Water Fund Feasibility Decision Support Document

Mexico City, Mexico
21 August 2017

Prepared for:
Latin American Water Fund Partnership

Prepared by:
anteagroup
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This Decision Support Document uses the results from the Feasibility Situation Analysis executed in June 2017 to inform the decision whether to move forward with the design of a Water Fund for Mexico City.

The methodology used to make the Go/No-Go decision was to identify problems for each relevant dimension of water security, their magnitude and how a Water Fund could help mitigate and resolve the problems.

The Feasibility Situation Analysis Report provides a greater level of detail about the current state of water security challenges in Mexico City and should be referred to for additional information.

The Strategic Plan will provide details on the Water Fund’s strategic direction and goals, and how the fund will address each problem.
1.0 EXECUTIVE SUMMARY

Based on Mexico City’s identified water security problems and the potential for a Water Fund to mitigate and resolve the problems, the recommendation is to proceed with the design of a Water Fund. A Mexico City Water Fund can have a positive impact on all Water Security Dimensions by generating the necessary interest from stakeholders, influencing public policy and water governance, and ultimately, unlocking the potential to create significant impacts.

In a general sense, a Mexico City Water Fund can contribute by:

- Closing important and relevant evidence gaps – conducting and aggregating scientific studies to provide actionable insights.
- Positively influencing water-related governance and decision making – to help create systematic change, bring new decision-making structures (e.g., provide credible ‘cases for investment’, serving as a ‘social witness’, etc.).
- Encouraging and driving implementation of natural infrastructure projects – which could include implementation and providing financial or other support for such projects.
- Convening stakeholders to enable meaningful and positive impact on scale – bringing together existing and new participants in an ongoing, structured, and robust dialog that builds consensus and drives positive collaborative action.

Water Security is defined broadly with this description and diagram:
## 2.0 GO/NO-GO RECOMMENDATION

### 2.1 Recommendation

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Proceed with the next Phase (Design) to establish a Water Fund for Mexico City.</th>
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</table>

**Physical Setting and Scope Considerations**

The water resource situation associated with Mexico City is complex. While the main area of focus is the Valle de México Basin, activities within this watershed are interrelated and include flows and discharges from other administrative and hydrogeological areas. Therefore, the Water Fund will address problems that impact the following relevant areas: Mexico City, its Metropolitan Area, Hydrologic Unit XIII, and Other External Source/Discharge Areas (e.g., transfers from other hydrologic units such as the Cutzamala and Lerma System).

See Section 2.1 of the Situation Analysis for more information about each hydrologic area and Appendix 1, Figures 1-8 for detailed graphic representations. See Section 2.4 of the Situation Analysis for the detailed Water Balance.

**Arguments**

The region of the Valle de México is extremely water-scarce and faces significant challenges in all dimensions of water security. Specifically, the primary challenges identified include:

**Domestic Water Security Problems**
- There is a lack of piped potable water supply to some residents of Mexico City and sanitation services are slow to come to areas of the City.
- Improved sanitation is necessary to improve hygiene and quality of life for the City.

**Economic Water Security Problems**
- The sanitation of water used for agriculture outside Mexico City in the Tula Valley (untreated effluents) poses a problem with hygiene and the health of the population.
• Water use driven by increased population and public-urban uses is higher than the sustainable water supply at this time.

**Urban Water Security Problems**
• Lack of effective storm water and wastewater infrastructure and management increases pollution and contamination of water within the City.
• High amounts of non-revenue water contribute to increased costs and water waste.

**Environmental Water Management Problems**
• Groundwater depletion due to over-exploitation of the Mexico City Aquifer.
• Land use changes affect the quality and quantity of surface water and groundwater recharge.
• Untreated wastewater discharge to environment.

**Resilience to Water-Related Natural Problems**
• The City suffers a serious subsidence problem as consequence of the excessive withdrawal of groundwater.
• The inability of the sewerage system to quickly pump out all the water during the rainy season increases the flooding risk.

While there are some existing initiatives underway (see Section 3.3 of the Situation Analysis), including the CDMX Resilience Strategy, there is not a single entity serving to bring relevant stakeholders to the table to enable meaningful and positive impacts on scale to address these problems in a coordinated fashion. A Water Fund would serve this important function as well as closing evidence gaps, positively influencing water-related governance and decision-making, driving implementation of natural infrastructure projects and convening stakeholders to enable impact on scale. The potential contributions/interventions identified in Section 2.0 and detailed in the Strategic Plan, clearly show that a Water Fund could have a positive impact on Water Security.

In addition, the Stakeholder Map, which is detailed in the Situation Analysis Document, shows that stakeholders are interested, have influence, and are willing to work with a Water Fund to help to improve Water Security for Mexico City. Evidence of this is the support for the creation of a Water Fund as part of the CDMX Resilience Strategy to promote sustainable use of the aquifer and contribute to water security planning.

See Section 3.0 below for data and details about the magnitude of these water security problems and potential Water Fund contributions/interventions to mitigate their negative impacts.

**Assumptions**

The following primary assumptions underlay the recommendation:
• Data from CONAGUA and SACMEX is sufficiently accurate and up to date.
• The estimates in the Situation Analysis Report are at least within the proper order of magnitude or present an under-estimate of the deficit with regards to the non-revenue water and the affected recharge area.
### SWOT Analysis

#### STRENGTHS

1. The Water Fund can have a meaningful impact – addressing an annual shortfall of 783 million m³.
2. The potential areas of intervention are mostly within the scope of a Water Funds’ operation, notably by:
   a. Closing important and relevant evidence gaps – conducting and aggregating scientific studies to provide actionable insights.
   b. Positively influencing water-related governance and decision making – to help create systematic change, bring new decision-making structures (e.g., provide credible ‘cases for investment’, serving as a ‘social witness’, etc.).
   c. Encouraging and driving implementation of natural infrastructure projects – which could include implementation and providing financial or other support for such projects.
   d. Convening stakeholders to enable meaningful and positive impact on scale – bringing together existing and new participants in an ongoing, structured, and robust dialog that builds consensus and drives positive collaborative action.
3. The Water Fund’s potential contributions could affect all dimensions of water security, increasing the chances of success.
4. The Water Fund currently has a director who has initiated the stakeholder engagement process.

#### WEAKNESSES

1. The stakeholder landscape is fragmented with multiple municipal and state authorities governing the areas of potential intervention. Some existing interventions, policies, and plans are already being implemented by some actors, but lack synergy and coordination.
2. The problems are very large and complex – addressing the entire water security situation with all its dimensions could overwhelm any single organization.

#### OPPORTUNITIES

1. Sanitation and access to clean drinking water aligned with the United Nation’s Sustainable Development Goals (SDG) attracting a great deal of attention from corporations, multilateral funding organizations and NGOs. Other SDG’s are likely to be benefitted by the Water Funds actions.
2. The current level of non-revenue water is at the higher end of the world average range and a significant reduction is economically viable.
3. The subsidence issue is well-known and well-publicized in Mexico City. Costs associated with subsidence are great and a reduction in further subsidence has a definite pay-back.
4. Reduction in consumption has an immediate pay-back in the avoidance of investments. The ‘low hanging fruits’ would be to address the perverse incentives for over-consumption currently in place (among others; the definition of fees is not based on the cost of the service, consumption ranges in the tariff structure are not related to the consumption pattern, tariffs defined for users without meters are generally higher than those defined for users with meters, no penalties for non-payment, discounts for payment of overdue accounts, poor quality of service does not exempt operators from receiving government transfers, and investments are not accounted for in the assets and the relevant depreciation is not recorded).
5. Mexico City’s history as a system of lakes and the continued need for water removal to keep the City dry points to a green infrastructure set of solutions where the water is stored (in ‘new’ lakes or the aquifer) for later use.
6. Mexico City’s problem is not unique, several large cities in the world are facing and addressing similar issues of over-abstraction of groundwater and the consequent subsidence (e.g., Jakarta, Ho Chi Minh City, Bangkok, and Tokyo). Knowledge-sharing and adoption of best practices offer less costly alternatives to inventing new solutions independently.
7. New technology (like the European Space Agency’s Sentinel-1) provides detailed monitoring of subsidence allowing for focuses attention to priority areas (for action) within the City.
8. The most important recharge area for the Mexico City aquifers has already been set aside with a certain degree of formal protection. Further formalization and enforcement of that protection (and supported by incentives for conservation) represent a significant opportunity to further protect the groundwater recharge zones.

#### THREATS

1. Corruption, non-enforcement, and graft could become considerations worth watching, particularly when dealing with licensing and permitting-related issues.
2. Considering the complexity of the challenges in Mexico City the potential for distraction will be great. It is essential that the Design Phase clearly outlines the areas of intervention and focus.
3. Acquired rights by minorities (e.g., squatters, legal or illegal) seem to trump the interests of the majority of inhabitants in the case of protection of recharge areas.
### 2.3 Conditions

To address the aforementioned weaknesses and threats the Water Fund’s Design Phase needs to consider the conditions below to ensure the Water Fund remains feasible and sustainable.

<table>
<thead>
<tr>
<th>Conditions</th>
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<tbody>
<tr>
<td>1. The Water Fund needs to put in place an effective continuing stakeholder engagement program to ensure the various stakeholders remain aligned with the Water Fund’s mission, goals, and objectives.</td>
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<td>2. The Water Fund needs to have a sound anti-corruption policy to maintain credibility and effectiveness.</td>
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<td>3. Upon the creation of the Water Fund, sustainable sources of funding must be sought to ensure the long-term success of the Fund.</td>
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<td>4. Some of the assumptions in this analysis will need to be verified to withstand scrutiny by experts and academia. Such verification should only be done if and when necessary (e.g., when decisions are required, for publication or dissemination). We recommend the following studies per category:</td>
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<tr>
<td>a. Optimum intervention portfolio</td>
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<tr>
<td>- Perform a Robust Decision Making Model Analysis to decide on the most optimal portfolio of solutions</td>
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<td>- Additional supporting studies to be determined using the science governance process for the Design Phase, to provide crucial data for further decisions. Common sense and re-use of existing studies will always be preferable over new and expensive studies. Some examples could be:</td>
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<tr>
<td>- Hydrogeological study to define: the effects of the depletion of the groundwater on the aquifer structure, recharge potential (compilation and analysis of groundwater recharge models), baseline of groundwater behavior, aquifer vulnerability, groundwater-surface water dynamics, and identify areas with high potential for artificial recharge of aquifers and their feasibility;</td>
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<tr>
<td>- Study to understand the impact of urban green infrastructure in absorbing and reducing peak flow of storm water and increasing water quality, and where it could be implemented;</td>
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<tr>
<td>- Risk impact assessment of water quality, and benefits of green infrastructure preventing water pollution;</td>
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<tr>
<td>- Assessment of the profitability of conservation in recharge areas.</td>
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</table>
b. Mechanisms for influencing public policy
   ▪ Monetization of the effects of domestic water security problem elements, including additional work on:
      - Business case for SACMEX on the cost of reducing non-revenue water as compared to transferring additional water;
      - Economic impact of maintaining and improve hydrological services;
      - Industrial/commercial production at risk;
      - Financial impacts of flooding and other water-related disasters would be crucial to the development of the Water Fund.
      The above includes the cost of no action.
   ▪ Treated wastewater study, including:
      - Effects of untreated water in agricultural activities (water quality);
      - Identify industries/activities who may change from first-use water use to treated wastewater.
   ▪ Data collection on: disaster prevention strategy, mitigation measures planned, adequacy of planned mitigation.

5. Stakeholder Engagement – from very early on – with the City’s Civil Engineering and Water Engineering Community will be vitally important to ensure the focus on grey infrastructure does not become an obstacle to other solutions.
### 3.0 PROBLEM STATEMENTS, MAGNITUDE AND POTENTIAL WATER FUND CONTRIBUTIONS/INTERVENTIONS

Considering the identified problems below and their magnitude, the establishment of a Water Fund will contribute by closing evidence gaps, influencing decision-making, supporting/providing green projects and bringing new stakeholders to the table to have impact on scale. The formation of a Water Fund will positively impact all dimensions of water security.

#### 3.1 Problem 1 – Over-exploitation and Subsidence

<table>
<thead>
<tr>
<th>PROBLEM 1</th>
<th>Water Security Dimension</th>
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<tbody>
<tr>
<td>Over-exploitation (current water demands exceed the amount of renewable water generated) of the aquifers and land use changes in and around Mexico City have caused an ongoing land subsidence problem, which causes physical damage to urban infrastructure and the aquifer.</td>
<td>![ ] ![ ] ![ ]</td>
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</table>

**MAGNITUDE OF PROBLEM**

- Groundwater is over-allocated by 783 million m³ per annum.
- Subsidence has lowered the City Center Area by as much as 9 meters, it exacerbates the flood-prone conditions in the City and has damaged the infrastructure (water and sewer lines, as well as the metro system) (CDMX, 2016).
- To supply the City with the current shortfall volume, allowing aquifer recovery and sustainable use, would cost between MXN$ 2.36/m³ and MXN$ 10.86/m³, with full implementation totaling an investment of almost MXN$ 4,000 million.
- Total loss of infiltration per year, due to land use change, can be up to 1 to 2 million m³, calculated by the difference between infiltration rates of pristine and non-pristine land use times the area lost.
- The degree of water stress in Mexico City is 234.8% (SEMARNAT, 2013). Any value above 100% is considered a very strong degree of water stress.
- The 783 million m³ over-allocation represents a monetary value to business of MXN$ 27,800 billion. Industrial and commercial sectors in Mexico City contribute 33.2% of Mexico’s total GDP.

See the Situation Analysis for additional information on the magnitude of this problem. Also see the Magnitude Sections of the other problems in this document because they are related and overlap.

**POTENTIAL WATER FUND CONTRIBUTIONS / INTERVENTIONS**

- Implement conservation and restoration projects and raise awareness directed to maintain and/or increase groundwater recharge in urban and other areas (includes policies).
- Promote water-use efficiency along with water/wastewater reuse in all sectors (residential, business, agriculture, institutions) and policies to safeguard recovered volumes.
- Monetize: 1) cost of subsidence and provide cases for investment of various remedies; and 2) comparison of preserving watershed health vs. inter-basin transfer.
- Improve water management practices to promote conservation (use measurement and reporting, fee collection, losses, incentives, pricing, etc.).
- Help to provide a ‘leak reporting app’ to the people of Mexico City.
- Activities and awareness directed to maintain and/or increase groundwater recharge, for example, increase supply by creating small-scale recharge areas throughout the City.
- Reduce demand through public campaigning, educational programs at all levels, providing incentives, water reduction clubs for small and medium-sized enterprises, water recycling schemes, promoting water reuse and water-use efficiency, etc.
- Specific conservation, restoration, and efficiency interventions could include:
  - Agricultural best management practices (BMPs).
  - Wetland restoration and creation.
  - Targeted land protection (includes forest, grasslands, paramo/punas ecosystems protection).
  - Revegetation.
  - Riparian restoration to address water quality (reduce nutrients and sediments).
  - Ranching BMPs.
  - Road management.
  - Fire risk management.
  - Create small recharge areas throughout the City to absorb excess water.
  - Help to identify and set aside (with an appropriate compensation scheme) areas of high flooding occurrence and allowing these areas to return to their previous state (e.g., lakes).
  - Advocate for mandatory permeabilization of large-paved surfaces.
  - Encourage the replacement, where possible, of storm water drains with wadis (taking into account mosquito-related health risks).
- Support modifications to gray infrastructure that maximizes the reuse of rainwater and/or storage in the aquifer or lake.

<table>
<thead>
<tr>
<th>Category</th>
<th>Close Evidence Gap</th>
<th>Influence Decision-Making</th>
<th>Implementing / Supporting Green Projects</th>
<th>Bringing New Stakeholders</th>
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### Problem 2 – High Non-Revenue Water

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<tr>
<th>PROBLEM 2</th>
<th>High amounts of non-revenue water and poor management contribute to increased costs and water waste.</th>
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</table>

#### MAGNITUDE OF PROBLEM

- SACMEX acknowledges that estimates of water losses through leakage in the ZMVM Water Network varies widely. The non-revenue water (leaks, not measured, used illegally, and other losses) is estimated at 41% (SACMEX, 2016). The amount of unaccounted water lost due to leaks within the distribution system is generally estimated as 15% as a rule-of-thumb in the absence of better data. The rate of fee collection is estimated as 77%, which means that 1 in every 4 bills goes unpaid.
- Collection of fees for water usage poses a large challenge in Mexico City. The water supplier often does not have the ability to distribute a bill for services and instead, invoices are generated once per year. This does not allow the user to track its water usage on a monthly or quarterly basis, resulting in lack of awareness on how much water is used. Late payments are not discouraged, as the water service is not cut off due to late payment and discounts are often offered for people who pay late as an incentive to collect any revenue. This often results in deliberate late payment.
- The current financial structure offers few incentives for water supply companies to be more efficient. Suppliers are not required to meet performance levels and government money transfers are not contingent on the quality of the service.
- Water use rights and tax resource transfers collection mechanisms are not transparent. Water use rights are paid with resources from the municipality and payment is done directly between the City Council and the National Water Commission (CONAGUA) bypassing the water supplier. Tax resource transfers are often not registered in the operators’ records. For example, investments are not accounted for in the assets and there is no record of the value of the infrastructure and therefore the relevant depreciation is not recorded (Banco Mundial, 2013).

See the Situation Analysis for additional information on the magnitude of this problem. Also see the Magnitude Sections of the other problems in this document because they are related and overlap.

#### POTENTIAL WATER FUND CONTRIBUTIONS / INTERVENTIONS

- Engage with relevant utilities and governing bodies to demonstrate the effective management, pricing system, and structure.
- Advocating for mandatory metering.
- Improve administration and management practices to better measure and report use, activate corrective actions, and receive payments (create right incentives).
- Monetize costs of subsidence and provide cases for investment of various remedies to attract donors to invest in improved treatment.
- Set up an exchange with other mega-cities with similar problems and exchange best practices.
- Work with the relevant authorities and the water utility, identify pilot program areas for improvement actions or engage experts (e.g., through international development cooperation initiatives) to assess infrastructure solutions.
- Help to provide a 'leak reporting app' to the people of Mexico City.
- Help to pay for a pilot repair team and incentivize appropriately for results, scaling-up deployment of successful results.
- Facilitate workshops with relevant utilities and governing bodies introducing models to demonstrate the effects of metering and helping utilities understand savings potential/ways to recover lost revenues.
- Help to improve decisions by advocating for tariffs reflecting real costs.

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### 3.3 Problem 3 - Flooding

**PROBLEM 3**

Lack of effective feeders (secondary) to primary storm water infrastructure leads to flooding within the City during the rainy season.

<table>
<thead>
<tr>
<th>MAGNITUDE OF PROBLEM</th>
<th>POTENTIAL WATER FUND CONTRIBUTIONS / INTERVENTIONS</th>
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<tbody>
<tr>
<td>▪ The floods in Mexico City are accentuated by the difference in levels between some parts of the City and the Great Canal, as well as the inability of the sewerage system to quickly pump out all the water during the rainy season and solid waste clogging secondary feeders.</td>
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<tr>
<td>▪ These factors increase the potential for flooding events and their severity and the resulting economic and social impacts. For example, the Benito Juárez International Airport generates an economic value of MXN$ 78,170 million per year (Oxford Economics, 2011). One day of operation lost at the airport due to flooding would equate to a loss of MXN$ 213 million.</td>
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<tr>
<td>See the Situation Analysis for additional information on the magnitude of this problem. Also see the Magnitude Sections of the other problems in this document because they are related and overlap.</td>
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<tr>
<td>▪ Study to determine if urban green infrastructure can have a positive impact on flooding.</td>
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<td>▪ Create awareness and implement education programs especially with regard to improper solid waste disposal and its impact on clogging secondary feeders.</td>
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<td>▪ Drive implementation of natural urban infrastructure and master plan to reduce and regulate flows during peak precipitation events (based on a Water Fund Master Plan).</td>
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<td>▪ Study the financial impacts of flooding in the Design Phase to create a sense of awareness and urgency to mitigate flooding.</td>
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<th>Water Security Dimension</th>
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<tr>
<th>Water Funds Support Category</th>
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<tr>
<td>Close Evidence Gap</td>
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<tr>
<td>Influence Decision Making</td>
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<tr>
<td>Implementing / Supporting Green Projects</td>
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<tr>
<td>Bringing New Stakeholders</td>
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### Problem 4 – Insufficient Water Delivery and Sanitation

**Problem 4**  
The water delivery and sanitation networks are insufficient to serve all residents of Mexico City.

<table>
<thead>
<tr>
<th>MAGNITUDE OF PROBLEM</th>
<th>POTENTIAL WATER FUND CONTRIBUTIONS / INTERVENTIONS</th>
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</table>
| • There are approximately 23 million people in the Valle de México and about 8.4% of this population (~1.93 million people) have no access to service and purchase water from private sellers (OECD, 2015) who distribute it in tanks. This resource deprived population pays on average MXN $142/m³ (about 14 times more than what users connected to the service pay). Assuming 20 liters daily use per person this amounts to MXN $1,634 million per year loss of purchasing power for this group.  
• About 70% of the City has fewer than 12 hours of running water per day. About 18% of the population lives in the hardest hit areas that have to wait several days for just an hour or two of supply (Salcedo, 2015). The situation gets worse in periods of drought.  
• 82% of those with daily water supply rely on storage systems or water tanks, and 18% of the population does not have daily water access (SACMEX, 2016).  
• The pipa water delivery network is very unreliable and disruptive to life in services areas. Sometimes the pipa drivers will push families against each other to benefit from who will pay more for its services. Women are often forced to wait at home for their water delivery, meaning that they are unable to work (Kimmelman, 2017).  
• Iztapalapa’s development was largely unplanned and about 1.8 million (mostly poor) people have moved to the area over the past four decades with the infrastructure being slowly built around them. The groundwater from shallow wells and boreholes in the area is polluted with magnesium, nitrogen, sodium, iron, and hydrogen sulfide and required treatment before use for human consumption (Salcedo, 2015).  
• The outlying areas of the City are the most vulnerable and often lag in gaining access to sanitation services. Wastewater is collected, but the majority of it is not treated. In areas where wastewater is discharged, there is a high level of ammonium nitrate contamination. The areas of Iztapalapa, Tláhuac and Gustavo A. Madero show levels of ammonium nitrate in the water in excess of 1 mg/l (SACMEX, 2016).  
• Lack of access to a drainage network deteriorates quality of life. A property with connection to the public drainage network has a 30% added value. The average value of a home without a drainage system is estimated at MXN $250,000 (US $14,000), therefore the added value of a connection to the network is MXN $108,226 (US $6,000) (Banco Mundial, 2013).  
• The Valle de México generates 2,684 million m³ of wastewater (84 m³/s), of which Mexico City contributes 347 million m³ (11 m³/s) (CONAGUA, 2013). About 36% of wastewater is discharged without any treatment, further polluting the rivers that transfer effluent away from the City (SACMEX, 2016).  
• The Atotonilco Wastewater Treatment Plant will treat more than 60% of the wastewater that is discharged to the agricultural areas in the Valley of Mezquital and the Valley of Tula in Hidalgo. This plant is in the final stages of construction and is expected to start operations in late 2017 (CONAGUA, SEMARNAT, 2017). | • Study the current financial situation associated with domestic supply and sanitation issues:  
– Define affected stakeholders and the impacts (financial-economic, social, health) on each;  
– Monetize the impacts of water supply and sanitation problems;  
– Use data to define most appropriate sources of funding, create a sense of urgency and justify investment.  
• Influence administration and management practices to collect appropriate water fees, which can be used to enhance water and wastewater services.  
• Encourage and/or implement green infrastructure interventions (e.g., polishing wetlands for wastewater treatment).  
• Bring stakeholders together to bridge the gap and drive towards a private-public solution through an action plan. |

<table>
<thead>
<tr>
<th>Water Funds Support Category</th>
<th>Core Evidence Gap</th>
<th>Influence Decision-Making</th>
<th>Implementing / Supporting Green Projects</th>
<th>Bringing New Stakeholders</th>
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See the Situation Analysis for additional information on the magnitude of this problem. Also see the Magnitude Sections of the other problems in this document because they are related and overlap.
### Problem 5 – Untreated Wastewater

<table>
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<tr>
<th>PROBLEM 5</th>
<th>POTENTIAL WATER FUND CONTRIBUTIONS / INTERVENTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated wastewater poses hygiene and health risks within Mexico City and areas where effluent is received.</td>
<td><strong>Water Security Dimension</strong></td>
</tr>
</tbody>
</table>

**MAGNITUDE OF PROBLEM**

- Globally, the Metropolitan Area of Mexico City is by far the largest single producer of wastewater that is used for agricultural purposes. The use of untreated wastewater for irrigation severely impacts the health of producers and consumers of crops (sorghum, barley, oat, wheat, corn, tomatoes, carrots, onions, and coriander). Otherwise a semi-arid region, the valley has become an important agricultural area by using untreated wastewater, with 110,000 ha of official and unofficial irrigated area, and more than 50,000 water users in the different irrigation districts. The wastewater mostly travels by deep drainage to the Tula River. A proposal to partially solve the City’s water treatment issue is the completion of a new Water Treatment Plant called the Atotonilco Plant, due in 2017. The proposed Wastewater Treatment Plant will have 35 m$^3$/s of capacity and will treat more than 60% of the wastewater produced in the Valle de México (SEMARNAT, 2011).

- Research shows that Mexico City ranks first in the world for gastrointestinal infections caused by water consumption, mostly due to pipe leaks that cause bacteria contamination. Morbidity rates for Ascaris lumbricoides in children between zero and four years; and Entamoeba histolytica for individuals between five and 14 years have increased from 2.7 to 15.3 per thousand children and from 12.0 to 16.4 per thousand respectively where wastewater irrigation is being used (Sosa-Rodriguez, 2012).

- Environmental costs of the lack of wastewater treatment are estimated as the value of treating wastewater in the Valle de México. These include infrastructure costs such as the Eastern Discharge Tunnel (TED) (over MXN$ 30,034 million and the Atotonilco plant (MXN$ 10,022 million) among others which are currently under construction. Also the operating costs (2% of the investment value plus MXN$ 1,421 million per year estimated operating cost at the plant). The total equivalent cost is MXN$ 5.70/m$^3$ (US$ 0.49/m$^3$) (Banco Mundial, 2013).

See the Situation Analysis for additional information on the magnitude of this problem. Also see the Magnitude Sections of the other problems in this document because they are related and overlap.

**Water Funds Support Category**

- Create awareness and implement education programs with key stakeholders using reporting and data on impacts.
- Establish and implement a performance and recognition program that includes assessing, reporting and rewarding performance.
- Create a program to encourage the application of innovative treatment and reuse technologies (with an emphasis on natural infrastructure).
- Influence the implementation new and wastewater treatment capacity and improve existing facilities.
- Set-up an exchange with other mega-cities with similar problems and exchange best practices.

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