



# Combined Project Information Documents / Integrated Safeguards Datasheet (PID/ISDS)

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Appraisal Stage | Date Prepared/Updated: 17-Jan-2018 | Report No: PIDISDSA23234



**BASIC INFORMATION**

**A. Basic Project Data**

Country Mexico	Project ID P164389	Project Name Water Security and Resilience for the Valley of Mexico (PROSEGHIR)	Parent Project ID (if any)
Region LATIN AMERICA AND CARIBBEAN	Estimated Appraisal Date 08-Jan-2018	Estimated Board Date 23-Mar-2018	Practice Area (Lead) Water
Financing Instrument Investment Project Financing	Borrower(s) Secretaria de Hacienda y Credito Publico	Implementing Agency CONAGUA	

Proposed Development Objective(s)

Improve the reliability of the Cutzamala System and strengthen the management of groundwater resources in the Valley of Mexico

Components

Water Resources Information and Infrastructure for the Cutzamala System  
Groundwater Management in the Valley of Mexico  
Institutional Strengthening and Project Management

**Financing (in USD Million)**

Financing Source	Amount
Borrower	96.00
International Bank for Reconstruction and Development	200.00
<b>Total Project Cost</b>	<b>296.00</b>

Environmental Assessment Category

B - Partial Assessment

Decision

The review did authorize the preparation to continue



Other Decision (as needed)

## B. Introduction and Context

### Country Context

- 1. Mexico's economy continues to expand at a steady though moderate rate of growth.** The increase in Mexico's GDP over the past three years, 2014-2016, at an annual average of 2.4 percent was slightly below the annual average growth posted during the previous two decades, 1994-2013, of 2.6 percent. The non-oil economy expanded between 2014 and 2016 at the same average annual rate of 2.8 percent as observed over the previous two decades. Growth is expected to moderate to about 2.2 percent in 2017 and strengthen in the medium term to about 2.5 percent by 2019 as uncertainty with respect to NAFTA and the presidential elections (of July 2018) dissipate and gross fixed investment growth resumes. Yet, these rates of growth are only about half of the average growth observed in emerging market economies (5.3 percent between 1994 and 2016).
- 2. Economic performance has been resilient in view of external shocks experienced in the past few years.** Mexico's economy endured several external shocks in the last few years including a sharp drop in oil prices with average oil prices down by 50-60 percent, an additional reduction in the volume of oil and gas production by 6 percent annually, international financial market volatility related to a normalization of monetary policy in advanced economies, and, more recently, uncertainty over the future of the United States-Mexico trade relation. Sensible monetary and fiscal policy responses to these shocks within an overall sound macroeconomic policy framework including a flexible exchange rate, an inflation-targeting monetary policy framework and a fiscal rule that ensures moderate public sector deficits, maintained macroeconomic stability in recent years.
- 3. Heightened fiscal consolidation efforts focus on expenditure cuts as the tool to stabilize public debt.** Modest economic growth and persistent fiscal deficits contributed to a steady increase in the (net) public debt burden over the past decade to an estimated 50.5 percent by the end of 2016. In managing the decline in oil revenue over the past two years, the government benefitted from a tax reform implemented in 2014 that substantially raised non-oil revenue and started to cut expenditures in 2015 and 2016 thereby meeting its overall fiscal deficit targets. Additional fiscal pressures and further fiscal consolidation, needed to stabilize the debt-to-GDP ratio in the short term, will require more spending cuts as the government committed not to raise taxes during the remainder of its term.
- 4. Moderate economic growth over recent years has limited significant poverty reduction and improvements in shared prosperity.** The most recent estimation of official poverty -based on a combination of monetary and non-monetary dimensions of welfare- shows a decline in the percentage of people considered poor from 46.2 percent to 43.6 percent and extreme poor from 9.5 percent to 7.6 percent between 2014 and 2016. Access to health services, access to social security and food security were the non-monetary components that improved the most. Monetary poverty also declined as poverty rates at the well-being poverty line dropped from 53.2 percent to 50.6 percent while the rates at the minimum well-being poverty line dropped from 20.6 percent to 17.5 percent. Such a decline in monetary poverty has been driven by higher growth of incomes at the bottom of the income distribution.
- 5. Despite this progress, the Mexican economy remains vulnerable to shocks from natural hazards.** Mexico averages more than 90 earthquakes per year in excess of 4.0 on the Richter scale and has seen a growth in



frequency and intensity of hydrometeorological events. From 2000 to 2015, damages from disasters in Mexico imposed an national aggregate cost of US\$25.1 billion.<sup>1</sup> The Valley of Mexico is particularly vulnerable to seismic activity due to the prevailing geological and topographical conditions, including a closed basin with soft soils and extensive urbanization on drained lakebeds. On September 19, 2017, a 7.1 magnitude earthquake resulted in over 300 deaths and approximately US\$2.0 billion in damages in Mexico City (including damage to water infrastructure). While damages are not expected to have a drastic impact on the Mexican economy, the losses in life and property underscored the importance of increasing resilience to natural disasters<sup>2</sup> of Mexico City.

#### Sectoral and Institutional Context

6. **An estimated 38 percent of Mexico's GDP is generated within the Valley of México Metropolitan Area (VMMA) and Toluca Metropolitan Area (TMA).** Together, these two metropolitan areas account for a population of almost 23.4 million people and host a diverse range of economic activities, from manufacturing to agricultural farmland, that require water for both consumption and economic development. Nevertheless, deficient water services, compounded by unreliable bulk water supply, impose economic costs on individuals and firms equivalent to an estimated 1 percent of the GDP of the VMMA.<sup>3</sup> With an estimated population of 21.5 million, the VMMA is considered the most populated urban center in Latin America, and currently demands a mean water supply of 63 cubic meters per second (m<sup>3</sup>/s)<sup>4</sup> for human consumption and industrial and commercial needs and an estimated supply of 11 m<sup>3</sup>/s for irrigation purpose. The TMA houses a population of approximately 1.9 million people with a mean water demand of 4.7 m<sup>3</sup>/s.<sup>5</sup>

7. **The supply of bulk water supply and water service provision for these two areas constitutes a major challenge.** Urban water demands for the VMMA are currently being met through three principal sources: groundwater from the main aquifer below the Valley of Mexico, which accounts for approximately 68 percent of the total supply; and two water transfer schemes, the Cutzamala System (24 percent); and the Lerma System (8 percent). Water demands for the TMA are being met through groundwater (84.6 percent); and the Cutzamala System (15.4 percent). Water service provision in Mexico City, while outside of the scope of this Project, is the responsibility of the Mexico City Water Utility (*Sistema de Aguas de la Ciudad de México*, SACMEX), which faces challenges including intermittent service provision for a quarter of customers, high leakage, and limited managerial autonomy.

#### Groundwater Supply

8. **The VMMA relies on the pumping of groundwater from aquifers for human consumption, industrial and commercial use, and irrigated agriculture.** As mentioned above, two-third of drinking water supply in the VMMA is pumped from aquifers across municipal and state boundaries (Map 1). Total groundwater withdrawals for all users (including industrial and agriculture) in the VMMA averages 55 m<sup>3</sup>/s. Meanwhile, the increase in urbanization and spread of impermeable surfaces have decreased natural recharge from 31 m<sup>3</sup>/s in 1980 to 23 m<sup>3</sup>/s in 2015, limiting the natural replenishment of the aquifer. Accounting for inflows from leaks from potable

<sup>1</sup> Improving the Assessment of Disaster Risks to Strengthen Financial Resilience, GFRDD, 2012, <https://www.gfdrr.org/sites/default/files/publication/Improving%20the%20Assessment%20of%20Disaster%20Risks%20to%20Strengthen%20Financial%20Resilience.pdf>.

<sup>2</sup> World Bank estimates minimum earthquake impact on Mexican economy, <http://www.notimex.gob.mx/ntxnotaLibre/428936>.

<sup>3</sup> World Bank, 2013, *Agua urbana en el Valle de México – ¿un camino verde para mañana?*

<sup>4</sup> CONAGUA-World Bank, 2015, Cutzamala Integral Diagnostic.

<sup>5</sup> Idém



water distribution and irrigation return flow, the result is an estimated net over-exploitation of 23 m<sup>3</sup>/s from the VMMA's aquifers<sup>6</sup>. This overexploitation has resulted in the fall of groundwater table under the city of up to 30 meters over the last 20 years, indicating that the current levels of groundwater abstraction are unsustainable.

9. **The ongoing overdraft of groundwater in the VMMA has resulted in significant land subsidence, damaging urban infrastructure and posing challenges to water supply.** As a result of land subsidence, Mexico City is sinking unevenly at up to 43 centimeters (cm) per year<sup>7</sup>. The National Autonomous University of Mexico (*Universidad Nacional Autónoma de México, UNAM*) estimates that land subsidence imposes annual costs of US\$1.4 billion in terms of damages to infrastructure including roads, the metro rail system, and municipal water supply facilities. Additionally, and particularly relevant in the VMMA, the soil compaction that results from groundwater withdrawals changes the behavior of soils during earthquakes and intensifies damages in some circumstances. Finally, as the water table falls, wells that provide water for human consumption must be deepened increasing energy costs associated with pumping water to the surface.

10. **Institutional and information challenges hinder effective aquifer management.** Multiple entities intervene in the management of groundwater without clear coordination. SACMEX, an entity within Mexico City's Secretariat of Environment, is responsible for the operation of most water supply wells; the National Water Commission (*Comisión Nacional del Agua, CONAGUA*), through its subsidiary entity the Basin Agency for the Valley of Mexico (*Organismo de Cuenca Aguas del Valle de México, OCAVM*), is responsible for the operation of the 218 wells that make up the Immediate Action Plan (*Plan de Acción Inmediata, PAI*); and a large—but as yet unquantified—number of private users operate groundwater wells. Additionally, the existing aquifer monitoring networks are outdated and limited information exists on abstraction rates, groundwater level fluctuations and groundwater quality characteristics.

11. **To respond to these challenges, and catalyzed by the September 2017 earthquake, the Government of Mexico (GoM) through CONAGUA has established the Technical Groundwater Management Advisory Committee (*Comité técnico de manejo de aguas subterráneas, COTEMA*),** comprised of representatives of the Mexican Institute for Water Technology (IMTA), the Federal Electricity Commission, SACMEX, CONAGUA, other public entities, academia, and NGOs. The Committee is responsible for informing the preparation of an Integrated Plan for Aquifer Recharge and Management in the Valley of Mexico that, inter alia, will (i) prioritize pilots for managed groundwater recharge through wells using treated wastewater; (ii) develop an incentive system to target subsidies for aquifer interventions; and (iii) reform the pertinent legal framework<sup>8</sup>. This Plan is currently under development and will be finalized by June 2018.

#### *The Cutzamala System*

12. **In addition to groundwater, the Cutzamala System plays an essential role in the supply of water for the VMMA and TMA.** This integrated water system – one of the country's largest engineering works – was originally designed in 1930 for hydropower generation and then from the late 1960s to 1993 transformed into an inter-basin water transfer system to reduce VMMA and TMA's dependence on groundwater resources. The Cutzamala System sources water from a multitude of rivers and springs from six sub-basins<sup>9</sup> in the States of Mexico and

<sup>6</sup> II-UNAM Presentation: "Plan de gestión integral y manejo de la recarga del acuífero del Valle de México"

<sup>7</sup> Solano-Rojas, et al. *La relación de subsidencia del terreno InSAR-GPS y el abatimiento del nivel estático en pozos de la zona Metropolitana de la Ciudad de México*; Boletín de la Sociedad Geológica Mexicana; 2015.

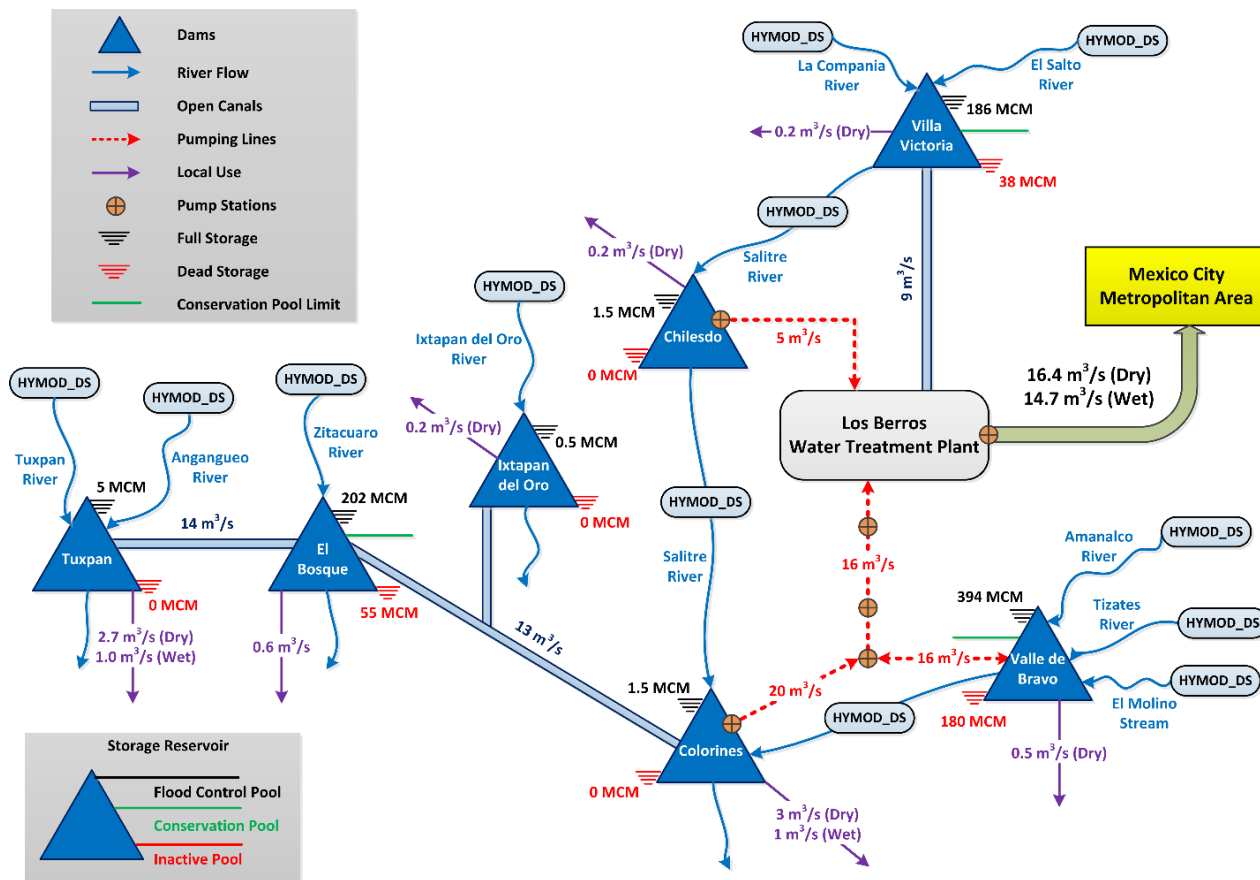
<sup>8</sup> The Institute of Engineering at the National Autonomous University of Mexico (UNAM) is leading the preparation of the Plan, which seeks to stabilize aquifer levels by 2030.

<sup>9</sup> These basins span upwards of 10,500 km<sup>2</sup>.



Michoacán. For this, the system uses eight main reservoirs, six main pumping plants, 322 kilometers (km) of canals (none of which are navigable) and tunnels, and the large Los Berros potable water treatment plant located outside Mexico City (Map 2 and Figure 1). The Cutzamala System provides an average of 15 m<sup>3</sup>/s to VMMA and TMA (in addition to the 55m<sup>3</sup>/s mentioned in paragraph 8) and is essential to maintain water pressure in the water distribution systems. The reliability of the Cutzamala System – defined in terms of percentage of days in the year that the System supplies that target water volume to Mexico City – currently stands at 82 percent<sup>10</sup>. Reasons for missing this target include: (i) the lack of timely information on water availability in the basins, (ii) the lack of an automated system for infrastructure management, and (iii) the limited flexibility to operate the System in the event of maintenance works or rapid changes in water levels.

Figure 1. Cutzamala System Schematic



13. Furthermore, many of the Cutzamala System Dams, which date from the mid-1900s, require rehabilitation and safety improvements to address critical dam safety issues. The Cutzamala System heavily relies on the safe and reliable operation of eight dams. A preliminary joint assessment by CONAGUA and the World Bank has identified several dam safety issues and deficiencies, in both structural and non-structural aspects. The inspections to date have identified no visible anomalies which could lead to immediate breach of dams under normal conditions. Nevertheless, without intervention the reliability challenges described above, coupled with dam safety issues, could pose serious risks to water security in the Valley of Mexico.

<sup>10</sup> World Bank Decision Tree report 2017.



14. **The VMMA and TMA depend on the Cutzamala System as a buffer for water shocks, including seismic events, though climate change puts its reliability at risk.** The September 2017 earthquake resulted in widespread damages to water distribution infrastructure in VMMA, including groundwater wells and the Mixquic-Tláhuac Aqueduct. Flow in the Cutzamala System was increased to 17 m<sup>3</sup>/s to compensate for losses from other systems<sup>11</sup>. Nevertheless, a recent study concluded that climate change could negatively impact the reliability of the Cutzamala System by altering precipitation patterns<sup>12</sup>. An ensemble of General Circulation Models (GCMs) concludes that by 2050, temperatures may increase between 1 and 4 degrees Celsius and precipitation changes are estimated in the order of +20 and -40 percent, with many GCMs converging to an average annual precipitation of 978 mm in the six sub-basins, representing a decrease rather than an increase in annual precipitation. Additionally, IMTA estimates that nearly 50 percent of the sub-basin area has a high to extreme degradation level, which impacts biodiversity and water quality. At the same time, economic and population growth in the VMMA, the TMA, and sub-basins of the System are increasing demand for water. Taken together, these climate and economic factors increase risks to the reliability of the System.

15. **To address these challenges, OCAVM led a technical cooperation program in 2013 to establish a framework for an integrated basin management plan for the Cutzamala System and its sub-basins in collaboration with the National Autonomous University of Mexico (UNAM), IMTA, and the World Bank.** This effort identified a comprehensive set of institutional actions and investments for the Cutzamala System and its sub-basins. These activities were carried out as a series of Reimbursable Advisory Services (RAS). They produced an integrated assessment of the Cutzamala System and its sub-basins<sup>13</sup> and informed the design of a stakeholder communication platform for the development and implementation of the plan as well as its dissemination to the broader community. These advisory services supported CONAGUA in the development of the Resiliency and Water Security Plan for the Sub-Basins of the Cutzamala, which is arranged around four pillars: (i) existing Cutzamala System infrastructure; (ii) water supply and sanitation services; (iii) irrigation services; and (iv) soil and environmental conservation. The RASs were expanded through a technical assistance in 2017 to apply the World Bank's Decision Tree Framework for Climate Resilience. This last exercise prioritized the integrated basin plan's investments incorporating considerations of water security, resilience and reliability.

16. **Multiple federal and local entities are involved in the management of the Cutzamala System.** OCAVM has a mandate to operate and maintain the Cutzamala System infrastructure, and is responsible for the delivery of bulk water to the VMMA and TMA. SACMEX receives bulk water transfers from the Cutzamala System and is responsible for water service provision within Mexico City. The GoM recognizes the need to account for this institutional structure in addressing the existing challenges of the Cutzamala System and its sub-basins. Accordingly, the GoM, through CONAGUA, has agreed to support OCAVM to reinforce financial and staff capacity to fulfill its mandate. This situation is particularly critical in the case of OCAVM, which has established a four-year Rehabilitation and Infrastructure Maintenance Program (*Programa de Conservación y Mantenimiento de la Infraestructura, PROCYMI*) estimated to cost US\$1.6 billion to address both operation and maintenance (O&M) and infrastructure improvement needs of the Cutzamala System (including US\$325 million in estimated O&M costs). OCAVM is working to implement the PROCYMI and other urgent measures to ensure the System's ongoing performance.

<sup>11</sup> Joint press conference with the Directors General of CONAGUA and OCAVM; October 5, 2017.

<sup>12</sup> Analysis based on the World Bank's Decision Tree Framework for Climate Resilience, carried out with WPP support.

<sup>13</sup> CONAGUA-World Bank, 2015, Cutzamala Integral Diagnostic.

<http://documentos.bancomundial.org/curated/es/309801468189248037/pdf/99219-P150092-SPANISH-WP-PUBLIC-Box393194B.pdf>



*World Bank Support*

17. In 2017, the GoM requested World Bank support for the development of an investment project that will support the implementation of the Resiliency and Water Security Plan for the Sub-Basins of the Cutzamala System.<sup>14</sup> Following the September 2017 earthquake, the GoM renewed its focus on numerous aspects related to seismic risk management and requested additional Bank support for the implementation of the Integrated Plan for Aquifer Recharge and Management in the Valley of Mexico. This six-year investment Project will therefore support the implementation of both plans, and is envisioned as the first stage of a 20-year program. The Project will also provide important learning value for both the GoM and the Bank through support for innovative groundwater recharge activities, implementing new resilient river basin planning frameworks and piloting the new national risk based dam safety regulations.

### C. Proposed Development Objective(s)

Development Objective(s) (From PAD)

18. The Project Development Objective (PDO) is to improve the reliability<sup>15</sup> of the Cutzamala System and strengthen the management<sup>16</sup> of groundwater resources in the Valley of Mexico.

#### Key Results

19. Expected results include:
- i. Improved reliability of the Cutzamala System for the delivery of water to the VMMA and the TMA (agreed volumes to be transferred are met 95 percent of the time);
  - ii. Annual reporting on groundwater information (quantity and quality) being used for decision making; and
  - iii. One managed aquifer recharge pilot operationalized.

### D. Project Description

20. **Component 1: Water Resources Information and Infrastructure Resilience of the Cutzamala System.** The objectives of this Component are to: (i) strengthen information, monitoring, and control systems for the effective operation of the Cutzamala System, and (ii) improve the safety and reliability of the infrastructure of the Cutzamala System for the delivery of water to the VMMA and the TMA. These activities will support Cutzamala System operators in adapting to changing climate conditions and thus build resilience to climate change.

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<sup>14</sup> The World Bank is the primary international donor active in the WRM space at the national level in Mexico, as well as in water service provision in Mexico City through engagements with SACMEX. Also in the VMMA, the French Development Agency (AFD) is supporting technical assistance and knowledge exchange on urban drainage that is scheduled to close in October 2018.

<sup>15</sup> Reliability is defined as the percentage of days in which the system successfully supplies the target delivery to Mexico City. This is a widely used metric for the reliability of bulk water systems. Current reliability of the Cutzamala System is estimated at 82 percent (World Bank Decision Tree report 2017).

<sup>16</sup> This includes groundwater monitoring and aquifer recharge.





- a. **Sub-component C1.1: Strengthening the information monitoring and control systems.** This sub-component will finance, inter alia: (a) the improvement of the data collection network to feed a decision support system for the management of water resources in the Cutzamala System basins including: (i) the purchasing and installation of a hydrometeorological and climate network, a water quality monitoring network, a groundwater monitoring network, a network to monitor reservoir and canal levels to measure water distribution and use, and: (ii) the instrumentation of the Cutzamala System Dams; (b) the revision and updating of the existing supervision control and data acquisition system (SCADA of the Cutzamala System; and (c) the design and implementation of a Decision Support System to carry out water balances, water allocation, and support the operation of the Cutzamala System..
  - b. **Sub-component C1.2 Improving infrastructure safety and reliability.** This sub-component will finance, inter alia: (a) the engineering analysis and design for an approximately 26 km reversible pressurized transmission line to convey water to the Villa Victoria reservoir and for the rehabilitation works of the Cutzamala System Dams; (b) the development of operation and maintenance, and emergency preparedness plans for the Cutzamala System Dams; (c) the carrying out of civil works and the acquisition and installation of electrical and mechanical equipment for the rehabilitation of the Cutzamala System Dams; (d) the construction of the Villa Victoria pressurized transmission line; and (e) the supervision of (i) all civil works, and (ii) installation of electrical and mechanical equipment.
21. **Component 2: Groundwater Management in the Valley of Mexico.** The objectives of this component are: (i) to improve the availability of and timeliness of information for groundwater management through an information platform called Aquifer Observatory, and (ii) to support pilot initiatives for managed aquifer recharge. The development of the Aquifer Observatory will provide information for better management of groundwater resources, thus contributing to climate change adaptation. These activities come as a direct response to the September 2017 earthquake and will strengthen resilience to future earthquakes events.
- a. **Subcomponent C2.1 Strengthening Information for Groundwater Management.** This sub-component will finance the design and implementation of an Aquifer Observatory for the Valley of Mexico including, inter alia: (a) the collection of baseline data and the preparation of a diagnostic for water quality and quantity of aquifers; (b) the preparation of an inventory of wells within the Valley of Mexico, including water user data; (c) the expansion and automation of the piezometric network of the Valley of Mexico; and (d) the improvement of the existing aquifer modeling tool to produce water balances and the dissemination of information.
  - b. **Subcomponent C2.2 Implementing managed aquifer recharge initiatives at pilot sites in the Valley of Mexico.** This sub-component will support CONAGUA in the implementation of managed aquifer recharge initiatives at pilot sites in the Valley of Mexico through financing inter alia: (a) the formulation, preparation of engineering analysis and designs, and proposal of alternatives for private participation in two pilot sites; (b) the carrying out of civil works and the acquisition and installation of electrical and mechanical equipment for the upgrading of existing wastewater treatment plants; (c) the construction of aquifer recharge wells; and (d) the construction of conveyance infrastructure from the WWTPs to the recharge wells.
22. **Component 3: Institutional Strengthening and Project Management.** The objective of this component is to strengthen the capacity of the institutions involved in Project implementation and ensure financing of the Project Implementation Unit (PIU). This includes, inter alia: (i) the provision of all consulting services and goods of the PIU needed to implement the Project and (ii) the carrying out of capacity building to strengthen water



infrastructure operation; groundwater management, including outreach and dissemination activities; citizen engagement mechanisms; and leadership and gender training for CONAGUA female staff.

## E. Implementation

### Institutional and Implementation Arrangements

23. The Project will be implemented by CONAGUA. CONAGUA has longstanding experience in the implementation of World Bank projects.<sup>17</sup> The National Savings and Financial Services Bank (*Banco del Ahorro Nacional y Servicios Financieros*, BANSEFI) will act as the financial agent, as was done in recently closed projects, and will continue to supervise fiduciary aspects, including financial management and procurement.<sup>18</sup> Additionally, a Technical Advisory Group will be established to inform the implementation of Component 2: Groundwater Management in the Valley of Mexico.

24. A Project Implementation Unit (PIU) will be formed within CONAGUA, including technical staff from OCAVM, and will be responsible for the coordination of the different activities between the relevant CONAGUA units and with other institutions. The PIU will provide technical and administrative support to ensure full development of each Project activity, will ensure compliance with Bank safeguards policies, and will be responsible for monitoring and evaluation (M&E).

**Note to Task Teams:** The following sections are system generated and can only be edited online in the Portal.

**Please delete this note when finalizing the document.**

## F. Project location and Salient physical characteristics relevant to the safeguard analysis (if known)

The first part of the Project (Component 1) is located in the Cutzamala System and its sub-basins, in the States of Mexico and Michoacán. It is an environmental system with important environmental problems, in the process of major degradation, where it is necessary to optimize the use of water and to stop processes of water and soil contamination, soil degradation and probable deterioration of nearby natural habitats. There is an important deterioration of water quality in the sub-basins due to deficient sanitation infrastructure and the direct discharge of untreated wastewater into watercourses. The topography in the area of the sub-basins is characterized by hills, mountain ranges, deep ravines and relatively extensive valleys. Predominant soils in the sub-basins (andosols) are characterized by very low bulk density and, being devoid of vegetation and located on slopes and hills, are very vulnerable to water and wind erosion processes. The main channels and the tributaries do not have a vegetation cover that contributes to the

<sup>17</sup> Most recently implemented projects by CONAGUA include: Modernization of the Water and Sanitation Sector Technical Assistance Project, P091695 (PATME – closed in 2008), the Water Utilities Efficiency Improvement Project, P121195 (PROME – closed in 2017) and the Modernization of the National Meteorological Service Project (MOMET – closed in 2016).

<sup>18</sup> It should be noted that SACMEX does not form part of the institutional arrangements of, nor have a formal role in, this Project.



retention of sediments and nutrients. The Component 2 of the project (Groundwater Management in the Valley of Mexico) will be developed in the lowest and most horizontal plain of the basin of Mexico, highly urbanized, which corresponds to the surface occupied by four large lakes and surrounding hillside plots. The groundwater in this basin has been exploited for decades for drinking water supply and water supply for agricultural and industrial activities (extraction is increasing and demand is increasing). Currently 68 percent of water used in the Valley of Mexico is pumped from groundwater and the aquifers are overexploited. Due to the overexploitation of the aquifers, differential land subsidence occurs that damages the existing infrastructure. This situation is aggravated by the loss of permeable surface and the reduction of vegetation and recharge zones, derived from the expansion of the urban area. There is limited practice of artificial aquifer recharge in this area. The Project safeguards instruments will contribute to mitigate environmental impacts resulting from Project implementation. Additionally, Project activities will mitigate the impacts of overexploitation of the aquifers of the area (Valley of Mexico Basin). These activities will also contribute to the improvement of the reliability of the Cutzamala System, among other expected benefits.

**G. Environmental and Social Safeguards Specialists on the Team**

Carlos Alberto Molina Prieto, Social Safeguards Specialist  
 Arelia Jacive Lopez Castaneda, Social Safeguards Specialist  
 Diacono Raul Vera Hernandez, Environmental Safeguards Specialist

**SAFEGUARD POLICIES THAT MIGHT APPLY**

Safeguard Policies	Triggered?	Explanation (Optional)
Environmental Assessment OP/BP 4.01	Yes	This Project is classified as Environmental Category B. The expected negative environmental and social impacts are relatively limited, and it is possible to apply mitigation measures. The possible negative environmental impacts of the Project are associated with activities and works to be carried out in areas where there is existing water abstraction, storage (dams), and conveyance infrastructure and within the pilot sites for recharging the aquifer with treated wastewater. The works involve the instrumentation, civil works and mechanical equipment for the rehabilitation of the Cutzamala System Dams; Construction of the Villa Victoria pressurized transmission line; in addition to upgrading of existing wastewater treatment plants to improve



wastewater effluent quality by incorporating advanced treatment modules to comply with Mexican water quality discharge standards for aquifer recharge; aquifer recharge wells; and conveyance infrastructure from the WWTPs to the recharge wells.

All these works and activities also have positive environmental impacts and support the efficient use of water resources in the area.

The Project includes works and activities for which the corresponding detailed engineering designs will be developed during Project implementation, so that their realization may involve construction procedures and technologies not yet defined. Given the above, CONAGUA has prepared an Environmental and Social Management Framework (ESMF), which includes an exclusion, selection and evaluation procedure to identify, evaluate and manage the possible impacts and environmental and social risks under the contracts. Both CONAGUA and the contractors who carry out the works will apply the ESMF. The ESMF will identify the environmental and social requirements for the contractors that execute the works, which will be included in the bidding process and in the contracts. The ESMF was consulted on December 7th and 8th, 2017 and the results of these consultations have been included in the ESMF that was disclosed at the Bank's and the client's websites on January 15, 2018.

The application of the ESMF will avoid and mitigate the possible environmental impacts of the works to be carried out as part of the Project, such as the following:

**Environmental:** Impact on the atmosphere by generation of dust, gases and noise derived from the movement of materials and operation of machinery and equipment; Impact on soil and water due to improper handling of chemicals, construction waste and hazardous waste (storage, transport and final disposal).

**Occupational Health and Safety:** Damage to health and physical integrity resulting from the improper handling of chemical products and waste; To accidents due to inadequate traffic signals and safety signs on the site; And the lack of personal



protective equipment or training in the use of tools and equipment.  
The ESMF includes references to the works contracts for the contractors that carry out the works and defines the responsibilities in the execution and supervision related to said contracts.  
The ESMF also includes relevant aspects such as a procedure for the selection of subprojects and the assignment of environmental obligations in accordance with the applicable national legislation on the environment, health and safety at work. It also proposes a set of good environmental and safety and hygiene practices to be applied in all cases. Likewise, it includes the establishment of efficient mechanisms for the reception and attention of complaints during the development of the works. The supervision of Project activities will include the evaluation of compliance with environmental, social, cultural and health and safety requirements. CONAGUA and the Project contractors will be responsible for the environmental, social and health and safety management (ESHS) of the work carried out. The environmental clauses in the terms of reference and contracts will indicate the obligation of the participating contractors to have the necessary management capacity related to ESHS aspects.

Natural Habitats OP/BP 4.04

Yes

In the area of influence to the Cutzamala System there are two Natural Protected Areas (ANP) of federal responsibility (The Monarch Butterfly Biosphere Reserve and the Valle de Bravo, Malacatepec, Tilostoc and Temascaltepec River Basins Protected Natural Resources Area), but these areas present severe problems of contamination and deterioration of natural habitats derived from unplanned anthropogenic activities that have been carried out for years on the site.  
The ongoing environmental degradation of Cutzamala sub-basins can lead to a loss of biodiversity in the Monarch Butterfly Biosphere Reserve, which protects key overwintering sites for a billion monarch butterflies in 80 percent of the area of the sub-basins.  
As part of the ESMF, the works to be carried out near the natural reserve areas should propose



		<p>additional monitoring actions to avoid impacts in those areas.</p> <p>The Project does not include activities or works within the Monarch Butterfly Biosphere Reserve, but activities may be carried out in its vicinity.</p> <p>In relation to the Valley of Mexico, one of the two possible pilot sites for groundwater recharge wells is located in the "Cerro de la Estrella" national park. The provisions of the existing management plan for this area must be observed, and this is also established in the ESMF.</p>
Forests OP/BP 4.36	No	OP 4.36 is not triggered as the Project does not foresee activities that will affect forests.
Pest Management OP 4.09	No	OP 4.09 is not triggered as no activities in the Project will include pest management or procurement of pesticides.
Physical Cultural Resources OP/BP 4.11	Yes	This safeguard is only triggered in a preventive manner. Based on a preliminary assessment it is unlikely that physical cultural resources would be found in the areas directly affected by the Project sub-projects. As a precaution, the ESMF includes measures for chance finds.
Indigenous Peoples OP/BP 4.10	Yes	<p>The Project will be implemented only on federal land within a 50-meter wide strip of CONAGUA property, and investments will focus on the improvement and maintenance of existing infrastructures. Additionally, new water conduits will be constructed on this strip. On the other hand, the social evaluation indicates the presence of indigenous peoples in the areas of influence of the project. These communities will not be directly affected, but could eventually be affected.</p> <p>During Project preparation, several activities were carried out to assess potential social impacts and strengthen the Project's performance under the components that have the potential to affect indigenous people during implementation. The social evaluation did not identify possible direct impacts on the indigenous population during Project implementation. Nevertheless, the client developed a general Indigenous Peoples Planning Framework (IPPF). The IPPF aims to establish guidelines for indigenous and local communities, may have culturally appropriate benefits during the preparation of the Project.</p>



Two public consultations for safeguards instruments (including the IPPF) were held:

1. Urban Area (Valley of Mexico). December 7, 2017. The workshop was held in Delegación Gustavo A. Madero, Mexico City. Participants included local leaders, civil society leaders, academics, researchers, users, neighbors, state and federal government officials.

2. Rural area (Cutzamala sub-basins). December 8, 2017. Participants included local leaders; Mazahua (Indigenous people present in the intervention area), civil society leaders, academics, researchers, users, neighbors, state and federal government officials.

While the Project is not expected to have a negative impact, the Mazahua requested that the government; (i) strengthen citizen participation mechanisms and mainstream communication and outreach efforts to indigenous communities (ii) allocate the equivalent of 5 percent of the total cost of works and infrastructure for the implementation of infrastructure and community services, and (iii) ensure the continuation of the integrated basin management.

Finally, the IPPF includes documentation summarizing the consultation process, results and how issues raised by the Indigenous Peoples leaders who have been consulted were addressed in the IPPF. The IPPF was disclosed at the Bank's and the client's websites on January 15, 2018.

Involuntary Resettlement OP/BP 4.12

Yes

No land acquisition or involuntarily resettlement is anticipated to occur in the implementation of the Project. The Project will be implemented on government owned land. Nevertheless, OP/BP4.12, Involuntary Resettlement, is triggered as a precautionary measure in the event of land acquisition and resettlement needs. A Resettlement Policy Framework (RPF) was prepared by the client to comply with the OP4.12 in the unlikely event of any possible involuntary resettlement or land acquisition necessitated by Project activities. Component 1 relates to the improvement of equipment for the monitoring of diverse operating conditions as well as to improve security conditions of the Cutzamala System. The Social Assessment concluded that there will not be risks or potential



impacts of land acquisition or involuntarily resettlement identified due to both activities described above will be carried out on government owned land.

Component 2 will pilot the managed recharge of local aquifers through the use of wells to inject tertiary treated wastewater. To mitigate the risk of possible downstream resettlement impacts which could result from the implementation of recommendations from technical studies financed under this Component, all TORs for the studies financed will include: (i) an analysis of the potential downstream effects; (ii) the identification of existing risks, if any; and (iii) development and implementation of the Resettlement Plan.

A consultation for the RPF was carried out on December 7th and 8th, 2017, without comments or objections to the presented RPF. All the questions and answers have been included in a consultation report for the various safeguard instruments. The RPF was disclosed at the Bank's and the client's websites on January 15, 2018.

The Cutzamala System involves the operation of eight dams, and several of the activities to be developed are directly related to them.

Sub-component 1.1 will finance the instrumentation of the eight dams that make up the Cutzamala System including dam safety monitoring instruments.

Sub-component 1.2 will finance civil works and electro-mechanical equipment for the rehabilitation and safety improvement of dams that form part of the Cutzamala System; and the development of emergency preparedness plans and upgrading of the operation & maintenance plans for the Cutzamala System dams.

There is a National Dam Safety Plan. CONAGUA has procedures in place for monitoring the physical status of the dams, with defined mechanisms applicable to the dams involved in the Cutzamala System, based on Mexican NMX dam safety regulatory standards (2015).

CONAGUA presented a summary of the existing procedures for the assessment of the safety of dams, and the reports on the evaluations carried out in each of the eight dams of the Cutzamala System.

Safety of Dams OP/BP 4.37

Yes





Some critical dam safety issues have not yet been sufficiently captured by CONAGUA’s dam safety assessment, and the dam safety assessment procedure / management capacity of CONAGUA needs to be strengthened.

CONAGUA has agreed to undertake more comprehensive risk-based dam safety assessment for the eight dams in the Cutzamala system as pilots during the first two years of Project implementation and enhance its capacity to better comply with the new national dam safety regulations.

The risk-based dam safety assessment and required remedial measures of the dams covering both structural and non-structural aspects will be reviewed by independent dam safety review panel. The terms of reference and composition / qualification of the panelists will be subject to Bank’s review.

Projects on International Waterways OP/BP 7.50	No	OP 7.50 is not triggered as the proposed project will not finance activities involving the use or potential pollution of international waterways.
Projects in Disputed Areas OP/BP 7.60	No	OP 7.60 is not triggered as the proposed project will not finance activities in disputed areas as defined in the policy.

**KEY SAFEGUARD POLICY ISSUES AND THEIR MANAGEMENT**

**A. Summary of Key Safeguard Issues**

1. Describe any safeguard issues and impacts associated with the proposed project. Identify and describe any potential large scale, significant and/or irreversible impacts:

**Environmental**

As a result of the development of the activities and works proposed in the project, the occurrence of large-scale, significant or irreversible environmental impacts are not expected. CONAGUA has developed an ESMF that will reinforce the environmental management of the project to further reduce the possible environmental impacts detected.

**Social**

The borrower developed a Social Assessment. The analysis concluded, that (i) no potential indirect and/or long term impacts have been identified due to activities in the project area; (ii) no negative effects are expected on the indigenous peoples in the implementation of the project; (iii) the amount of water that will be sent to Mexico City will not be increased; and (iv) the safety of nearby communities will be improved (accidents originating in open canals will be mitigated). Nevertheless, an IPPF was prepared by the client. The IPPF establishes guidelines for indigenous and local communities.



The project will be implemented on government owned land. Consequently, no activities are foreseen to necessitate involuntary land acquisition. Nevertheless, a Resettlement Policy Framework was prepared by the client.

#### Dam Safety

CONAGUA has undertaken dam safety assessment of eight Cutzamala System Dams and shared with the Bank. Some critical dam safety issues have not been sufficiently captured by these reports. Given more strategic and intensive use of some storage dams, such as Villa Victoria Dam to be connected with the water treatment plant by two-way pressurized water conveyance system, the safety and sustainability of the storage dams would be more critical under the project. Also, the dam safety assessment and management capacity needs to be enhanced in line with the 2015 Mexican dam safety regulations. The emergency preparedness plans and operation & maintenance plans will be prepared based on proper dam safety risk and downstream consequence assessment given their high hazard of downstream areas.

2. Describe any potential indirect and/or long term impacts due to anticipated future activities in the project area:  
No indirect or long term negative impacts are foreseen due to anticipated future activities in the project area.

3. Describe any project alternatives (if relevant) considered to help avoid or minimize adverse impacts.  
Alternatives are to be assessed during implementation.

4. Describe measures taken by the borrower to address safeguard policy issues. Provide an assessment of borrower capacity to plan and implement the measures described.

#### Social

The Social Assessment highlighted (i) the need to strengthen citizen participation mechanisms and mainstream communication and outreach efforts to indigenous communities; and (ii) the request to allocate the equivalent of 5 percent of the total investment costs for infrastructure works to the affected ejidos; the negotiation of this 5 percent will be determined under customary uses, and it will be the Communal Assemblies (Asamblea Comunal) that determine the actions that will be carried out. In the unlikely event of any possible involuntary resettlement or land acquisition originated by project activities a RPF was prepared by the client.

#### Environmental

CONAGUA has prepared, consulted and disseminated an ESMF that includes an evaluation procedure to identify, evaluate and manage potential environmental impacts and risks. The ESMF identifies the environmental requirements that must be met and that will be included in all bidding documents and contracts. The bidding documents and works contracts will include compliance with applicable Mexican laws and regulations, the World Bank's safeguard policies and the implementation of basic good environmental practices. The ESMF includes: screening of potential subprojects for environmental risks and impacts; carrying out a required environmental assessment to obtain regulatory authorization for the respective subprojects; and implementing necessary mitigation and monitoring measures.

#### Dam Safety

CONAGUA will undertake a more comprehensive risk-based dam safety assessment as per the 2015 Mexican dam safety regulations for eight Cutzamala System Dams as pilots through which CONAGUA would enhance its capacity to better comply with the new dam safety regulations across the country. CONAGUA has agreed to establish an independent dam safety review panel whose terms of reference and composition/qualification of panelists are subject to Bank's review. CONAGUA has also agreed to prepare / upgrade the operation & maintenance plans and emergency preparedness plans for the dams based on proper safety risk and downstream hazard assessments.



5. Identify the key stakeholders and describe the mechanisms for consultation and disclosure on safeguard policies, with an emphasis on potentially affected people.

Two consultations were held:

1. Urban Area (Valley of Mexico). December 7, 2017. The consultation was held in Delegación Gustavo A. Madero, Mexico City. Participants included stakeholders from civil society, local leaders, academics, researchers, users, neighbors, state and federal government officials.

2. Rural area (Cutzamala). A second consultation was held on December 8, 2017, with stakeholders and leaders, Mazahua (Indigenous people present in the intervention area), civil society leaders, academics, researchers, users, neighbors, state and federal government officials.

Feedback obtained during the consultations focused on Mazahua requests to national government to (i) strengthen citizen participation mechanisms and mainstream communication and outreach efforts to indigenous communities; (ii) allocate the equivalent of 5 percent of the total cost of works and infrastructure for the implementation of infrastructure and community services; and (iii) ensure the continuation of the integrated basin management. The feedback received through this consultation process was summarized and incorporated in each safeguard document as appropriate.

**B. Disclosure Requirements**

**Environmental Assessment/Audit/Management Plan/Other**

Date of receipt by the Bank  08-Jan-2018	Date of submission for disclosure  15-Jan-2018	For category A projects, date of distributing the Executive Summary of the EA to the Executive Directors
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**"In country" Disclosure**

Mexico  
15-Jan-2018  
  
Comments

**Resettlement Action Plan/Framework/Policy Process**

Date of receipt by the Bank  08-Jan-2018	Date of submission for disclosure  15-Jan-2018
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**"In country" Disclosure**

Mexico  
15-Jan-2018  
  
Comments



**Indigenous Peoples Development Plan/Framework**

Date of receipt by the Bank

08-Jan-2018

Date of submission for disclosure

15-Jan-2018

**"In country" Disclosure**

Mexico

15-Jan-2018

Comments

**C. Compliance Monitoring Indicators at the Corporate Level (to be filled in when the ISDS is finalized by the project decision meeting)**

**OP/BP/GP 4.01 - Environment Assessment**

Does the project require a stand-alone EA (including EMP) report?

No

**OP/BP 4.04 - Natural Habitats**

Would the project result in any significant conversion or degradation of critical natural habitats?

No

If the project would result in significant conversion or degradation of other (non-critical) natural habitats, does the project include mitigation measures acceptable to the Bank?

NA

**OP/BP 4.11 - Physical Cultural Resources**

Does the EA include adequate measures related to cultural property?

Yes

Does the credit/loan incorporate mechanisms to mitigate the potential adverse impacts on cultural property?

Yes

**OP/BP 4.10 - Indigenous Peoples**

Has a separate Indigenous Peoples Plan/Planning Framework (as appropriate) been prepared in consultation with affected Indigenous Peoples?

Yes

If yes, then did the Regional unit responsible for safeguards or Practice Manager review the plan?



Yes

If the whole project is designed to benefit IP, has the design been reviewed and approved by the Regional Social Development Unit or Practice Manager?

NA

#### **OP/BP 4.12 - Involuntary Resettlement**

Has a resettlement plan/abbreviated plan/policy framework/process framework (as appropriate) been prepared?

Yes

If yes, then did the Regional unit responsible for safeguards or Practice Manager review the plan?

Yes

#### **OP/BP 4.37 - Safety of Dams**

Have dam safety plans been prepared?

No

Have the TORs as well as composition for the independent Panel of Experts (POE) been reviewed and approved by the Bank?

No

Has an Emergency Preparedness Plan (EPP) been prepared and arrangements been made for public awareness and training?

No

#### **The World Bank Policy on Disclosure of Information**

Have relevant safeguard policies documents been sent to the World Bank for disclosure?

Yes

Have relevant documents been disclosed in-country in a public place in a form and language that are understandable and accessible to project-affected groups and local NGOs?

Yes



### All Safeguard Policies

Have satisfactory calendar, budget and clear institutional responsibilities been prepared for the implementation of measures related to safeguard policies?

Yes

Have costs related to safeguard policy measures been included in the project cost?

Yes

Does the Monitoring and Evaluation system of the project include the monitoring of safeguard impacts and measures related to safeguard policies?

Yes

Have satisfactory implementation arrangements been agreed with the borrower and the same been adequately reflected in the project legal documents?

Yes

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**Approved By**

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Country Director:	Jutta Ursula Kern	18-Jan-2018

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