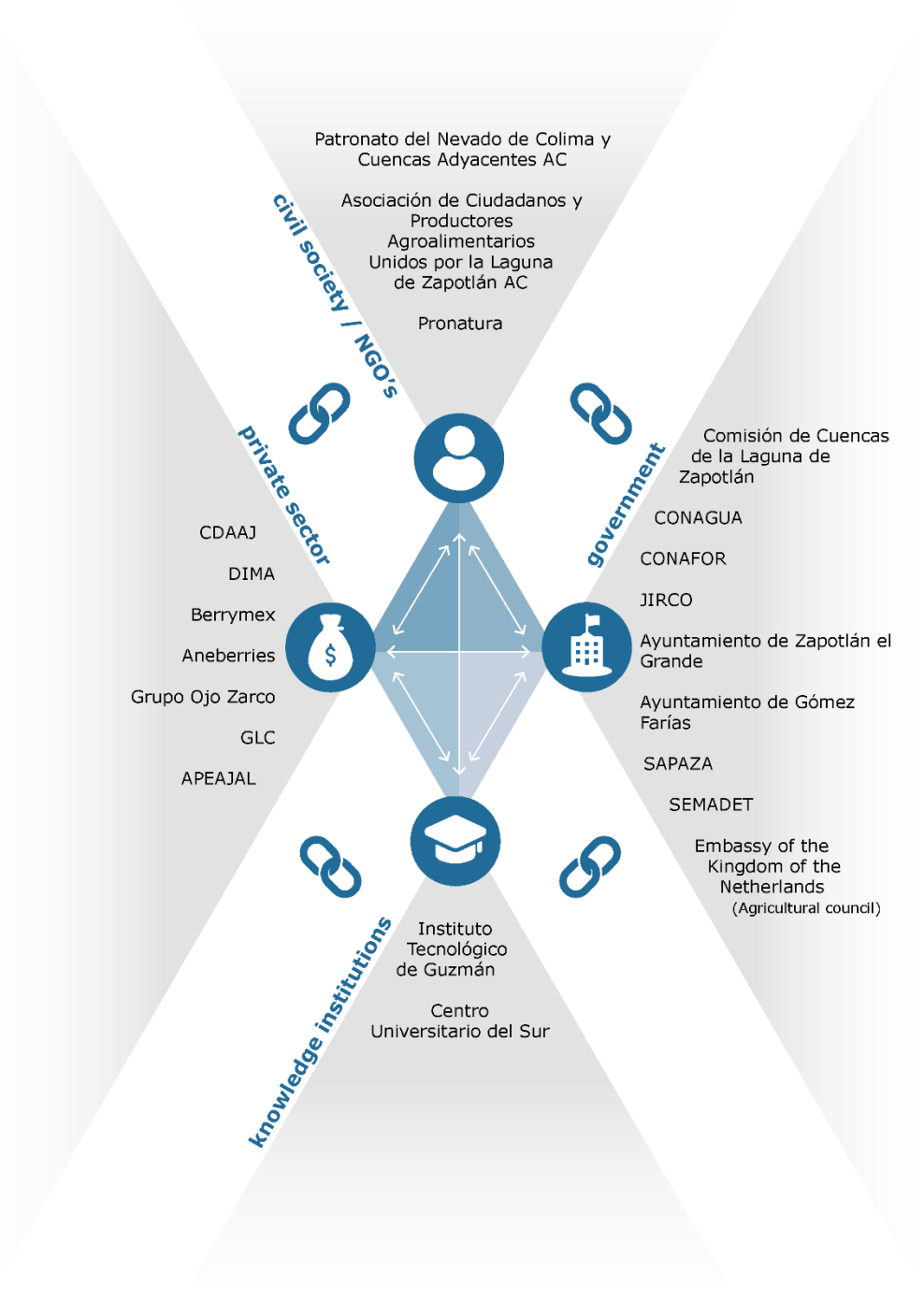
At all three levels of government, there is no policy setting a maximum limit on the amount of nitrogen that farmers can use, which is crucial for protecting local biodiversity and water quality. Additionally, there is a challenge in facilitating a market transition towards a sustainable farming. Although there is some export to Europe and Asia, The United States is the primary importer of various Mexican products, including avocados. However, the environmental requirements for these products to enter the American market are minimal, which means producers are not compelled to adopt sustainable practices. As a result, the international private sector is not incentivized to support a sustainable transition of this market and farmers in the Laguna de Zapotlán landscape lack the urgency to invest in reducing water consumption and increasing biodiversity on their lands as no policy requirements, certifications or other incentives are available or in force.

These challenges also affect many agricultural plantations, particularly avocado. Decreasing water quality and irregular water availability, erosion, sedimentation flow (with the soil ending up in the laguna), and high temperatures, all of which affect current productivity and the long-term sustainability of the business model. With high quality groundwater running out, there is an additional risk of avocado plantations collapsing due to salinity of the available groundwater.

Local stakeholder action

In response to these environmental pressures, there has been a growing focus on sustainable agricultural practices in recent years, with some efforts aimed at reducing deforestation and managing water resources more efficiently.

Various actors within the Laguna de Zapotlán landscape are actively taking steps and engaging in discussions aimed at improving the conditions of the water basin. Actors of the civil society and individual farmers are sharing their stories, water-related problems and their initiatives for mitigating losses from extreme floods and erosion. NGO's are seeking financing opportunities for supporting initiatives on reforestation and sustainable land use. Knowledge institutes are researching conditions and changes in the water basin, as well as investigating the effects of mitigation measures being taken. Although enforcement is difficult, local government has taken steps towards creating concrete institutional frameworks for protecting native areas and limiting deforestations. The private sector, which includes larger farmers' associations, are investing in measures for reducing the effects of plantations on the environment and supporting reforestation.



Using local knowledge and the already existing studies that have been done, the above-mentioned actors are aware of the origin of the problems in the Laguna de Zapotlán landscape and are taking their own measures for mitigating risks.

3. SPECIFICATIONS

Ambition

The ambition of this assignment is to support the collective action of local stakeholders in La Laguna de Zapotlán in working towards ecological restoration of the landscape, including improved water quality, water availability and biodiversity. The assignment envisions to provide a strong foundation for collective action, by providing technical assistance that backs-up and concretises the desired actions of the local stakeholders and that results in projects that can be financed by governments, private sector and financiers.

Scope

The transition committee has developed several strategic plans for the region. This assignment aims to detail some of the prioritized interventions from these strategic plans into a project package ready for follow-up funding. As an indication, the ratio between the components 1/2/3 in the scope is envisioned to be 60%/20%/20%. Anticipated activities include:

1. Support with the technical development of three projects, including conceptual/technical designs, steps needed to take towards implementation and budget specifications. The following three priority projects, ranked on importance from a to c, have been selected by the transition committee for further detailing:
    a) Design of nature-based water treatment systems to treat the surplus of urban wastewater.
        - Provide technical and financial assistance to the Municipality of Zapotlán El Grande to re-design or expand existing, and develop new waste water treatment plants in a more nature-based manner. Specific assistance is required to:
            - Design of a natural water treatment system to treat the excess of urban wastewater from water treatment plant no. 1 and a review of the technical configuration for the use of alternative varieties of plant species.
            - Develop a technical and financial roadmap for the expansion of water treatment plant no. 2 in Zapotlán el Grande. The operating agency has determined that it is feasible to increase the treatment capacity and that there is land available to expand the infrastructure.
            - Design of a nature-based water treatment system to treat wastewater from El Fresnito settlement (1.018 inhabitants) in Zapotlán el Grande.
            - Technical and financial assistance for the water treatment plant in the municipality of Gómez Farías for it to function at 100%. This water treatment plant uses activated sludge and currently functions at 20%. Financial assistance include identification of funding sources for the construction of a wetland in the municipality of La Cofradía (492 inhabitants).

- Technical and financial assistance for the development of a so-called "*línea morada*" project, where treated water could be reused in the industry.
- Guidance of local municipalities on developing application and selection criteria for nature-based water treatment systems to support decision-making as well as improve the quality of contracting.

b) Promote the recovery of the forests and biodiversity through ecological connectivity
   - Cooperate with and provide support to Patronato de Nevado de Colima y Cuencas Adyacentes A.C. (local NGO active in the area) for the continuity of the "Biological Islands and Corridors" project, which aims at the ecological and forest restoration of the sub-basin of the Zapotlán Lagoon.
   - Development of a strategy, including monitoring criteria, to evaluate the impact generated through the Biological Islands and Corridors program in the years 2022, 2023 and 2024.
   - Development of a strategy to improve the ecological connectivity and recover forest vegetation (original biodiversity) in La Laguna de Zapotlán.
   - Identify and map the polygons relevant to ecological and forest restoration and connectivity within the Zapotlán Lagoon Basin.
   - Support with the technical strengthening of the Low Carbon Forest Nursery, where the plants for the ecological and forest restoration project are produced.

c) Develop a plan to stop the expansion of the agricultural frontier in non-permitted land uses and promote the official protection of water recharge zones:
   - Support a community socialization and awareness plan. Gather inputs from local stakeholders on current incentives/drivers for land use change and translate into an outline for a course or workshop on good environmental practices as formal training for agricultural producers.
   - Identify and list (examples of) local mechanisms for environmental compensation and/or payment for environmental services for the environmental restoration of forests due to their importance as areas of water recharge and climate stability, promoting official recognition as protected natural areas. Preferable built upon examples already applied in Mexico.
   - Identify potential mechanisms for effective establishment and rollout of good environmental practices among the local value chain, that can be embraced by the producer-buyer association.

2. Support through co-creation and knowledge exchange:
   a) Support the process of co-creation with local stakeholders with workshops and knowledge exchange on the topics above. Integrate lessons learned and connect with collective action efforts that address nexus challenges in critical sourcing / production areas elsewhere and

involve the broader value chain in formulating a joint response, such as those supported through Partners for Water in Chile and Peru[1].

b) Support LAN Mexico with international knowledge exchange on the topics above by establishing active links and exchanges with landscape restoration efforts in similar landscapes. Specifically:
    - Exchange with collective action initiatives on the nexus elsewhere, to support integrate this into the LAN Mexico strategy.
    - Exchange with promising landscape restoration in similar environments (e.g. with LAN Kenya on initiatives in the Partners for Water thematic portfolio such as in Kisumu, Kenya) that infuse the process of scaling and connecting among initiatives.

3. Support the development of an investment agenda, the structure to receive funding and involve potential financiers (involvement of value chains, private sector, donor conference). Based on the outcomes of activities 1 and 2, support the local stakeholders in their outreach to applicable private sector, national and international financing options. This includes mapping the options, writing a plan on how they could get involved and organize a conference together with the local stakeholders.

Deliverables

The following deliverables are anticipated by the end of the assignment:

- Inception document (report or slide deck) with detailed workplan, planning, and clearly defined intermittent milestones.
- A proposal and groundwork for the design of nature-based water treatment systems to treat the surplus of urban wastewater, including a detailed strategy, implementation plan and budget.
- Roadmap for the promotion of the recovery of the forests and biodiversity through ecological connectivity.
- A strategy to stop the expansion of the agricultural frontier in non-permitted land uses and promote the official protection of water recharge zones.
- Organise and implement a minimum of 5 co-creation workshops for local stakeholders related to the three priority projects that have been described under 1) in the scope of this ToR.
- A broadly supported, well-structured and detailed investment agenda for the funding of the implementation of activities for the three priority projects that have been described under 1) in the scope of this ToR.
- Five meetings with RVO and LAN Mexico during the implementation of the assignment (at the start, in the middle and at the end).

[1] For more information on collective action in water stewardship: WWF, ea (2024) https://wwfint.awsassets.panda.org/downloads/unpacking-collective-action-in-water-stewardship.pdf

- Organise regular meetings with the Transition Committee to discuss the progress of the assignment.

4. KEY COUNTERPART ORGANISATIONS

The six counterpart organisations that are directly connected to this assignment are mentioned in the table below.

Organisation	Type of involvement and responsibility
RVO – Partners for Water	Responsible for the coordination and monitoring of the project activities of the assignment through its Program Advisor.
Embassy of the Kingdom of the Netherlands in Mexico City	The team of LVVN at the Embassy will support the project with insights and network.
Transition Committee	The Transition Committee will support in providing existing data and information on the estuary to the team of experts and provides support in reaching out to relevant stakeholders.