

# Isla Urbana

## Growth Plan

*Vision 2030*



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# ***Chapter 1: Introduction***

Hola, Isla Urbana!

What you are about to read has had many names along the way: playbook, guide, capstone deliverable, suggestion booklet, how-to-manual. At its core, it is very much all of these things.

Most specifically this is a business-focused growth plan; a consulting guide aimed to help you pivot and grow this business into the larger, more impactful organization we believe it has the potential to become.

Over the past five months we have attempted to immerse ourselves in the world of Isla Urbana, learning all we could about the various social, ecological and economic issues that surround water accessibility and management in Mexico City. Our visit to Pueblo De Santo Tomas Ajusco, showed us the amazing impact you are having on Tlalpan. We were left so humbled and inspired by everything this company has done for communities in Mexico City, we determined that our value here was to provide Isla Urbana with business-oriented tools, recommendations and models that justify (both qualitatively and quantitatively) the level of growth that we know your company is capable of.

We believe that with the tools and recommendations at hand, Isla Urbana will be better equipped to make rainwater for all a reality!

Capstone Spring 2016

# Chapter 2: Executive Summary

## Vision 2030

Kicking off this growth plan with the year 2030 is incredibly symbolic. Simply put, each component of the following manual plays an integral part in growing and molding Isla Urbana into the influential powerhouse it can and should become. So please, strap in tight and hold onto your hats, for an accelerated glimpse into the future...

Vision 2030 focuses on two symbiotic but distinct business approaches. The first approach examines IU's funding strategy to ensure capacity building, while the other delves into IU's internal organization to respond to that expanded funding stream. In brief, these approaches **seek to increase IU's installation capacity and its diversify client-base in order to provide 6% of households in Mexico City, an equivalent of half the number of homes not connected to the central water grid, with rainwater harvesting systems by 2030.**

The decision to focus on a business plan was driven by a temporal analysis of installation capacity, which showed the need to accelerate the pace of installation in order to realize city-scale sustainability benefits through IU's work. The research showed that if IU were able to install systems in the equivalent of 50% of the homes not connected to the central water grid, the outcomes could reduce Mexico City's aquifer drawdown rate by about 2%, as well as satisfy 8% of the city-wide water demand during the rainy season. But at its current capacity, it would take Isla Urbana 157 years to reach this goal. With this in mind, the need for a plan to support IU's business growth took on real meaning.

In order to assist IU's growth and thus achieve the potential sustainability benefits of rainwater harvesting, this document offers a set of tools for the **short, medium** and **long** term.

Stabilizing funding, refining and expanding business structure and increasing installation and service capacity are goals that a clear and concise plan will help realize. The focus on business structure is a means to an end: by 2030, IU will be a recognized leader in rainwater harvesting technology in Mexico City, Mexico as a nation and internationally. The organization will be able to meet the needs of current and past installations while providing excellent customer service before, during and after new installations. Its systems will make a recognized difference in improving the functioning of both water provisioning and overflow water management in Mexico City. And IU will continue to make a positive impact in the lives of Mexico City's marginalized communities.

# **Chapter 3: IU in 2030**

## *Long Term Program Development and Growth Planning*

From its founding through today, Isla Urbana has functioned as a small, nimble, highly responsive organization with dual missions of promoting rainwater harvesting and providing access to water for citizens on the margins of Mexico City's current infrastructure. IU has succeeded in proving the concept of rainwater harvesting as an effective household water security measure in Mexico City. Rainwater harvesting has now been embraced by several government agencies and departments as well as by schools, private clients and those whose systems have provided additional financial stability and reduced household stress.

But with this success comes a need to build for the future. Because of IU's nature as a "kitchen table operation" in which the partners all influence the organization's pattern of growth and development, coming to consensus on streamline plans for growth and expansion will likely take time and effort. Vision 2030 presents a plan for growth, in which the organization could meet the need to install over 147,000 systems over the next 10 years. Achieving this goal would help Mexico City to reach a capacity for harvesting rainwater that will make a difference in both in the lives of its citizens by bolstering water security and reducing the aquifer drawdown rate. This plan was put together with the full realization that small organizations are exposed to the whims of funding and therefore need to jump at opportunities that arise from unexpected sources. The following document offers one way to tie the many advantages and interests of IU together into a package that can address funders, government agencies, and community partners.

### **3.1 Current Opportunities and Challenges**

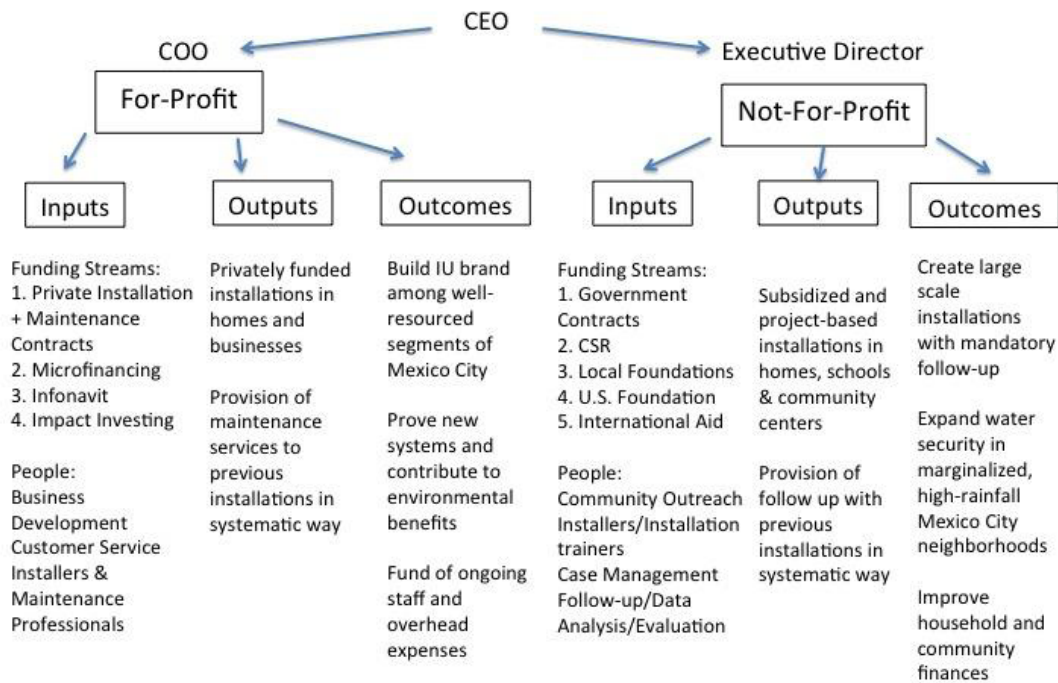
IU is currently experiencing great demand from Mexico City government agencies as well as with the delegation of Tlalpan, where much of the work has been based in the past. While these are exciting and highly visible projects, the nature of contracting with the government is periodic, with uncertainty in payment timelines and susceptibility to different levels of support and continuation with each new election. In order to assure the future of IU, and to build out the functions not directly related to system installation, the following development plan intends to draw on current strengths and available opportunities.

### **3.2 A Growing Business and a Thriving Non-profit**

The diagram depicted below, represents the vision Isla Urbana's organizational structure, in which a diversified client base and funding regime ensures the synergy between the for-profit and not-for-profit sides of IU:



## Business Vision for IU



### Larger Impact

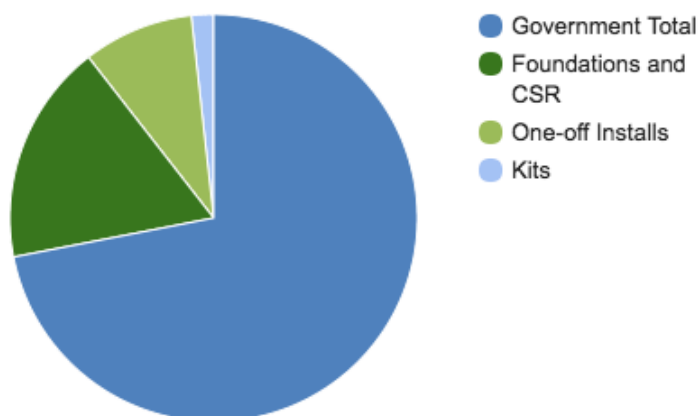
Part of the proposed business expansion plan includes developing data to make the case for accrued impact of household scale RWH. It also includes creating the capacity to design both standard and bespoke RWH installations at all price points, and offering various service contracts that will keep staff plumbers employed and all clients happy. Using better data collection through more intensive client interaction, including interaction created through service contracts, IU will be able to mount research-based, evaluation-tested arguments for its programs and document positive impact on women, education, health, family finances and the environment of the city. This research could be used as a platform to campaign for regulatory intervention requiring rainwater harvesting in appropriate neighborhoods (for instance, to reduce the rate of subsidence through aquifer decline).

### 3.3 Potential for Growth and Financial Diversification

Over the period 2009-2015, Isla Urbana has experienced increases and decreases in growth rate due to the way government funding arrives and must be spent in short periods of time. However, using a metric of installations/week, its growth over this period averages to adding an additional 3.7 installations per week per year. That brings Isla to its current installation capacity of 18 system installations per week. At this rate, it could install almost 40,000 systems by 2030, but this would not bring about the citywide impact that would solidify the case for rainwater harvesting in Mexico City.

The pie-chart below represents our understanding of Isla's current funding breakdown.

2015 IU Budget Breakdown by Funding Source



The reliance on government funding may be vulnerable if this relationship falters in the future. In order to prepare IU to become more financially resilient, a variety of additional funding sources were evaluated. With these proposed sources of funding, Isla will be poised to grow its revenues in significant ways and thus expand its installation capacity at a pace needed to meet the goal of installing over 147,000 systems by 2030 to provide rainwater harvesting to the equivalent of half the unconnected homes in the city.

#### 3.3.1 Short Term

For the short term, the growth plan provides information on what IU would need to do, and which potential partners could be approached to gain additional funding. The goal of this period of growth (between 1 and 5 years) is to maintain an increase of installation capacity of three times the 2010-2015 average rate of growth.

Potential forms of additional support:

- 1. Mexican Foundations and Individual Giving --** Operational or Project-Based Support  
Range of support: \$10-\$100,000
- 2. Corporate Social Responsibility Funding --** Operational or Capacity-Building Support  
Range of support: \$1,000-\$100,000
- 3. Additional Delegation Government Grants --** Project-Based Support  
Range of support: \$10,000-\$1,000,000
- 4. Additional Municipal Government Grants --** Project-Based Support

Range of support: \$10,000-\$1,000,000

With these additional sources of revenue, and provided Isla is able to restructure its offerings to provide enough revenue to cover more of its on-going operational costs and added funds needed for capacity building steps, Isla could double its current budget by 2021, leading to the ability to add capacity for installations at approximately 11 systems/week each year. These forms of additional funding, plus a more diversified stream of payments ensuring cash on hand, will add to the organization's ability to continue its linear growth at an increased pace. Yet even with this level of growth, Isla would only be able to install around 70,000 systems by 2030.

### 3.3.2 Medium Term

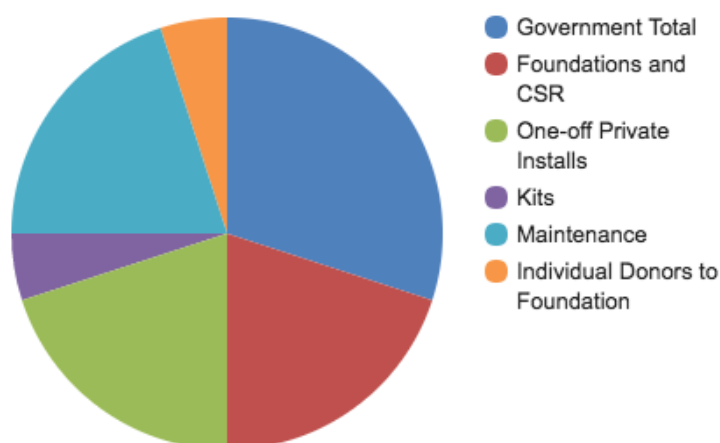
In the medium term, the playbook provides information about the needed steps for IU to approach potential partners for growth at a citywide scale. This is a critical period for growth for IU, and it needs to achieve nearly a 25 percent rate of growth per year to meet the 2030 goal. While that is an aggressive growth target, it is possible. This will secure the argument for Isla as the vehicle by which Mexico City meets its rainwater harvesting goals.

Potential forms of additional support:

**Infonavit:** Per-household installation support. Securing the ability to have green mortgages to finance rainwater harvesting systems for customers able to access them could help launch IU's exponential growth phase. This financing could mean households had up to \$1,250 to spend toward purchasing a system, and more than 1.6 million green mortgage credits had been issued by July 2014, indicating the potential scale of accessing this funding stream.

**Microfinancing:** Per-household installation support. Microfinancing is another way for a middle-income segment of the Mexico City population to potentially finance rainwater harvesting systems. Loans range from hundreds to thousands of dollars, though are often saddled with high interest rates.

2022 IU Budget Breakdown by Funding Source



### 3.3.3 Long Term

In this growth model, the long-term between years 10 and 14 assumes a continued growth at 25 percent per year. During this period, as Isla Urbana is established as the premier provider of rainwater harvesting services citywide, it will need to look to larger scale projects and partners to continue its growth.

Potential forms of additional support:

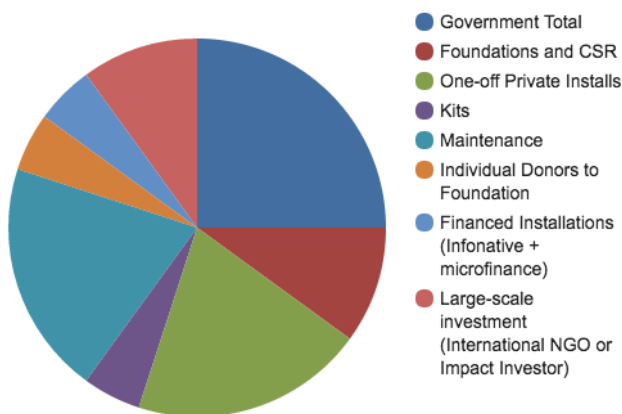
- 1. International Organizations --** Project-based or Capacity Building Support  
Range of support: \$100,000-\$1,000,000+ -- Due to the requirements of these organizations, to access this funds IU would likely need to partner with other NGOs or government agencies in the application and implementation process
- 2. Impact Investors --** Investment for Business Equity  
Range of investment: \$100,000-\$1,000,000+

Combining these sources of additional revenue with growth of one-off installations, maintenance contracts, and continuing government projects could result in the accomplishment of the goal of installing over 147,000 systems by 2030.

### What This Could Look Like

Over the long term, as well as diversifying revenue streams through the kinds of funding discussed above, IU will need to maintain a financial plan that is sustainable. This means relying more on private installations and renewable maintenance contracts, and less on large-blocks of government funding. Below are some possibilities of what diversified budgets in the medium and long term could look like, expanding away from the current overwhelming reliance on government funding.

2030 IU Budget Breakdown by Funding Source

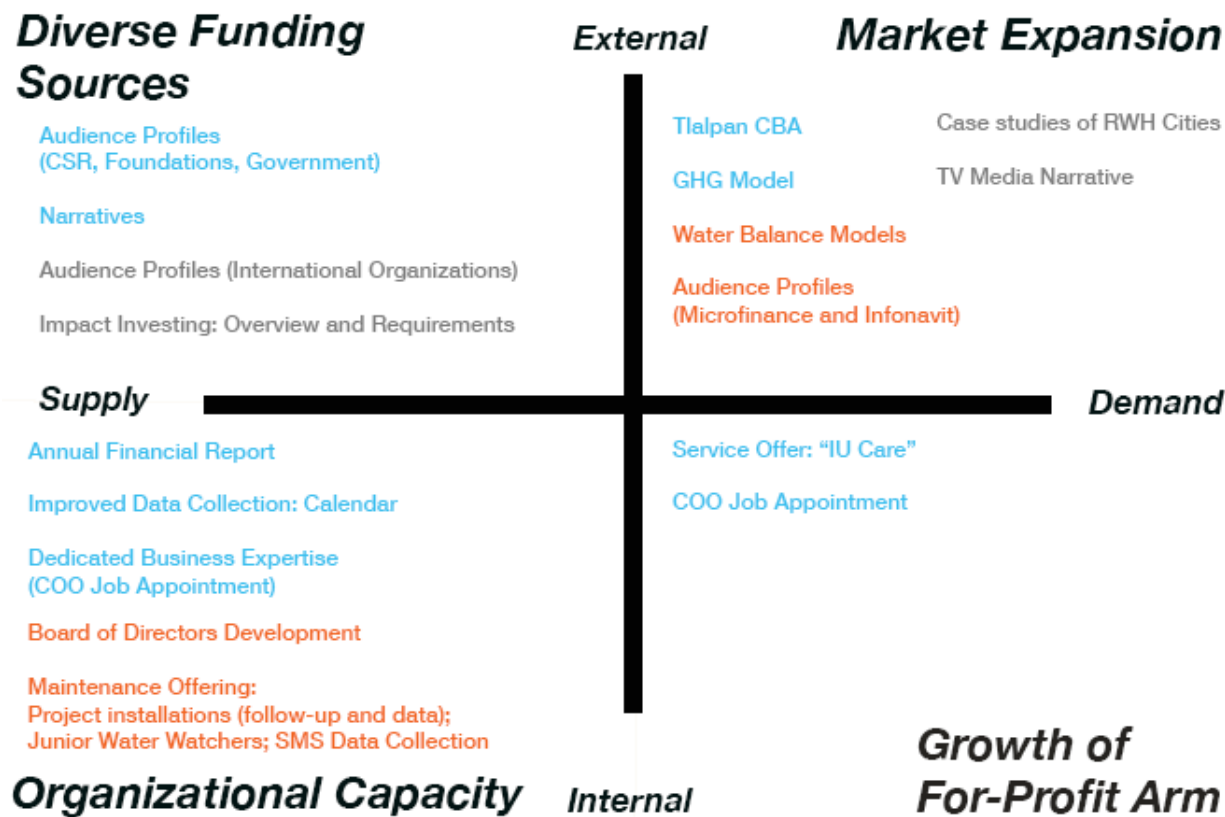


These charts are single versions of a huge number of possible combinations of these funding variables. Their main purpose is to show what could make up IU's areas of support at these stages in its future.

### 3.4 Introducing the Toolkit

Now that the architecture of the plan has been established, it essential to explain the methodology behind categorizing the various tools, models and recommendations that have been provided. The following **Growth**

**Matrix (below)** is strategically designed to segment and prioritize the proposed business goals and objectives, in order to best represent how each component of this growth plan is relevant for Isla Urbana. The matrix is a visual representation that portrays where these growth areas would fit on two different continuums: **Supply vs. Demand** and/or **External vs. Internal** change.



3.4.1 Diverse Funding Sources

This area of growth falls under the supply/external portion of the matrix. In order to better ensure the ability to meet future system demand (installations, maintenance, etc.), IU must seek diversified revenue sources by striving to secure a variety of new, non-governmental partners, as well as service-oriented products that allow for increased income. Multiple revenue sources will bolster organizational capacity, thus allowing the organization to grow its positive social and environmental impact in Mexico City.

3.4.2 Organizational Capacity

This growth element falls under the supply and internal portion of the matrix. Here, in order to bolster Isla Urbana’s internal ability to manage increased system demand (installations, maintenance, etc.), the company must ensure that its organizational structure and capacity is equipped to handle both consistent and sporadic influxes of orders and requests for maintenance. Financial transparency is necessary to create confidence for future funders, and is often a requirement when applying for funding or creating partnerships. The tools and recommendations attributed to this growth element will provide practical ways to expand organizational capac-

ity, with the intent of further capitalizing on IU's ability to effect social and environmental change in Mexico City.

### **3.4.3 Market Expansion**

This growth element falls under the external and demand portion of the matrix. Here, in order to create further demand IU must be able to identify, leverage, and advertise the myriad qualitative and quantitative factors that make rainwater harvesting viable, attainable, and desirable. The tools and recommendations attributed to this growth element provide meaningful qualitative and quantitative information to justify why and how rainwater harvesting is a salient concept. Furthermore, this growth element also includes more conceptual recommendations for service-oriented products, aimed to attract different customers

### **3.4.4 Growth of For-Profit Arm**

This growth element falls under the internal and demand portion of the matrix. In order to continuously build upon IU's social and environmentally-focused mission of providing rainwater for all, it is significant to expand the for-profit sector, to better support the not-for-profit division. The tools and recommendations attributed to this growth element focus on standardizing IU's product offerings and engaging in market research with the hope of developing more bespoke products and service offerings. A bolstering of organizational capacity will allow the allocation of employees to focus on internal R&D, with the intention of building a broader and more systematized line of products.

## **3.6 A Timeline for Development**

Within the context of this growth matrix framework, the following table presents where each of the various tools, models and recommendations fits into three stages of development. The table is intended to advertise the new resources proposed in support of IU's recommended growth, what their potential value is, and how the tools provided will offer additional information to help Isla Urbana realize the full scope of its potential.

There may also be internal changes to financial reporting, self-study, data collection and operating structure within IU to realize this rapid growth. The timeline below, divided roughly into three phases, illustrates how the realization of new funding partners might key to internal structural changes.

## Combination Introducing Deliverables:

Term	Purpose	Tools	Internal focus area	External focus area
<b>Short term</b>	Making a data-driven case for RWH at Neighborhood scale	Tlalpan CBA (4.1.1) GHG model (4.1.2)		Market Expansion
	Pursuing Corporate Social Responsibility (CSR) funding	Corporate giving profiles (4.3.2) Narratives (4.3.14)	Organizational Capacity: Financial transparency through annual report *(secondary focus area)	Diverse Funding Sources
	Pursuing Local Foundation Funding	Foundation profiles (4.3.6) Narratives (4.3.14)	Organizational Capacity: Financial transparency through annual report *(secondary focus area)	Diverse Funding Sources
	Pursuing additional Government funding	Government agency profiles (4.3.10)		Diverse Funding Sources
	Focus on innovative follow-up data collection	Calendar (4.4.1)	Organizational Capacity: Improved outcome measurement	
	Need for dedicated expertise to guide for-profit business side/ Strengthen the for-profit side	COO Job Appointment (4.4.2)	Organizational Capacity: Business-oriented operations	Diverse Funding Sources

	Broaden and systematized product offerings: Monetize and Expand Maintenance Capacity	“IU Care” (4.2.1)	Growth of for-profit arm	Market Expansion  Diverse Funding Sources
Term	Purpose	Tools	Internal focus area	External focus area
<b>Medium term</b>	Making a Strong Case for RWH at the City scale	Water balance and rainwater capture models (5.1.10)		Market Expansion: Providing new data for pitch purposes for more audiences
	Expanding the Market through Microfinance	Microfinance profiles (5.1.1)  Microfinance FAQs (5.1.2)		Market Expansion
	Having an approved RWH system with Infonavit	Infonavit profile (5.1.7)		Market Expansion
	Recommendation for Board Development	Board of Directors information (5.2.5)	Organizational capacity: Navigating complexity	



	Improved maintenance offerings	<p>Project installations (follow-up and data)</p> <p>Junior Water Watchers</p> <p>SMS Data Collection (5.2.1 – 5.2.4)</p>	Organizational capacity: Improved data collection	
Term	Purpose	Tools	Internal focus area	External focus area
<b>Long term</b>	RWH part of the fabric of Mexico City	<p>Case studies of RWH Cities (6.1.1)</p> <p>TV Commercial (6.1.5)</p>		Market Expansion: Preparation for/acceptance of scalable growth
	Pursuing International Development Organization Funding	Development Organization profiles (6.2.1)		Diverse Funding Sources Preparation for/acceptance of scalable growth
	Pursuing Impact Investment Funding	Impact investing Overview and Requirements (6.2.5)	Organizational capacity: Information for decision making	Diverse Funding Sources

# **Chapter 4: Short Term (1-4 years)**

## *Standardizing the Pilot Program*



Welcome to the short term! The tools, models and recommendations are designed to bolster Isla Urbana's core competencies. By proposing organizational changes that would allow operations to run at their optimum level, and quantitative justifications for expanding the market for rainwater harvesting beyond the pilot delegation of Tlalpan, the short term properly positions the organization for the longer term growth, proposed later on in this growth plan.

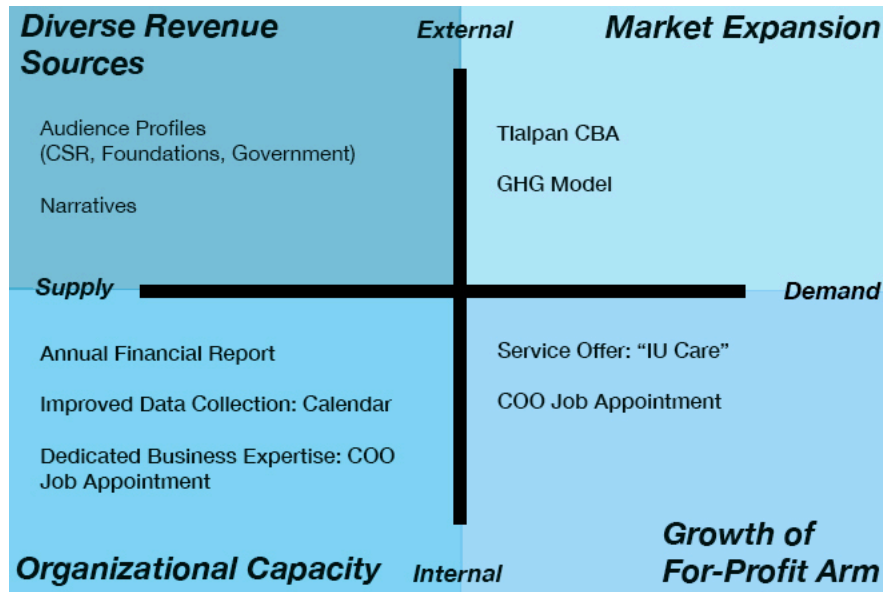
Analyzing the political context and organizational framework in which IU is currently working has led to an identification of several specific risks that the organization could face, which further illuminated a rational and coherent route for the content within this toolkit.

Right now Isla Urbana is in a position to leverage their political support from Claudia Sheinbaum, with the goal of drastically increasing installations in Tlalpan to help alleviate the need for subsidized pipa trucks. In the short term, IU has to address its organizational capacity, by creating more financial transparency. Furthermore, IU must improve its ability to conduct monitoring and evaluation on its projects, as well as creating systematic product offerings. These changes are necessary in order to diversify IU's funding sources and increase resilience against the risk that any future political changes could spell the end of support.

Addressing these aforementioned risks will allow IU to lay the foundations for future growth as outlined in the medium and long term strategies. Financial transparency is necessary to create confidence for future funders, in order to meet requirements when applying for funding and/or creating partnerships. This can generally take the form of an annual report and audited annual financials, which includes information on funding sources and amounts and overhead costs.

Systematic product and service offerings provide a consistent package for customers for both the for-profit and non-profit arms of the operation. They help to create consistency and develop a 'brand' for Isla Urbana's rainwater harvesting quality of service, alongside its distinctive blue rainwater harvesting cisterns. This section also discusses the need for innovative follow-up data collection through a Calendar and the suggestion for a COO appointment to bring dedicated business expertise.

## 4.1 Market Expansion



Below are measurable impact models, aimed to help justify company growth through making a more data-driven case for rainwater harvesting in the geographic focus area of Tlalpan. The following cost-benefit analysis and GHG emissions analysis serve as “proof of concept” tools, which have the potential to be standardized and replicated as Isla Urbana makes the case for market expansion into other delegations in Mexico City.

### 4.1.1 Cost-Benefit Analysis of Rainwater Harvesting in Mexico City

The current failure in government ability to provide basic service through traditional water utilities, combined with market inefficiencies filled by government subsidized pipas, has inspired the construction of this cost-benefit analysis (CBA).

The aim here is to determine whether there is monetary benefit to installing rainwater harvesting systems, in replace of the current system of pipa deliveries. The data and referential information used here is based on Isla Urbana’s pilot district of Tlalpan, where many households are not connected to the water grid.

The calculations in this CBA were based off extremely conservative assumptions. For example, the likely increased future demand and monetary value of water was not included, nor was a higher assumed future cost of pipa services. The results of the CBA were unanimously positive, as they suggested a positive net present benefit of **\$36,001,997.44** to the delegation of Tlalpan, if 50% of the homes not connected to the water grid were to receive RWH installations. The modest assumptions of this CBA further suggest that the monetary results are likely even more in favor of RWH than the numbers would suggest. Please refer to **Appendix Section A2.0** for a detailed and in-depth exploration of the methodology, assumptions and **results for this CBA**.

### 4.1.2 GHG Inventory Analysis

Assuming that the activity of these thousands of diesel-burning and heavy-duty trucks are a significant source of greenhouse gas emissions in Mexico City, this model attempts to calculate the greenhouse gas emissions attributable to pipa water truck activity in the delegation of Tlalpan.

#### Approach / Methodology

Calculations were based on the industry-standard guidelines from The Greenhouse Gas Protocol, jointly developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD). This inventory only includes “scope 1” emissions, those directly generated from owned or controlled sources of the analyzed organization (the “pipa” water trucks subsidy program in Tlalpan). Activity data (estimated distance traveled by the

water trucks) were multiplied by emission factors (amount of greenhouse gas emitted per unit of activity) in order to obtain the total annual emissions.

### Assumptions

The GHG emissions associated with pipa water truck activity in Tlalpan were determined according to the following assumptions:

According to the 2010 census, there are 175,983 households in Tlalpan, of which 72.5% are connected to the water grid, therefore 48,395 houses are not connected to the water grid. The number of houses not connected to the grid were assumed to be participating in the pipa water truck subsidy program. The average distance traveled by pipa water trucks from the filling station located at Six Flags Mexico City to the households were estimated to be 22 km, based on the location of Ahuayoto Village, visited by our team. Emission factors for heavy duty trucks were found in the 2012 Federal District Emissions Inventory. Finally, the Global Warming Potential (GWP) factors were derived from the IPCC's 4th assessment report.

Significant estimation errors (probable underestimation) may arise from the fact that the intermittent nature of water supply may prompt families to request water trucks even if their home is connected to the grid. Furthermore, sharing of water tanks is frequent between neighboring houses; representing another source of estimation error.

The assumption that all households (final water delivery spots) are within the same distance from the refilling station at Six Flags Mexico is the largest source of uncertainty in the calculations. This distance was calculated using Google Maps as the main roadway between Six Flags Mexico and Pueblo De Santo Tomas Ajusco. An alternative (shorter) 17.1km route ("por Picacho-Ajusco") was suggested by Google Maps, however it is not the main road and was not considered in the calculations.

Ideally, actual activity data, such as total distance traveled by pipa water trucks and/or total fuel consumption would be the best approach towards refining this greenhouse gas emissions inventory. There is, however, no evidence that this data is readily available.

The actual water load was also not considered in the calculation. While it was assumed that pipa trucks are heavy load vehicles (>3.8 metric tons), adjusting the model to the actual water load and uphill transportation will likely significantly increase the final emissions.

In the absence of activity data (distance traveled by trucks or total fuel consumption), building a Geographic Information System (GIS) tool is the second-best approach (other than attempting to obtain data from municipal governments) towards refining the greenhouse gas emissions estimate of pipa activity. The GIS tool containing the road network and spatial information of the households participating in this subsidized program could improve the estimate of total distance traveled.

### Results

The estimated GHG emissions associated with pipa water trucks activity in Tlalpan is over **24,500 metric tons** of carbon dioxide equivalent per year. This figure represents about 1.43% of all heavy-duty truck emissions in Mexico City and 0.05% of the city's total emissions (all sources).

### Conclusions

Considering the limited geographic and activity scope of the model, we believe the pipa water trucks represent a very significant source of greenhouse gas emissions in Mexico City. Furthermore, it may be conjectured that water truck activity is a major source of harmful particulates emissions, another reason why the activity should be tracked. Rainwater harvesting holds the potential to reduce the reliance on carbon-intensive pipa trucks for water supply, thus significantly contributing towards the mitigation of greenhouse gas emissions in Mexico City.

## 4.2 Growth of For-Profit Arm

As previously stated, the aforementioned models serve as quantitative tools aimed to help expand the market for rainwater harvesting in Mexico City. As a means of simultaneously preparing for expanded market demand, the next set of tools and recommendations aim to help IU grow its for-profit arm. By developing a more consistent business model, accompanied by an expanded catalogue of systematized product offerings and pricings, IU could leverage its knowledge and expertise in this space, bolstering its for-profit sector.

### 4.2.1 Service Offerings & Additional Revenue Stream: “IU Care”

As use of rainwater harvesting spreads, an important additional form of revenue for IU could be the provisioning of maintenance services to clients who pay for private, non-subsidized installations. While this strategy has been implemented with some clients in the past, it should be a systematized offering that is part of a package sold to each customer; providing them the opportunity to opt out of maintenance instead of opting in. Additionally, customers who do not have other preferred service professionals with whom they are already working, should be encouraged to enroll in maintenance contracts, promoting the expertise offered by IU in maintaining their systems. Some of these service offerings would be: **Cleaning (roof, gutters, tank), Chlorine & Filters Subscriptions, Limited Warranty.**



This will also be a way of gathering data about the private systems, as it provides more opportunity for IU to interact with its customer-base. Having a thriving maintenance practice will also allow IU to employ more people more frequently, as the maintenance calls would gradually increase over time, helping fill the gaps in hours for staff who are only needed part-time for installations.

An important part of the ability for IU to grow will be the establishment of a regular, dependable source of income, and a key component of this growth plan is a focus on the development of business prospects in higher end private installations. The private installations themselves form part of this revenue, though they do require additional customization beyond what is demanded for large low-income project installations; thus involving additional staff time. It is our recommendation to establish a separate division or designate an additional team member in charge of cultivating this business, as well as developing a program for maintenance contracts at a price point that allows the business to fund general operating expenses and, ideally, some capacity development. These contracts can build off established maintenance relationships such as those IU has cultivated with universities, larger buildings and other clients whose facilities professionals are unable or unwilling to care for the RWH systems.

This additional focus on maintenance in the for-profit business should be coupled with the desire for additional follow-up through the non-profit on subsidized installations. While installations and follow ups are currently seen as separate processes when selling new government partners on RWH installations, they must be part of a complete package, in order to assure the citywide promise RWH offers. The method for doing this could take a number of forms.

## 4.3 Diverse Funding Sources

A major goal of this project is to help to illuminate a pathway towards obtaining funding that is both sustainable, year after year, and more resilient than the current project-based, short-term, one-off government grants. To attract this type of funding, IU will need to begin producing annual reports as soon as possible. These provide information, highlight programmatic and financial successes, and are a major touch point for a variety of funders. In addition to the recommendation of releasing annual financial reports, a set of tools has been provided, based on researching potential funding sources that could be accessed in the short term, including corporate giving, local foundation funding, and additional government agencies. Securing funding from these potential partners, however, will require narratives directed toward their particular funding interests. The narrative tools will help build the case to each of these stakeholders, making the argument to diverse funder audiences.

### 4.3.1 Annual Report

A broader spectrum of funders will require financial transparency and an annual report, particularly in the case of corporate CSR, microfinancing and, given changes to current regulation, green mortgage programs like INFONAVIT. One possible system, promoted by CEMEFI, Centro Mexicano para la Filantropía, Mexican Center for Philanthropy, is discussed below. The CEMEFI is a private non-profit without political or religious affiliation, whose mission is to promote and articulate philanthropic, socially committed and responsible citizens, organizations and businesses to achieve a more equitable, compassionate and prosperous society participation. The CEMEFI is a membership organization that brings together more than 500,000 members. It created institutionality and transparency standards to strengthen utilitarian practices in nonprofits and community organizations on the one hand, and to encourage donors on the other. It offers standards divided into three different levels:

- A. Basic, in which an organization has:
  - 1. A legal constitution certified by a public notary
  - 2. A legal authorization from the Tax Authority to receive donations
  - 3. A definition of Vision, Mission and Objectives
  - 4. A verified phone and address
  - 5. And an annual report about results and use of resources
- B. Medium, in which an organization also has:
  - 6. A governance structure including independent board membership
  - 7. Professional and formal (legal) employment
  - 8. Volunteer or intern employment
- C. Optimum, in which an organization reaches
  - 9. More than 3 years of operation
  - 10. More than 3 income sources

CEMEFI offers a certification in these areas, which could provide the certainty of third party validation of IU's practices. This could also be part of the package of IU changes to attract new donors and provide certainty to stakeholders. It would also allow the organization more visibility among potential private donors (CEMEFI also has a CSR component, distinctive for private companies). Participation in the network of other CEMEFI organizations could open doors to potential allies. There is, however, a cost to be paid for certification every two years. If this cost is not tenable, IU could simply use these standards as a guidance without becoming officially certified.

More information on CEMEFI can be found: <http://www.cemefi.org/programas/indicadores-institucionalidad-y-transparencia/los-10-indicadores.html>

### **4.3.2 Audience Profiles: Corporate Social Responsibility (CSR) Funding**

One of the most overwhelming challenges in seeking CSR funding is determining which companies best align with Isla Urbana's mission and focus. The following audience profiles are a hand-picked catalogue of corporations that would be optimal private capital collaborators with IU. Each profile has been curated to include only the most relevant information, which Isla Urbana would need to know in order to pursue a partnership.

An essential part of the effort to achieve a diversified revenue streams, the CSR audience profiles are as follows:

1. Coca-Cola
2. Pepsico
3. PEMEX



## 4.3.3 Coca-Cola Foundation

### Contact information:

Vivian Alegria  
valegria@la.ko.com  
www.fundacioncoca-cola.com.mx



### OPERATIONAL / FINANCIAL MODEL

Coca Cola Company recognizes that water is a critical resource that is integral to their operations, and strives to be conservative in the use of water in their manufacturing process. Understanding the value in good water stewardship, they also place a high priority in protecting the local water sources that they work with. Moreover, Coca Cola Company has a global philanthropic body known as the Coca Cola Foundation that supports international efforts to empower communities, promote well-being, and make a positive impact on the environment. The foundation's core sustainability priorities are women (economic empowerment and entrepreneurship), water (access to clean water, water conservation and recycling), and well-being (active healthy living, education and youth development).

### FUNDING AVAILABLE

During the first half of 2015, the foundation awarded USD \$26.2 million to 74 community organizations around the world with a focus in the following categories:

- To improve access to water and sanitation
- To protect watersheds
- To provide water for productive use, and/or
- To educate and raise awareness about water issues, including engagement on water policy

Last year alone, Coca Cola awarded USD \$1,700,000 to Pronatura Mexico's program "Water and Waste-water plant for Marginalized Communities," and USD \$500,000 to Pronatura's Mexican Reforestation Program. Their funding ranges from USD \$100,000 to USD \$3,000,000.

### CONCERNS/KEYWORDS

- Access to water and sanitation
- Protect watersheds
- Provide water for productive use
- Rainwater harvesting
- Aquifer recharge

### RELEVANT SUSTAINABILITY METRICS

- Offset through RWH to aquifer extraction
- Number of households with RWH systems
- Number of households now with access to clean water
- Number of "vulnerable" neighborhoods served with RWH systems

### IU'S APPEAL

In Mexico, the Coca Cola Foundation has set up a national reforestation and water harvesting program, in association with the National Forestry Commission (CONAFOR) and the National Commission for the Protection of Natural Areas (CONANP). The program has the objective of returning 100 percent of the water they use in their products and production process, through strong efforts in using rainwater harvesting as a method to recharge the aquifers in the communities they operate in.

As of 2011, the foundation has built 162,000 groundwater recharge wells, harvesting around 1.25 billion litres per year of rainwater, on top of planting over 30 million trees across the country.

Isla Urbana is an excellent candidate for the grant because the organization's work is aligned with Coca Cola Foundation's priority areas, especially in the areas of water and women empowerment. Coca Cola's existing efforts in rainwater harvesting are focused on the environmental protection aspect, through fostering aquifer recharge efforts. Therefore, Isla could present itself as the link between the company's more environmentally focused efforts in aquifer recharge, to one that reaps more direct social and economic impacts from rainwater harvesting, such as women's empowerment.

Moreover, Isla Urbana could present its work as a potential extension of the national reforestation and rainwater harvesting program that Coca Cola Mexico works with in association with Pronatura, the National Forestry Commission (CONAFOR), and the National Commission for the Protection of Natural Areas (CONANP).

To make their appeal stronger, IU should develop clear metrics to evaluate its impact on increasing access to water in the communities they operate in, and its potential impact on aquifer recharge. IU should also seek collaboration with Coca Cola's current partners in the reforestation and rainwater harvesting program in Mexico, to leverage and scale their work through Coca Cola's existing network.

#### **ADDITIONAL CONTACTS**

PRONATURA MEXICO, AC

Contact information:

Adolfo Alaniz Ramirez, Director General

Tel. (55) 56 35 50 54 57

pronaturaxm.gro.arutanorp @ www.pronatura.org.mx

COMISIÓN NACIONAL FORESTAL

5360, San Juan de Ocotán, 45019 Zapopan, Jal.,

Tel. (52) 33 3777 7000

COMISIÓN NACIONAL DE ÁREAS NATURALES PROTEGIDAS

Camino Al Ajusco #200, Tlalpan, Jardines En La Montaña, 14210 México, D.F.

Tel. (52) 55 5449 7000

## 4.3.4 PepsiCo

### Contact information:

Tricia Lynch, Sponsorship and Business Solicitations  
700 Anderson Hill Road, Purchase, New York 10577



### OPERATIONAL / FINANCIAL MODEL

In understanding how essential water is to PepsiCo's success, they aim to help protect and conserve global water supplies. Water is not only an integral component of their beverages, but also needed by the company to grow and process the agricultural goods that are the basis for the majority of their snack and food products. Its importance also exists at an operational level and along their supply chain, utilizing water for energy transfer and sanitation. Therefore, PepsiCo places a high priority in ensuring that their employees, consumers, and the communities that they operate in have safe and affordable water supplies.

### FUNDING AVAILABLE

In 2014, PepsiCo gave \$4.2 million (out of a total \$30.1 million) towards the "Environmental Sustainability" strategic priority of their grant program.

### CONCERNS/KEYWORDS

- Water stewardship
- Positive water balance
- Watershed management
- Promoting access to clean water

### RELEVANT SUSTAINABILITY METRICS

- Number of households with increased access to water
- Measures of reduced impact on local watersheds
- Amount of avoided water extracted from aquifers

### IU'S APPEAL

PepsiCo and the PepsiCo Foundation have established six partnerships that provide solutions to the global water crisis. They are:

- Columbia Water Center at the Earth Institute (Columbia University)
- Safe Water Network
- Inter-American Development Bank
- China Women's Development Foundation
- Water.org
- 2030 Water Resources Group

PepsiCo already works on influencing watershed management in Mexico City, in partnership with the Nature Conservancy. In order to further expand their work to alleviate the pressure on Mexico City's aquifers, PepsiCo could consider working with IU.

PepsiCo also set ambitious goals to achieve universal access to water and sanitation. In partnership with IDB's Aquafund and led by World Vision, they have worked on leveraging public/private partnerships to provide access to water and sanitation for dispersed low income rural communities in Colombia and Mexico. IU's focus on providing individual peri-urban marginalized households with a reliable and autonomous source of water through rainwater harvesting systems is in line with this vision.

Lastly, the company aims to transform water resource planning to close the supply-demand gap in partnership with 2030 Water Resources Group. Local PepsiCo representatives have in the past, contributed to the development of national and regional programs and projects advocating for improved management and better use of water resources. With IU's positive relationship with the local delegation and its projects with the City of Mexico, IU could be a great local partner for PepsiCo to help continue its work in developing programs promoting widespread availability of water for people, ecosystems and for economic development and growth.

PepsiCo does not respond to unsolicited proposals for funding, so IU would need to contact one of their established partners with a proposal or project. The foundation works closely with the Columbia Water Centre to increase access to safe drinking water, a relationship that could be leveraged through the Capstone group. Aligning PepsiCo's strategic priorities with IU's mission will allow them to expand their work within Mexico City's urban context.

**ADDITIONAL CONTACTS**

COLUMBIA WATER CENTRE

Contact information:

842 S.W. Mudd, 500 West 120th Street, New York, NY 10027

## 4.3.5 PEMEX

### Contact Information:

Investor Relations  
Tel: (52) 1944 9700  
ri@pemex.com



### OPERATIONAL / FINANCIAL MODEL

The Mexican national oil company, PEMEX, maintains a program of significant donations as part of their corporate social responsibility (CSR) program. The three areas of focus within their CSR are: basic infrastructure in communities, investment for the welfare and quality of life, and social investment. The social investment aspect directs funds to programs, work or social initiatives that foster quality of life for communities, and supports conservation, reforestation and improvements of ecosystems around the country.

### FUNDING AVAILABLE

PEMEX gives funds to local governments to support the development of basic social infrastructure. In 2015, an amount of \$2.7 million USD was granted by PEMEX to the Federal District alone, and the amount awarded nationally totalled \$112 million USD.

### CONCERNS/KEYWORDS

- Basic infrastructure in communities
- Welfare and quality of life
- Ecosystem improvements

### RELEVANT SUSTAINABILITY METRICS

- Offset through RWH to aquifer extraction
- Number of households with RWH systems
- Number of households now with access to clean water
- Number of "vulnerable" neighborhoods served with RWH systems

### IU'S APPEAL

Although funds are generally granted towards communities with strong presence of the oil industry, PEMEX also grants donations to various types of communities and organizations that are not directly related to the oil industry. PEMEX has large investments in social projects nationally, as part of their social responsibility program. Messaging that appeals to PEMEX's focus on social investments by presenting Isla Urbana's work as a solution with multiple benefits that range from providing basic water infrastructure for low-income communities to improving resiliency of these communities to adapt to climate change, would make Isla Urbana an attractive candidate for the grant. Another argument that Isla Urbana could employ is to use its pilot site in Tlalpan, and make the link between their operations and efforts to protect the conservation lands that lie on its peripheries.

#### **4.3.6 Audience Profiles: Foundation Funding**

The next batch of audience profiles focus on foundations that provide grants and other forms of capital to organizations with projects and initiatives that aim to provide social benefit. Again, these foundations have been handpicked as potential funders that would help Isla Urbana expand its portfolio of revenue sources.

The selected foundations are:

1. FUNDACIÓN MEXICANA PARA LA SALUD A.C.
2. FUNDACIÓN GONZALO RÍO ARRONTE
3. The U.S.-Mexico Foundation

## 4.3.7 Fundación Mexicana para la Salud

### Contact information:

Dra. Ariadna Rubio Ramírez, Communication Coordinator  
Tel. (52) 5655 9011/Fax. (52) 5655 8211  
<http://funsalud.org.mx/portal/>



### FINANCIAL MODEL

Composed of individual and institutional associates, the Mexican Health Foundation (FUNSALUD) is a private institution with a high level of financial transparency that sponsors projects funded through private donations.

### FUNDING AVAILABLE

FUNSALUD manages its own projects as well as funding outside organizations. In 2014, it administered 161 grants, with 55 going to FUNSALUD projects and 106 to outside partners. It managed 134 funds in local currency and 27 in dollars. It spent \$25,755,126 in pesos for the various projects and carried a balance of \$32,462,612 pesos to fiscal year 2015. It expended \$1,238,740 on projects managed in dollars, and had \$2,880,840 to carry into fiscal year 2015.

### CONCERNS/KEYWORDS

- Understanding and meeting health needs in Mexico
- Building partnerships to address important health problems

### RELEVANT SUSTAINABILITY METRICS

- Number of people with increased access to water for cleaning and sanitation
- Number of homes with increased access to potable water
- Decreased incidence of waterborne illness

### IU'S APPEAL

FUNSALUD's goal is to contribute to the improvement of health in Mexico. It promotes research and training in health-related topics throughout the country. It also seeks to identify health problems and generate solutions through specific projects. This is an underdeveloped aspect of IU's work, but understanding the connection between increased water access (through rainwater harvesting) and improved health could be a major selling point in terms of advocating for rainwater harvesting on a larger, city-wide scale. IU could also be in line with FUNSALUD's principle of promoting collaboration between the private, public and academic sectors.

An application to this foundation would need to focus on the health-related aspects of providing marginalized communities with increased access to water, perhaps in the form of a research partnerships with and academic institution. A successful joint project might involve further studies of water quality in the rainwater harvesting systems, decreases in waterborne illness, or changes in parasite infections as a result of access to rainwater and decreased dependence on non-potable piped water or trucked water.

## 4.3.8 La Fundación Gonzalo Río Arronte

### Contact information:

Telephone-Fax: 51 40 38 40  
(Water -- ext. 504), 55 66 62 33  
E-mail: fundacion@fgra.org.mx



F U N D A C I Ó N  
GONZALO RÍO ARRONTE, I.A.P.

### FINANCIAL MODEL

The Gonzalo Río Arronte Foundation is a private non-profit foundation without party, racial or religious affiliation, founded in 2000. It is headquartered in Mexico City and its scope covers all of Mexico.

### FUNDING AVAILABLE

For year ending 12/31/2014, assets: \$730,000,000  
Total giving: \$14,000,000<sup>1</sup>

### CONCERNS/KEYWORDS

- Water self-sufficiency
- Water use reduction
- Flood control
- Marginalized communities

### RELEVANT SUSTAINABILITY METRICS

- Pipas deliveries avoided
- Educational trainings provided on water demand management
- Volume of rainwater harvested/waste water slowed
- Monetary benefit to communities
- Water savings through rainwater harvesting

### IU's APPEAL

According to its website, the Water Program of the Gonzalo Río Arronte (FGRA) Foundation is guided by a vision of a sustainable Mexico with regard to water, believing in a water self-sufficient society that is aware of the full importance of the resource.

The foundation's mission is to influence the revaluation of water by supporting projects promoted by organizations, public or private, which carry out socially beneficial activities to promote a culture of caring for water bodies, streams and watersheds, control-correction or optimization of water usage, minimization of the negative effects of excess water and that are particularly aimed at marginalized rural communities.

These goals fall in line with IU's mission to make marginalized communities in the Mexico City peri urban environment self-sufficient in water harvesting. Also, IU's argument about rainwater harvesting being both a supply and demand side management strategy could be very effective with this funder. Other areas of interest to the funder also align with IU goals, such as the foundation's desire to "promote alternative sanitation and prevent water pollution by applying green technologies or appropriate simple understanding and operation, low cost, easy to use, reproducible and adaptable to different scales, socio-cultural or regional contexts and changing circumstances technologies, driving participation and ownership of beneficiaries through self."



## 4.3.9 The US-Mexico Foundation

### Contact information:

Email: [info@usmexicofound.org](mailto:info@usmexicofound.org)

U.S. Office:

136 Madison Ave, Suite 533; New York, NY 10016

Tel +1 646-722-3833

Mexico Office:

Alvaro Obregon 168 P-1; Col. Roma Norte, Mexico, D.F. C.P. 06700

Tel +52 55.5520.3071

### FINANCIAL MODEL

A public foundation established in 2009 to improve relationships between the US and Mexico with an emphasis on youth.

### KEYWORDS/ CONCERNS

National collaboration in philanthropy and education



(Source: <http://www.usmexicofound.org/about/mission-and-vision/>)

### RELEVANT SUSTAINABILITY METRICS

- Educational trainings provided on water demand management
- Number of youth attending trainings
- Number of rainwater harvesting systems in schools and students impacted
- Monetary benefit to educational system
- Number of U.S. partners/donors

### IU'S APPEAL

The U.S.-Mexico Foundation provides funding to qualified organizations in the United States and Mexico that work to strengthen education and civic engagement in Mexico and develop greater understanding and cooperation between the two countries. It is not specifically interested in environmental projects or in construction projects. But, IU's story of focusing on the educational and community development aspects of rainwater harvesting, as well as IU's unique history with roots in both the U.S. and Mexico, could make it a viable applicant for foundation funding.

## KEY POINTS

An application to this foundation would need to stress alignment with both its educational and the binational relationship goals. IU would need to focus on these aspects of its founding, as well as its ongoing partnerships with U.S. schools, researchers, organizations, etc.



(Source: <http://www.usmexicofound.org/programs-citizen-engagement/grants/>)

## OPTIMAL FORMAT FOR COMMUNICATION

Letter of Inquiry form available here: <http://www.usmexicofound.org/programs-citizen-engagement/grants/>

#### **4.3.10 Audience Profile: Government Agencies**

The final selection of audience profiles in this chapter expands upon Isla Urbana's current and past successes in achieving support and funding from the Mexico City government. The following provides a deeper dive into opportunities with familiar government agencies, as well as new details and insight on groups that Isla Urbana might have not yet collaborate with. Pursuing additional government funding will also allow for Isla Urbana to continue its existing relationships with government agencies.

The agencies profiled are:

1. Mexico City Government
2. SACMEX
3. Resilience Office (100 Resilient Cities)

## 4.3.11 Mexico City Government

### OPERATIONAL MODEL/OVERVIEW

The Federal District Development Program 2013-2018 guides public policy in Mexico City by establishing 5 priority lines of action that provide the guidelines for budget allocation. For 2016 the City's budget is organized as follows<sup>1</sup>:

Line of action	Budget (Mexican pesos)	Budget (US dollars)	% of total budget
Social equity and inclusion	\$42,230.7 million pesos	\$2,346.15 million USD*	25.3%
Governability and public safety	\$36,565 million pesos	\$2,031.4 million USD	21.9%
Economic sustainable development	\$8,598.1 million pesos	\$477.7 million USD	5.2%
Habitability and services, Public space and Infrastructure	\$52,896.2 million pesos	\$2,938.7	31.7%
Anti-corruption and accountability	\$26,346.2 million pesos	\$1,463.7 million USD	15.8%
Total	\$177, 834.4 million pesos	\$9257.6 million USD	100%

\* 1 USD = 18 pesos

### COMPATIBLE PROJECTS/ASSETS<sup>2</sup>

#### *Line of action: Social equity and inclusion*

In order to attend to social inequality, the City has set up The Immediate Social Intervention Program. This program attends the four social deficiencies of CONEVAL social gap index: education, household access to basic services, access to health services and adequate housing.

IU could continue building its appeal to insert RWH in this program to alleviate household access to potable water. Additionally, the City has other relevant infrastructure programs where IU could collaborate:

a. School infrastructure to attend safety and adequate services in schools

Budget: \$100 mdp (\$5.5 million USD) for office of Public Works and \$922.4 mdp (\$51.2 million USD) for Delegations.

b. Maintenance of art infrastructure

Total budget of \$184.6 mdp (\$10.25 million USD) for the office of Public Works and \$810 mdp (\$45 million USD) for Delegations for diverse art initiatives, not only art infrastructure

c. Decent work program

Intended to reduce informal employment and unemployment through training in different crafts, provision of stipends for employees' first job, and self-employment programs.

<sup>1</sup> Source: Secretaría de Finanzas, Presupuesto de Egresos del Distrito Federal Ejercicio Fiscal 2016 <http://www.finanzas.df.gob.mx/egresos/pe2016/ProyectoPresuEgresosDFEjercicioFiscal2016.pdf>

IU could continue working with schools, use the opportunity to collaborate in artistic public spaces and train young workers in installation activities or follow up activities.

*Line of action: Economic Sustainable Development*

- The city aims to keep economic growth while protecting and reducing its environmental impact. Some programs aligned to these goals, where IU could generate collaboration opportunities are:
  - a. GHG emissions measurement and mitigation strategies
    - Budget: \$252.8 mdp (14.04 USD million)
    - IU could argue its reduction of the use of pipas.
  - b. Water management
    - Infrastructure operation: budget: \$2,203 mdp (\$122.4 million USD)
    - Water imports to CONAGUA for potable water provision. Budget: \$2,619.7 mdp (\$145.54 million USD)
    - IU could use a cost-benefit analysis to compare the investments between large-scale infrastructure and RWH systems and compare the investment and sustainability impacts of importing water from other basins vs. RWH.
  - c. Conservation land
    - Support for local communities in sustainable agriculture activities that prevent conservation land degradation. Budget: \$10 mdp (\$555,555 USD)
    - Support local communities with payment for ecosystem services in Tlalpan, Milpa Alta, Xochimilco and Tláhuac.
    - Budget: \$40.6 mdp (0.5 million USD).
    - IU's services are related to aquifer conservation, but informal settlements keep threatening the conservation areas. IU could build a small task force to partner with the communities in Tlalpan and Xochimilco to promote sustainable activities and partnerships to conserve the forest areas for aquifer recharge. IU should also emphasize how RWH helps aquifer overexploitation (offsetting runoff, reducing extraction to meet household demands).

*Line of action: Habitability and Services Public space and Infrastructure*

For 2016, the government is planning on making infrastructure improvements in public spaces and buildings, which represent an opportunity for RWH system installation and art activities (i.e. murals) where IU could collaborate:

- a. Infrastructure and Urban Improvement Fund in delegations, where neighbors will decide what urban improvement projects to fund.
  - Budget: \$200 mdp (\$11.11 million USD)
- b. Public space improvement, including pocket parks and public plazas
  - Budget: \$486 mdp (\$27 million USD)
  - b. Public markets infrastructure
    - Budget for infrastructure maintenance of \$70.7 mdp (\$3.8 million USD) from SEDECO (Economic Development Office) and \$175.6 mdp (9.75 million USD) from Delegations.
- d. Public space in Delegations to maintain parks, improve social and sports facilities and street maintenance and repair.
  - Budget : \$4,511 mdp (\$250.6 million USD)
- e. Hydraulic infrastructure
  - SACMEX: \$774.3 mdp (\$43 million USD)
  - Delegations clean water: \$752 mdp (\$41.8 million USD)
  - Delegations drainage maintenance: \$720.6 mdp (\$40 million USD)
- f. Housing credits improve low-income families' home conditions (safety, access to services).
  - Budget: \$1,258 mdp (\$70 USD million) for a total of 15,289 credits.
  - Delegations' budget \$178 mdp (\$10 USD million)

**MISSION STATEMENT/ KEYWORDS/ CONCERNS**

The vision of the City for 2012-2018 is:

- Where individuals have equal access to resources and opportunities
- Where the vulnerable population is supported through inclusive policies
- A city that respects and strengthens human rights

## RELEVANT SUSTAINABILITY METRICS

- Environmental benefits of RWH:
  - GHG emissions associated with pipa trucks avoided
  - Offset through RWH to drainage/stormwater overflow
  - Offset through RWH to aquifer extraction
  - Offset through RWH to water imports from neighboring basins
- Social benefits of RWH:
  - Number of households with RWH systems
  - Number of people with RWH systems by gender and age
  - Number of schools with RWH systems
  - Number of community kitchens with RWH systems
  - Number of plumbers trained
- Economic benefits of RWH:
  - Cost-benefit analysis with emphasis on relative short-term payback (as opposed to ROI on pipe repair)
  - Savings associated with RWH in public and government buildings
  - Pipa-related savings to households and Delegaciones

## IU'S APPEAL

Mexico City generated 30.7 million tons of CO<sub>2</sub>e in 2012, the largest source of emissions being transportation (41%) (SEDEMA). The City has set the mitigation goal to reduce GHG and particle emissions by 31.4 million tCO<sub>2</sub>e compared to the base year of 2012 —the expected GHG and particle emissions projection for 2025 is for 2025 is 36.633 Mton CO<sub>2</sub>e— in a conservative approach (GDF).

Through collaboration with experts and academics, Mexico City has also identified the main natural hazards that have disrupted the city's activities in the last decades: Floods, overflow of wastewater, earthquakes and forest fires. The city has also built vulnerability indexes to identify the population that is most exposed to these hazards and to guide its social programs.

Through collaboration with the different government offices, IU can advance in its mission of making rainwater an obvious alternative to increase reliable water access, achieving the City's emissions goals as well as improving resilience in the face of potential disasters.

## KEY POINTS

- IU should continue collaborating with Mexico City's government, strongly emphasizing the social, economic and environmental impacts of RWH.
- IU can also use the language of the city's government, emphasizing how RWH serves human rights and promotes social equity.

## OPTIMAL FORMAT FOR COMMUNICATION

Annual report. Social media campaign. Media campaigns (TV, newspapers, etc.) Update RWH fact sheet "Lluvia para todos. Por un México Sustentable en Agua."

## 4.3.12 SACMEX

### Contact information:

<http://www.sacmex.df.gob.mx/>

Chief Officer: Ing. Ramón Aguirre Díaz

Phone: (52) 57 28 00 00/ 56 54 32 10 (Mexico City time zone)

Email: [ramon.aguirre@sacmex.df.gob.mx](mailto:ramon.aguirre@sacmex.df.gob.mx)

### OPERATIONAL MODEL

Provision of potable water, drainage and sewage services to about 8.8 million inhabitants in Mexico City as well as a floating population of 4.2 million through the operation of the city's hydraulic infrastructure network.

Budget 2016: Hydraulic infrastructure: \$774 mdp

### COMPATIBLE PROJECTS AND/OR ASSETS

*Plan Agua para el Futuro (Water for the future)*

- 2018 goals include the provision of potable water for 100% of population, a 10% reduction on the water deficit and a reduction in the number of neighborhoods exposed to flooding.
- 2040 goals include the 24/7 water service for 100% of the population, 50% reduction in water leakages and achieve Zero neighborhoods in risk of flooding.

*Programa de Mujeres plomeras (Women plumbers program)*

- Basic training workshops for women
- Syllabus includes a basic overview of water culture, potable water, drainage and treatment; detection and repair of leakages, tank cleansing techniques and safety measures.

*Dame 5 x el agua:* Water consumption awareness campaign

### KEYWORDS/ MISSION STATEMENT

- Effective and efficient distribution of water services in Mexico City
- Operation, maintenance and construction of water infrastructure for the city
- Exploitation, use, distribution, management and protection of water resources

### RELEVANT SUSTAINABILITY METRICS

- Environmental benefits of RWH
  - Number of rain days
  - Total m<sup>3</sup>/s of stored rain using a RWH system (SACMEX data of water per source is in m<sup>3</sup>/s)
  - Offset through RWH to drainage overflow, stormwater run-off, and aquifer extraction
  - Number of water saving and sustainable consumption initiatives
- Social benefits of RWH
  - Number of households with RWH systems
  - Number of people with RWH systems broke by gender and age
  - Number of schools with RWH systems and RWH-fed water fountain
  - Number of community kitchens with RWH systems
  - Before and after RWH installation: assistance rates in schools
  - Number of plumbers trained

- Economics benefits of RWH
  - Cost-benefit analysis with emphasis in relative short-term payback (as opposed with ROI on pipe's repair)
  - Pipa-related savings (who pays for pipas? Delegaciones or City government?)

## IU'S APPEAL

The director of SACMEX, Ramon Aguirre has expressed that rainwater harvesting needs to be part of a broader strategy that promotes water saving, waste water treatment and water reuse since, by itself, rainwater harvesting is not a viable option for supply (Reforma 2011). Isla Urbana provides workshops and artistic activities within communities to promote a closer relationship with water and, thus, a conscious use of this resource. SACMEX also has a water and art program where IU could be involved.

In 2014 SACMEX sponsored the installation of RWH systems in 10 elementary schools in Tlalpan, with an investment of 600 thousand pesos per school. The water harvested is to be used for sanitation services (sinks and toilets) providing 95% of the supply (Reforma 2014). SACMEX does not mention if they worked with external providers for the system's installations, but this certainly represents an opportunity for IU to continue its collaboration with government agencies.

SACMEX, CONAGUA and SEMARNAT authorities have also expressed that efforts for water sustainability should also need to include the preservation and reforestation of the peri-urban green belt (Conservation land) (Reforma, 2011). Isla Urbana could use its well-rooted relationship with the Ajusco community, as well as the already active and involved community center in Santo Tomás, to promote environmental and forestry awareness activities that could help contain of the urban sprawl in the Tlalpan area. IU could do this in collaboration with other NGO's through the IRRRI Consortium for example.

## KEY POINTS

IU should continue collaborating with SACMEX by promoting RWH as a sustainable alternative for water supply.

IU's focus needs to be oriented to the areas of the city with the heaviest precipitation rates, since according to the climate change scenarios will have more intense events and are in more risk of flooding.

IU also can collaborate with SACMEX through their skill-development workshops like the "women plumbers" program by organizing rainwater catchment and water reuse workshops. IU also has large collaboration potential in developing attractive and fun consumption and awareness campaigns along with SACMEX

IU has an opportunity on keeping a public record tab or dashboard about its collaborations with the government. Publicizing its collaborations could help push for additional funding or collaborations for follow up and effectiveness measurement.

## OPTIMAL FORMAT FOR COMMUNICATION

IU website. Pitch for a joint training program for women plumbers. Update RWH fact sheet "Lluvia para todos. Por un México Sustentable en Agua". Annual report.



## 4.3.13 Resiliency Office

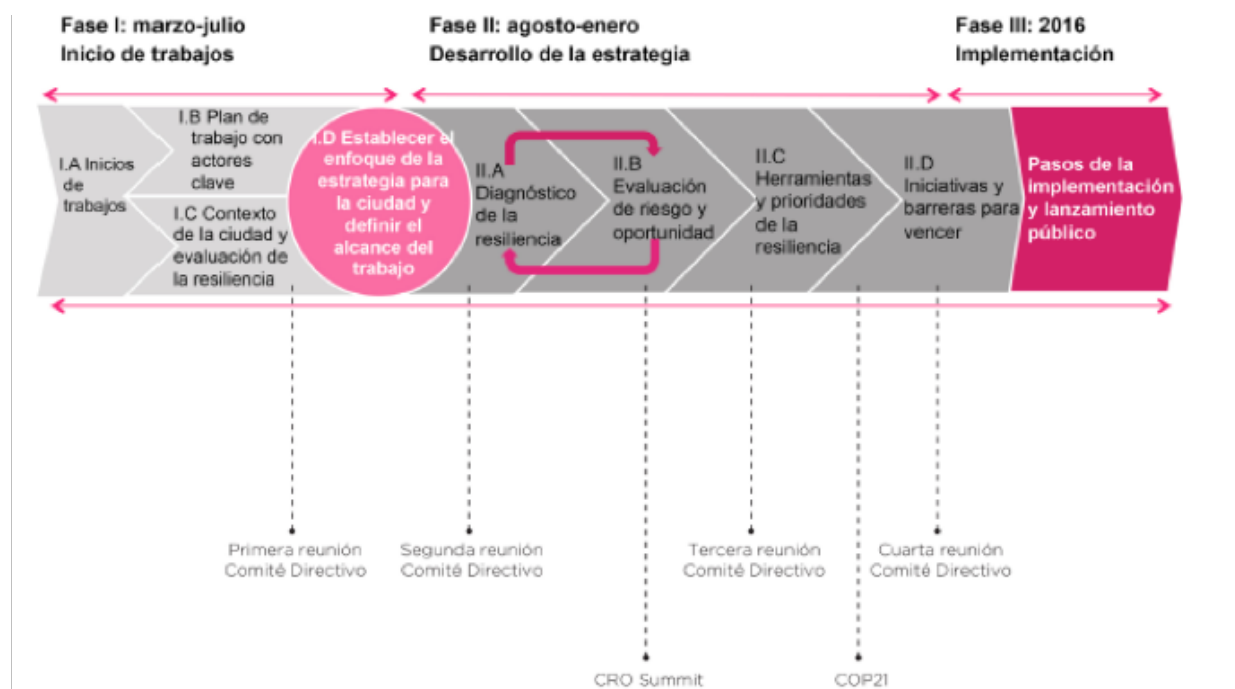
### Contact information:

Chief Resilience Officer: Armando Matus

### OPERATIONAL MODEL

In 2013 Mexico City was elected to be part of the Rockefeller Foundation's 100 Resilient Cities initiative that aims to help cities become more resilient to the physical, social and economic challenges that are a growing part of the 21st century.

The resiliency strategy is a multi-stakeholder effort coordinated by a Chief Resilience Officer (CRO) sponsored by the Rockefeller Foundation. The definition and implementation of the resiliency strategy is organized by the following structure:



(Source: 100 Resilient Cities, Evaluación Preliminar de Resiliencia CDMX, August 2015)

The definition of the strategy is being led by the CRO and two partners: AECOM (infrastructure company) and Arq911 (Architecture studio), who are facilitating workshops with the participation of public, private and academic partners.

The strategy will be implemented by a Steering Committee (Comité Directivo de Resiliencia) integrated by the Mayor Office, City Agencies, private, academic and social actors.

## COMPATIBLE ASSETS

- Resilience strategy: an adaptive transformation facing global challenges (i.e. climate change, chronic stresses (i.e. lack of water access, outdated infrastructure) and sharp events (i.e. floods and earthquakes)
- Emphasis on reducing vulnerability of the poor
- Integration of multiple stakeholders at different scales.
- “Important to foster a saving culture”- Adriana Chávez<sup>1</sup>
- Dialogue with Rotterdam to implement water plazas.<sup>2</sup>

## KEY POINTS

The resilience strategy envisions adaptive transformations in the face of global challenges (like climate change) and chronic tensions that jeopardize the city’s future sustainability: aquifer depletion, conservation land decline, mobility and air quality, among others.

Six focal areas and initiatives will seek to build an equitable society by focusing their efforts in vulnerable groups.

### *1. A resilient future for the Megalopolis:*

Address the dynamic interaction between CDMX and the larger megalopolis. This is particularly important for water management because Mexico City is part of a larger basin and shares resources with other urban concentrations that do not necessarily share a vision for resource management. The megalopolis had 29 million inhabitants (2020) representing 29% of Mexico’s population in just 4.4% of the national territory. The megalopolis includes: 16 municipalities (delegations) in CDMX, 29 municipalities in Hidalgo, 80 municipalities in Estado de México, 33 municipalities in Morelos, 22 municipalities in Puebla, 60 municipalities in Tlaxcala. Thus, strong interinstitutional collaboration is needed.

### *2. Planning for urban resilience:*

Stop degradation of conservation land: Periurban area at the south and east of the city. High ecological value due to environmental services, including aquifer recharge and microclimate regulation. By 2000 irregular settlements covered 2.2% of CL, by 2006 they were 3.1% and by 2010 it was 3.17% (SEDEMA)

### *3. Building a resilient future for the Basin of Mexico Valley:*

IU is already part of this working group on preventing a water catastrophe in the basin. The work will focus on drought and aquifer degradation.

### *4. Resilient urban equipment:*

Hospitals, schools, communication networks, water grid, drainage exposed to climatic or seismic events. Pilot: CEDA

### *5. Resilient economy:*

R!SE initiative to coordinate private sector involvement.

### *6. Resilient transportation system:*

Sustainable mobility culture that promotes health and public space recovery.

<sup>1</sup> Conversation with Adriana Chavez, February 19th, 2016, New York.

<sup>2</sup> <http://www.100resilientcities.org/blog/entry/rotterdam-exchange#/-/>

#### **4.3.14 Narratives: Making the Argument to Diverse Funder Audiences**

Accompanying the qualitative tools featured earlier in this chapter are several narratives, drafted to convey some of the more human-focused benefits of rainwater harvesting. These are aimed to appeal to funder audiences who value the social benefits a company offers to society. These stories are intended to capture the attention of potential funders by portraying how rainwater harvesting fortifies water security, which in turn has a myriad of knock-on benefits for households and individuals. The following stories are:

1. Women's Empowerment & Water Accessibility in Mexico City
2. Female Plumbers
3. Health & Educational Benefits of Rainwater Harvesting: Households/Schools
4. Citizen Empowerment
5. Creating Shared Value
6. Conflict Management

#### **4.3.15 Women's Empowerment & Water Accessibility in Mexico City**

##### **Intended Audience**

Potential donors such as the United Nations, who often require elements of gender equality and women's empowerment in project proposals. This could also be valuable for the beneficiaries themselves, as a tool for understanding the long-term benefits of rainwater harvesting.

Gender Equality and Women's Empowerment are part of Sustainable Development Goal (SDG) 5. As a basic element of human rights, the widespread recognition that the increased involvement of women in the workforce and their ability to earn money independently has a variety of positive effects. When women are earning money they reinvest up to 90% of their income back into their households, which means improvements in their family's health and nutrition, as well as better education for their children.<sup>1</sup> Inadequate infrastructure that impacts access to basic necessities such as water can impact a woman's ability to enter the workforce and achieve these benefits for her family, and independence for herself. UN Water estimates that globally women spend 200 million hours each day, collecting water for themselves and their families.<sup>2</sup> Instead that time could have been spent on education, earning an income, spending time with their families, or contributing to their communities. Although in Mexico the trend over the past decade has actually seen more women entering the workforce and contributing more to their household's income, this trend only applies to women who are unburdened by the effects of inadequate infrastructure, which creates water insecurity.<sup>3</sup>

Many Mexican households impacted by water insecurity must stretch their water as far as possible. This traditionally falls to the women, who often devise innovative ways to reuse water, such as utilizing dirty grey water that has already been used to wash laundry for flushing toilets. The time and energy expended in wringing every last possible use from the limited amount of water available could have been spent earning an income. In these same peri-urban communities where jobs are scarce, you will find women earning extra money through cooking or doing laundry for other households. Access to a reliable source of water could ensure a steady source of income for themselves, which in turn provides benefit to their families and communities. That is why SDG target 5.4 specifically calls for the recognition and value of unpaid care and domestic work through the provision of, among other things, public services and infrastructure.

Water insecurity also impacts health and sanitation, with females once again experiencing the greatest burden. Girls without adequate access to sanitation are more likely to miss school, negatively impacting their education and development.<sup>4</sup> SDG 6 therefore suggests that ensuring access to water and sanitation for all with a specific caveat to pay 'special attention to the needs of both women and girls'.

Rainwater harvesting is a sustainable solution to addressing water insecurity in Mexico City, and will help

<sup>1</sup> Ruth Pearson et al., *Because I am a Girl: The State of the World's Girls 2009* (New York: Plan International, 2009), 137 – 155.

<sup>2</sup> "World Water Day 2016," UN Water, accessed 12 March 2016, <http://www.unwater.org/worldwaterday>

<sup>3</sup> Carmen Pagés and Claudia Piras, *The Gender Dividend: Capitalizing on Women's Work* (Washington DC: Inter-American Development Bank, 2010).

<sup>4</sup> Pearson et al.

citizens and government achieve the aforementioned Sustainable Development Goals. Moving towards gender equality through empowering the female population will yield positive and progressive benefits throughout the entire society.

### **4.3.16 Defining a Program Area: The Case for Female Plumbers**

#### **Intended Audience**

Organizations such as SACMEX, the Social Development Office, myclimate, Cambio Azul, and any other organization that provides partnership potential.

As its capacity expands, Isla Urbana will need a larger and larger body of well-trained, highly reliable workers to install, maintain and follow up on systems. IU has already successfully trained 12 local plumbers as current or past RWH installers, with three of them (a group of brothers), surpassing all expectations and being promoted within the organization. They now manage installations, run IU's warehouse, and to take new potential installers on for trials and possible apprenticeships.

Workforce training and the creation of skilled jobs that pay a living wage are important aspect of capacity building in low income communities. Adding definition and metrics for success to this area of work where IU is already succeeding could help bring in new funders and would also be a continuing tie to the lives of residents in areas where rainwater harvesting systems are proliferating. For this reason, a program outline is developed below with reference to other successful initiatives leading to skilled jobs for women.

#### **The Idea**

An opportunity may exist for partnering with SACMEX and the Social Development Office to couple training in rainwater harvesting technology with their program for training female plumbers. That program was initiated during a drought as a method to quickly fix leaks to improve water and energy efficiency. Additionally, the Director of IU has expressed an interest in training a group of women, specifically those selected through a program working on job training initiatives with victims of sexual trafficking.

#### **Previous Efforts**

A temporary program to train female plumbers was initiated during drought conditions in 2009, the driest period Mexico City had experienced in 68 years. The Mexico City Water Commission trained 570 women between the ages of 18 and 65 as plumbers to detect and repair leaks in homes. The program was designed to save water and as temporary employment for women. The local government had plans to hire the plumbers to repair plumbing at schools and public markets the following year (did this happen?). The then-mayor of Mexico City, Marcelo Ebrard, MCed the graduation.

As of December 2015, myclimate, a non-profit climate protection organization based in Switzerland, was sponsoring a program with Cambio Azul to install water saving devices in thousands of homes in Mexico City while training 500 female plumbers. Since the program began in 2012, it claims the following accomplishments:

Water saving devices have been installed in 17,000 households  
 45,000 devices (1-3 devices per household) have been installed  
 50 women plumbers have been trained so far, with a goal of 500. An average savings of 40% on gas and water, equaling USD 300 per year (= 44 days of yearly average income of target group)  
 Each household also reduces carbon emissions by 1-1.4 t CO<sub>2</sub> per year

Myclimate could be an additional partner for IU, and possibly help fundraise to support IU's job training initiative.

## The Environment

The training and certification regime for plumbers in Mexico is often not formalized. Most local plumbers in the areas where IU works are trained by friends, relatives or neighbors. As in other countries, plumbing and other skilled trades are predominately male-dominated in Mexico. Though women are equal and protected by various statutes under Mexican law, including the Convention on the Elimination of All Forms of Discrimination Against Women from July 1980, there is still significant workplace discrimination against women in both formal and informal work situations.

This has also been a challenge in terms of women breaking into skilled trades in the U.S. that have long been high-wage and male dominated. Several nonprofits exist to support women in this challenge, such as Chicago Women in Trades, Nontraditional Employment for Women (located in NYC), and Women Unlimited (in Maine). While designed to help women overcome the more formalized barriers to obtaining the union memberships, apprenticeships and more advanced placements they need to be fully certified in skilled trades, they may provide useful partners in designing curricula and assessing participant success. They may also provide models for how IU could partner with Mexico's National Employment Service to have its job training activities or apprenticeship placements subsidized.

## The Proposal

IU begin by taking on a pilot group of 3-4 women, either with previous training in plumbing or a strong desire to pursue jobs in the construction and maintenance of rainwater harvesting systems. The women are apprenticed for six months to IU's team of experienced RWH installers. At the end of their apprenticeship, they are either employed by IU or provided with job placement assistance. Ideally, at least some will find placement within the organization, perhaps in the built-out area of rainwater harvesting system maintenance. Those not successfully employed could be referred to continued job training, in partnership with existing programs for training women as plumbers.

This extension of IU's job training efforts will require additional capacity for training, which will slow down installations, as well additional expertise in case management, to assist with job placement and also to follow up with the graduates at regular intervals to keep track of their career progress as well as to quantify their earnings advancement.

### 4.3.17 Health & Educational Benefits of Rainwater Harvesting

La utopía está en el horizonte. Camino dos pasos, ella se aleja dos pasos y el horizonte se corre diez pasos más allá. ¿Entonces para qué sirve la utopía? Para eso, sirve para caminar

Eduardo Galeano

## Intended Audience

IU could build upon this argument, using this story to address capital holders and donors (both private and public) as well as potential partners (e.g. the Rockefeller Foundation 100 Resilient Cities)

## Public Health Effects

There is a powerful correlation between access to water and benefits in health and education. This notion is supported by a 2013 study conducted by Barde,<sup>5</sup> in which standardized test scores are higher for students that have consistent and convenient access to quality water<sup>6</sup>. The results were seen that the effect of regular access to water at a student's home had a significant<sup>7</sup> impact on academic test scores, particularly for

<sup>5</sup> The impact of Access to Piped Drink Water on Human Capital Formation - Evidence from Brazilian Primary schools. Barde, Julia Alexa. ECONSTAR. 2013.

<sup>6</sup> Consistent access to quality water was defined as piped water in study; for these purposes consistent access is defined as presence of a RWH system

<sup>7</sup> How important is clean water for education. Mejia, Francisco. Inter-American Development Bank.

families with lower incomes.

The World Health Organization has documented water-related diseases in Mexico. Specifically, Hepatitis E is associated with poor water supplies and lack of or poor sanitation and hygiene practices; resulting in infection and/or inflammation of the liver<sup>8</sup>. While proper precaution that might reduce the occurrences of Hepatitis E include, education in sanitation and personal hygiene, hand washing, and adequate and clean water supplies<sup>9</sup>, households without regular access to water are more susceptible to illnesses. Clean and adequate water via a RWH system will enable members of a household to practice increased hygiene and sanitation, decreasing the chances of water-related diseases.

Studies also indicate that water related diseases among school age populations will negatively impact attendance, classroom participation and performance<sup>10</sup>. Reasons for these findings range from varying levels of nutrition at home, hygiene practices and education, financial resources and time to focus on school-related activities. Furthermore, student attendance is impacted by intermittent water delivery times. Households in peri-urban areas of Mexico City must have someone home for a water delivery, and can wait up to 30 days for the truck to arrive. These long wait times and the need for someone to be present at the time of a delivery can hinder student's attendance rates, negatively affecting their academic achievements.

Other related health issues noted in peri-urban areas of Mexico are poor nutrition and sanitation for infants. Mothers noted the stress or lack of water interfered with regular cleaning, cooking or hydrating young children. Improved water solutions can significantly reduce diseases such as diarrhea, trachoma, pneumonia and other water related illnesses that are young children are particularly vulnerable to<sup>11</sup>.

### Household Water Resilience

The various public health dilemmas inflamed by water poverty and insecurity, are projected only to worsen with time, as Mexico City's population continues its record growth. The challenge of providing water to an ever-increasing number of households is already a real threat to the city's hydrological resilience.

Mexico has had an accelerated urban growth in the last four decades. Housing, sustainability and resilience represent a big challenge for Mexican cities, since urban population is expected to grow from 80.4 million (2010) to 103.3 million in 2030.<sup>12</sup>

Mexico City, with about nine million inhabitants holds 8% of the population in Mexico and is the entity where houses are better served in terms of water, drainage electricity and urban infrastructure in the whole country. In 2010, Mexico City had about 2.4 million inhabited homes, where 67% were particular houses, 24% were apartments and the remaining percentage was unspecified<sup>13</sup>. In spite of having the best urban infrastructure of the country about 12.6% of houses in Mexico City did not have access to piped water according to the last census,<sup>14</sup> with poor areas located south and east are the ones who are often most affected. The Delegaciones subsidize pipa trucks and eligible families pay \$100 pesos (5.50 USD) per service. A non-subsidized pipa can cost \$900 pesos (50 USD) in average for the Ajusco communities and prices scale up depending on demand.<sup>15</sup>

CONAPO, the population authority in Mexico estimates that 37, 000 new homes will be formed in Mexico City every year between 2013-2018<sup>16</sup>. Since homes will continue growing in Mexico City, homes are a crucial unit in building sustainability and resilience.

<sup>8</sup> World Health Organization. Water Sanitation Health. [http://www.who.int/water\\_sanitation\\_health/diseases/hepatitis/en/](http://www.who.int/water_sanitation_health/diseases/hepatitis/en/)

<sup>9</sup> World Health Organization. Water Sanitation Health. [http://www.who.int/water\\_sanitation\\_health/diseases/hepatitis/en/](http://www.who.int/water_sanitation_health/diseases/hepatitis/en/)

<sup>10</sup> Water, Sanitation, and Hygiene Program in Basic Education. Document of the Inter-American Development Bank. (ME-L1086)

<sup>11</sup> Water, Sanitation, and Hygiene Program in Basic Education. Document of the Inter-American Development Bank. (ME-L1086)

<sup>12</sup> Fundación Hogares El Ideal del Hogar, INFONAVIT, 2016.

<sup>13</sup> INEGI, Documentos del Censo Nacional de Población y Vivienda, Entidad: Distrito Federal [http://www.inegi.org.mx/prod\\_serv/contenidos/espanol/bvinegi/productos/integracion/estd\\_perspect/df/Pers-df.pdf](http://www.inegi.org.mx/prod_serv/contenidos/espanol/bvinegi/productos/integracion/estd_perspect/df/Pers-df.pdf)

<sup>14</sup> Niall, Nolan, Potential for potable water savings by Using Isla Urbana rainwater harvesting systems in Tlalpan, Mexico City.

<sup>15</sup> Familia Castaneda, Interview March 19<sup>th</sup> 2016.

<sup>16</sup> Gaceta Oficial del Distrito Federal, Programa General de Desarrollo Urbano 2013-2018, September 11, 2013 [http://www.consejeria.df.gob.mx/portal\\_old/uploads/gacetas/522fe67482e50.pdf](http://www.consejeria.df.gob.mx/portal_old/uploads/gacetas/522fe67482e50.pdf)



Mexico City needs gets 31 m<sup>3</sup>/s of water every day, where the depleted underground aquifer represents 67% of the sources<sup>17</sup>. According to INEGI Mexico City extracts almost three times more water from the aquifer than its natural recharge rate, making its continued exploitation an unsustainable alternative<sup>18</sup>. The rest of the water demand of the city is covered by superficial water from Lerma and other local springs, as well as imported water from the Cutzamala basin.

On the other hand, according to Centro Virtual de Cambio Climático en la Ciudad de México, the Cutzamala basin is highly vulnerable to climate change impacts due to ageing piping infrastructure, clandestine withdrawals and the increase in temperatures in the catchment zones<sup>19</sup>. Additionally, the Lerma basin already suffers from drought, and in a climate change scenario this situation could worsen.

As defined by the Rockefeller Foundation 100 Resilient Cities, resilience is the capacity of individuals, communities, institutions, businesses and systems within a city to survive, adapt and grow no matter what kinds of chronic stresses and acute shocks they experience.<sup>20</sup>

But the big question is: how does a single house contribute to building urban resilience? Beyond an idealistic vision where citizens take sustainability and other urban issues in their own hands, households could have tangible impacts in the overall city resilience using technology and efficiency measures. For example, it estimated that between 30 to 50% of water is wasted in homes, due to outdated technology and consumption habits.<sup>21</sup> If actionable attempts were made to change these habits, the aggregation of efforts could create an important impact in urban sustainability.

Using this approach, households could contribute by:

1. Reducing their demand of water by installing water-saving technologies such as efficient shower heads and taps and low water consumption toilets. According to Mexico City's government, using water-saving technologies could reduce the water demand by 68%.<sup>22</sup>
2. Reducing the output of waste water by recycling and recovering water, for example reusing water from dish washing to toilet flushing. Some of the severely restrained households in Tlalpan are already taking these kind of actions.
3. Multisourcing or using local and renewable sources, like rainwater, to cover the population's demands.

According to Isla Urbana case studies, residences that have been using rainwater harvesting systems can cover between 40 to 70% of their demand<sup>23</sup>. According to a household interviewed on March, rainwater can provide enough water for use for up to 9 months.<sup>24</sup> If it is considered that Isla Urbana alone has installed 1,600 systems, the aggregated impact begins to be important.

If more and more households can install rainwater harvesting systems and apply consumption reduction initiatives, the city could lessen the burden over the aquifer and other sources, addressing one of the most pressing chronic factors for the resilience strategy. More than that and, considering that households are more than just buildings, where individuals reinforce their values and beliefs, rainwater catchment at the household provides an immense opportunity to raise citizenship and awareness towards environmental resources and consumption.

<sup>17</sup> Ibid.

<sup>18</sup> Gómez-Reyes, Eugenio, "Valoración de las componentes de balance hídrico usando información estadística y geográfica: la Cuenca del Valle de México", Revista Internacional de Estadística y Geografía, INEGI Vol.4, num 3, Sept-Dec 2013

<sup>19</sup> Óscar A. Escolero Fuentes, et.al., "Recursos Hídricos", in Jesús Efrén Ospina Noreña, Carlos Gay García, Cecilia Conde, María Amparo Martínez, compilers, La Ciudad de México ante el Cambio Climático Centro Virtual de Cambio Climático en la Ciudad de México, 2010, pp. 7-22.

<sup>20</sup> <http://www.100resilientcities.org/resilience#/-/>

<sup>21</sup> <http://revistadelconsumidor.gob.mx/?p=40635>

<sup>22</sup> [http://cuidarelagua.df.gob.mx/agua\\_ciudad.html](http://cuidarelagua.df.gob.mx/agua_ciudad.html)

<sup>23</sup> <http://islaurbana.mx/servicios/servicios-para-la-casa/>

<sup>24</sup> Familia Castaneda, Interview March 19<sup>th</sup> 2016.

### 4.3.18 Citizen Empowerment: Community Engagement and Self-Sufficiency

#### Intended Audience

Donors and/or capital holders, specifically private capital benefactors, international organizations, and/or government organizations. The donor or federation should prioritize water security and community engagement. This narrative could also appeal to anyone who is interested in the water management system as a whole.

Rainwater harvesting can help empower communities by engaging with both macro and micro approaches/ increasing self-sufficiency on an individual level and understanding the associated wide-scale impacts that results from aggregation. To do so requires community participation at both planning and implementation stages. The goal is a coordinated effort that will support emotional investment, a sense of empowerment and an understanding of individual, community and city-scale benefits among the beneficiaries.

In many of the communities that IU works with, the strength of the social capital holding the community together is great. Here, people pull together to resist a system that is often harshly stacked against them. Leveraging this to ensure success in implementation, IU's work can have far-reaching effects in helping many break free from the cycle of poverty and exclusion that exists.

#### Community Engagement

IU focuses a significant amount of its efforts to engage with stakeholder communities. IU operates under the philosophy that a community needs to first understand and acknowledge that a problem exists and that an alternative solution is available. This is a crucial step that must occur before a solution offered from the outside can be accepted; to avoid any sense of paternalism. IU hopes to aid the process of the understanding and calls it "revealing". Through education campaigns and community engagement, IU wants to promote community ownership of their water supply.

#### Promoting Self-Sufficiency

RWH is an important tool in allowing people to become independent from the conventional, yet unreliable supply of water. Particularly in the marginalized, urban peripheral communities where IU works, households are excluded from the system and therefore have to pay a disproportionately high amount for their water.

Paying more per liter than a typical family living in central Mexico City, the knock-on effects of the lack of water permeate throughout peri-urban communities, across genders, social groups and ages. IU offers these constituents the ability to secure their source of water for approximately 5-8 months of the year, with the installation of a RWH system. This will significantly affect their ability to save money and attend work or school with certainty, freeing them from the constraints of water insecurity.

By obtaining their own RWH system, households can also breakaway from a reliance upon government subsidies when their water tanks run dry. The nature of the system is such that the uncertainty associated with pipas truck deliveries (5 to 30 days); and the amount that they must pay for normal amount of water further exacerbates the difficulties and costs of daily life in the urban periphery. The ability to be free of this dependence empowers community members to break the cycle and change their "water destiny".



### 4.3.19 Creating Shared Value

#### Intended Audience

This narrative is designed to inform Isla Urbana and large corporations on Shared Value Creation (SVC) and its related benefits. By transforming business practices towards shared value corporations such as Coca-Cola, Nestle and Johnson & Johnson; all of which operate within Isla Urbana's reach, and could achieve potential financial benefits for the organization.

#### What is Shared Value?

SVC is an innovative way to achieve economic success. It is an understanding that business and communities prosper together via actions, operations, and investments in time and resources that address social and environmental challenges. Treating social problems as business objectives can lead to efficiencies, innovations, competitive advantages and increased profits. To create shared value is to identify societal needs, and address those needs via a business model that generates both economic and social value for the corporation and surrounding communities; thus connecting company success with social progress.

There are numerous advantages for corporations operating in Mexico to create shared value. These may present themselves as cost savings, improved water efficiencies and climate change adaptations. Recognizing the significant water problems present in Mexico City, Isla Urbana could play an important role in helping organizations implement strategic changes through their technology. This is an example of benefit that serves both the organization and surrounding communities. While corporations stand to gain from economic benefits, such as decreased vulnerability to fluctuating water prices, the greater society and environment will also prosper from a decreased stress on the water supply.

#### Potential Projects/ Partnerships

A potential partnership with Coca-Cola, for example, could employ the use of IU's rainwater harvesting technology to help reduce the latter's water footprint. Through their existing partnership with UNDP in the 'Every Drop Matters' program, Coca-Cola is already heavily involved in water stewardship programs in Europe, the Middle East, and Asia.

Nestle also has several initiatives on creating shared value with regard to water. These include water efficiency measures across operations, advocating water stewardship, raising awareness on water conservation techniques, providing education and training, and improving water access: all of which help Nestle align their water goals with business objectives.

IU is well positioned to help companies like Coca-Cola and Nestle integrate water stewardship into their Mexican operations through the installation of rainwater harvesting technology at their operations. Corporations will benefit by reducing costs and their environmental impact, as well as increasing community relationships. IU will also benefit from the increased visibility and exposure that will come from having large corporations seen using their technology.

### 4.3.20 Conflict Management

According to the UN, water is a universal human right. But in Mexico City, the threats of water poverty and insecurity seem to be increasingly more frequent.

Two years ago a riot broke out in San Bartolo Ameyalco, in response to a water pipe that ran through this town, solely to provide better quality water to wealthier areas of Mexico City. And a recent article in The Guardian entitled, "Mexico City's Water Crisis – from source to sewer," captures much of the fear that politicians, engineers, and citizens face, as "conflict between communities" looms on the horizon as social, economic, and health-related costs continue to mount. This violence attributed to water stress is a real cause for concern in Mexico City, as it has the potential to cause disruptive turmoil, further exacerbating the divide between those who have convenient and frequent access to clean water, and those who do not.

The struggles and inequities surrounding clean water accessibility in Mexico City are escalating, as uncontaminated water becomes increasingly more cost intensive to provide. And given the dilapidated state of Mexico City's current water infrastructure, it is unlikely that the federal or municipal governments will be able to provide a substantial, centralized solution to the water crisis in the near future.

However, there is an empowering and viable solution available for the citizens of Mexico City. Rainwater-harvesting systems from Isla Urbana allow households to capture their water independently, supplementing what is received from the taps and the water trucks that supply families remotely. Rainwater harvesting is an empowering technology that allows citizens to take ownership in the water supply, reducing dependence on existing water infrastructure, which in turn will hopefully mitigate future conflicts born from inequitable access to this essential resource.

Rainwater harvesting will help ensure communal prosperity for future generations of Mexico City residents, mitigating the potential for future conflict and social unrest. Isla Urbana is helping pave the way for a more secure and healthy city.

## 4.4 Organizational Capacity

This section includes some tools and recommendations that will help IU build the internal capacity to deal with rapid expansion and additional funding complexity. First, it will need more and better ways of measuring the outcomes of its installations based on a few key variables in order to report to additional funders. We have created a calendar that could serve as a communication tool between IU and customers of its installations. On one hand, it outlines needed steps in the maintenance of a household's rainwater harvesting system and promotes adoption through interactive educational tools. On the other hand, it allows users to track important milestones such as how long their systems provide water before they need to call a pipa truck, both promoting optimal system use and capturing user data.

Besides improved and streamlined data collection methods, an important aspect of this area is the creation of internal structures and systems that will increase organizational capacity and facilitate growth. The tool we offer for this aspect of IU's development is a draft job posting for the position of COO, a key post in creating business and internal systems up to the challenge of large-scale change.

### 4.4.1 Calendar

The calendar facilitates direct communication between Isla and the client after a system is installed. Each month contains either an activity, a game/contest, or information relating to water, water use and rainwater harvesting. The content is split between two distinct audiences: children and adults, allowing participation among the entire family. Isla's contact information is also listed at the bottom of each page, to encourage the client to reach out in the case of a question or confusion. The aim here is to help condition families who have little faith in service offerings, to become more familiar with the amenities and relationships their rainwater harvesting system brings.

We envision the calendar as a tool to help bring Isla within the home as a trusted partner and friend. As an item that will remain usable in the household throughout the entire year, the calendar also provides opportunities for data collection. Stickers are incorporated to remind users of monthly maintenance or denote occurrences such as cistern overflow or when it is empty. The concept of both encouraging awareness and recording data, would be used to provide Isla with insight into how the systems are being used. At the end of the year, the calendar can be collected and exchanged for a new calendar; at which point the data entered over the twelve months will be available for analysis. A digitized version of the calendar would also be available for clients who own smartphone and tablet devices.

The interactive content for all twelve months, in addition to a watercolor mockup of the calendar can be found in the **Appendix, Section A3.0**. We hope that you will take our ideas and make it your own, using the graphic expertise that makes Isla's branded content so special.

#### 4.4.2 COO Appointment (Assisting Growth of the For-Profit Section)

Isla Urbana  
 Chief Operating Officer  
 Isla Urbana  
 Av. División del Norte 2745, Int. 2,  
 Coyoacán, Barrio San Lucas, 04030  
 Ciudad de México, D.F., México  
 +52 55 5446 4831

Founded in 2009, Isla Urbana's mission is to implement rainwater harvesting in low-income communities in Mexico. We have designed an environmentally, socially, and economically sustainable rainwater harvesting system that collects and cleans rainwater for households, schools, community centers and others. The system is inexpensive, easy to install, and provides individual residences with about 40% of their water supply per year. Our rainwater harvesting systems promote sustainable water management practices and provide a reliable source of water for the citizens of Mexico City and for other communities in Mexico.

As Isla Urbana is poised to grow and contribute to change in Mexico, we seek a seasoned Chief Operation Officer to oversee Isla Urbana's business development while fostering the organization's core values and strategic planning projections.

##### Position

Isla Urbana, made up of both for-profit and not-for-profit sides, has been growing steadily and is now seeking to dramatically accelerate its growth. It is looking for a mission-focused, seasoned, strategic, and process-minded leader with experience scaling an organization. The COO must be able to help others at Isla Urbana deliver measurable, cost-effective results that make the vision a reality. Importantly, the successful COO will have the skills, sensitivity, and personal confidence to tap into the power that each member of the team brings to this mission. While it is essential that the COO bring efficient and effective systems to increase the productivity of the organization, it is also critical that the team retain the creative spark that drives the organization's concept.

##### Responsibilities

Reporting to the General Director, the COO will lead all the internal operations of Isla Urbana's for-profit arm and will have the following responsibilities:

- Oversee marketing and finance campaigns to expand the market for rainwater harvesting systems, maximize client satisfaction, and foster the growth of the organization.
- Coordinate the annual operations planning, budgeting and revenue projections
- Lead the performance management process that measures and evaluates progress against goals for the organization
- Build fundraising and sales infrastructures
- Increase fee-for-service contracts and build out post-installation maintenance service offerings
- Identify growth opportunities and priorities
- Develop an accounting system that provides the organization with quick access to financial information and enables strategic budgeting

##### Key Qualifications

As a prerequisite, the successful candidate must believe in the core values of Isla Urbana and be driven by the mission. The candidate should demonstrate a passion for breaking new ground to lead social change. Beyond that, we are seeking a candidate that has proven experience in scaling a business organization and a demonstrated ability to both lead and build the capabilities of a driven, bright, diverse team. The successful candidate will have had management experience with a for-profit organization. Experience in managing a "values-driven" organization will be highly prized.

**Additional preferred characteristics:**

- Results-proven track record of exceeding goals and a bottom-line orientation; aptitude for problem solving, project management, and creative resourcefulness
- The ability to think strategically, anticipate future consequences and trends, and incorporate them into the organizational plan rapidly
- Skills and experience to effectively build organizational and staff capacity, developing a top-notch workforce and processes that ensure the organization runs smoothly
- A thorough understanding of finance, systems, and HR; broad experience with the full range of business functions

*For more information, please visit [www.islaurbana.org](http://www.islaurbana.org)<http://www.islaurbana.org/english>*

# **Chapter 5: Medium Term (5 - 9 years)**

## *Making the Data-Driven Case for RWH at the City Scale*

*MEDIUM - TERM*



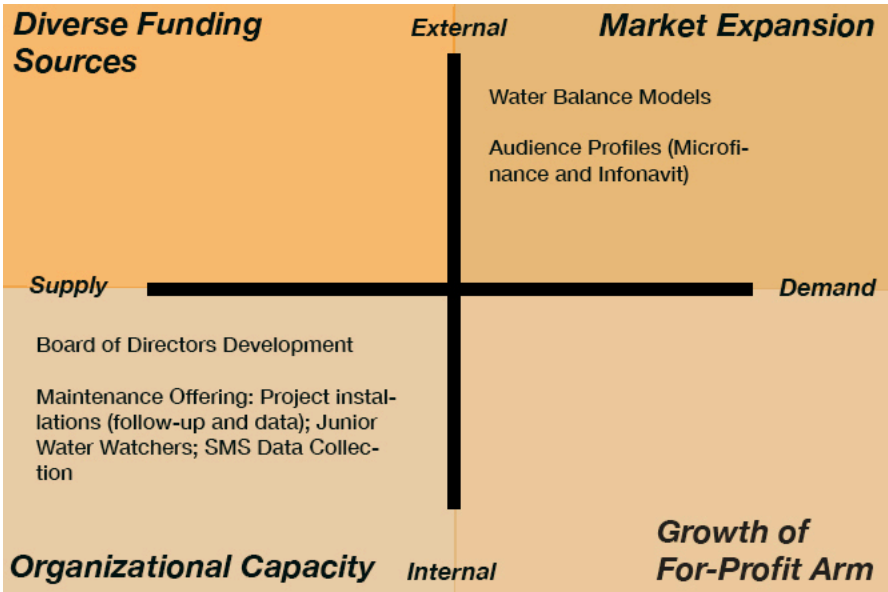
Congratulations, and welcome to part two of the growth plan; also known as Medium Term. While the short term goals presented in the last chapter focused on diversifying Isla’s funding sources and strengthening the for-profit arm, as well as expanding within Tlalpan, this term focuses on spreading operations into the South-western portion of Mexico City, the area with the highest yearly amount of rainfall.

The following analysis on Green Mortgages (Infonavit) and microfinancing opportunities will allow Isla to pursue an additional segment of the population as customers and thus to diversify its client base. This will also help lower its reliance on government funding, thus providing greater financial stability.

The city government will have changed after the 2018 elections. It would therefore be beneficial for IU to prepare itself with clear data to show positive impacts of rainwater harvesting with regard to health, education and environmental benefits of IU installations, necessary to make a data-driven case to support IU. The water models in this section will fortify the notion that the environmental impacts are not just localized, but benefit all of Mexico City. Internally, IU will need divisions to specialize in areas such as: installation, maintenance, financing and follow-up. All of these internal divisions will need relevant data tracking.

To ensure a successful geographic expansion to the other rainy areas of the city, an analytical focus on improved data collection for the proposed maintenance programs, has been provided; this would cater to both the private and subsidized installations. IU must be able to continue to grow steadily and handle all the necessary capacity increases. Monitoring and evaluation of projects is necessary both for an external audience – to see the benefits of their donor money – and internally – for the organization’s own benefit to determine areas of improvement. Also recommended in this term is the establishment of a board of directors, to further enhance the internal accountability and credibility of IU as a non-profit organization.

### 5.1 Market Expansion



Welcome to the market expansion section of the medium term portion of this growth plan! All of the efforts in the short term have brought you to a place where Isla Urbana is poised to grow its reach to new delegations and customer demographics. By standardizing the pilot program in Tlalpan, IU can now focus on growing its presence in delegations such as Iztapalapa and Xochimilco, areas in the southwest that experience incredibly wet rainy seasons.

Additionally, Isla Urbana can grow its client base to new constituents who fall somewhere in-between the demographics that require subsidies, and those who are more financially well-off. The following combination of tools, profiles and narratives focus on opportunities in microfinancing and Infonavit (as well as individuals

in the formal working community). The following provides essential bits of information, intended to inform Isla Urbana on opportunities within both of these spheres.

### **5.1.1 Market Expansion: Microfinance**

Microfinancing allows IU to continue its market expansion within low-to-middle income communities, as well as any household that may have difficulty paying for an installation. Improvements in water access, made possible through sustainable technologies, is one of many targets that microlenders are specifically addressing.

Several lending organizations have been vetted as an optimal fit for Isla Urbana based on their requirements, ensuring that IU's system would be an eligible technology for funding. Microfinancing provides low-income residents who have little access to credit opportunities to obtain loans at more affordable rates. Ultimately, exploring these opportunities expands Isla Urbana's client-base to an entirely new assembly of beneficiaries; thus expanding the market for rainwater harvesting.

The first of the following two documents is a FAQ sheet about microfinancing, which aims to answer some of the more general inquiries this demographic of constituents might have. The second is an in-depth analysis of Kiva a popular organization that pairs beneficiaries with microlenders. This analysis details organizational information about Kiva partners that would be excellent potential collaborators with Isla Urbana.

### **5.1.2 Microfinance FAQs**

#### **Introduction to Key Concepts and Ideas of Microfinancing**

Microfinancing offers a secure alternative avenue to access financial services, which serve a broader purpose of facilitating income-generation opportunities, stable consumption and risk reduction for individuals and households who are typically ineligible for such opportunities and benefits.

#### **What is microfinancing?**

In the regions where IU works, the socio-economic fabric is extremely diverse. On one end of the spectrum, members can apply directly for government subsidies, and on the other, those with formal jobs may allow them to independently purchase the system. A certain group falls in between, and this is where microfinancing offers a huge potential for extending IU's reach. Individuals in this category may have small businesses, which generate some stable income. Their purchasing power may be limited and microfinancing may be the best or only option to afford high upfront costs of purchase.

Nonetheless, IU would need to champion the creation of specific financial programs, customized to meet the economics of IU's client base. IU must make the case to their selected financial partners, for creating specific APRs (annual percentage rates) and repayment structures. This would help groups or individuals to access the RWH units while maintaining financial stability for both the microfinancing organization and IU's customers by avoiding high default rates.

#### **What is the difference between a micro financing institution and a bank?**

Microfinancing Institutions (MFI) differ in size and reach; some serve a few thousand clients in their immediate geographical area, while others serve hundreds of thousands, even millions, through numerous branches. Many MFIs offer services beyond loans and savings, including education on business and financial issues and social services focused on health and children.

#### **Who holds the debt of a loan?**

Borrowers who take out loans are the ones who hold the debt. Borrowers are considered either an individual or group of individuals. Depending on the amount of the loan, some microfinancing organizations will require the borrower to put up some sort of collateral (valuable possessions), which he/she must be willing give-up to serve as offset in case of their inability to pay. Many microfinance organizations in Mexico offer loans without the need to verify the borrower's financial or income credentials by charging extremely high APRs.



### **Why pursue funding from a microfinancing institution rather than a traditional bank?**

Much of Mexico City's underserved population typically won't qualify for formal lending from a bank, due to a lack of credit history. Some banks will require insight on a savings account, which many residents are might not have. Given all the latter, these people still need access to capital for improvement of their lives.

### **What does it mean to default on a loan? What happens if a borrower defaults?**

When a borrower is unable to make his or her scheduled loan payment, he or she might default. Before funds are lent, borrowers are screened by the local Kiva Field Partners that look for factors such as loan history, village/group reputation, loan purpose, etc before deeming a borrower worthy. Still, defaults might happen due to unforeseeable issues such as: health issues, civil disturbances, currency fluctuations etc. If a borrower defaults, field partners will likely pursue collections, while adhering to Client Protection Principles from the Smart Campaign.

### **Who is responsible in case of default? How does default affect the NGO's ability to continue to work with the microfinancer?**

Since most lenders provide the loans under personal or group agreements, default-related penalties will go directly to the individual or groups that obtained the loan. Nonetheless, a high default rate could discourage institutions from distributing more loans, which could also encourage them to change the repayment structure and agreements with any customized programs that might have been created for Isla Urbana. It is therefore important work closely with microfinance institutions to provide eligible clients with the best financial tools.

### **Do microfinance institutions offer financial education opportunities?**

Yes. Microfinance institutions hold a variety of financial education courses, which vary from introductory to more extensive business application and financial planning. Sometimes a third party organization such as water.org or Kiva can supplement the community with further education on debt management. Isla Urbana could participate in these educational programs by creating workshops tailored to their clients' needs. This could be facilitated via joint partnership with selected micro-financing institutions and governmental organizations that offer financial services to the community.

### **Can microfinance be combined with government subsidy?**

Yes, as long as the borrower meets all the qualifications and conditions set by the microfinance institution. Since many microfinancing loans are used to help individuals access services or improve human development, they may be combined with public assistance, grants or other financial tools.

### **What are the lengths of loan payback?**

Payback periods vary greatly due to geographic location, the lending organization's finances and the type project the loan is funding. Therefore, payback periods can range anywhere from 6 months to 5 years. Organizations such as KIVA offer an average loan size of USD \$200 with APRs ranging from 0-30%, depending on the financial partner selected; the average payback period is approximately 14 months. Since Isla Urbana's client-base is quite diverse, the average size of the loan and payback period will likely vary. Therefore, it might be best for IU to create a variety of customized rates and repayment structures, tailored to meet the range of its client's needs.

### **How do the typical lending amounts measure up to the cost of IU's technology and services?**

The typical loan value is around \$200 USD with popular micro-lenders such as KIVA. Therefore, Isla Urbana could face the challenge of requesting institutions to raise the loan size on single individuals or households, since RWH units range from \$500 to \$1000 USD. However, partnerships with microlending institutions could result in the creation of programs tailored to cover the total cost of IU's technology and services fees.

### **How are payments made?**

Payment could be collected a number of different ways. If the technology is available, payments could be made via mobile device, with the fees applied to the mobile provider. Other methods include paying at a local tienda or market, and/or meeting the organization's representative to pay in person. A recommendation for collection could be to leverage existing relationships within IU-friendly neighborhoods, and appoint local community leaders to collect loan payments.

### How often are payments made?

Payments are generally set to the schedule of weekly, bi-weekly, twice a month, or monthly. Some small creditors such as, Emprendamos Bank, offer the option of daily payments to help customers to cope with high APR upcharges.

### What are *Client Protection Principles*?

These principles are designed to foster successful outcomes for lenders and borrowers. These principles are the minimum standards clients should expect, with respect to ethics, transparency and privacy.

The core principles are:

- Appropriate product design and delivery
- Prevention of over-indebtedness
- Transparency
- Responsible pricing
- Fair and respectful treatment of clients
- Privacy of client data
- Mechanisms for complaint resolution

#### Sources:

<http://www.themix.org/about-microfinance/FAQ>

<https://www.kiva.org/about/stats>

### 5.1.3 Microfinancing: Kiva Partners

There are various avenues for constituents to capture funds for installations of Rain Water Harvesting (RWH) systems. For low and mid-income residents, microfinancing could be a viable funding option, specifically through Kiva, an organization that facilitates relationships between financial field partners and the borrowers. Field Partners have varying metrics and focus areas, which are explained more thoroughly below.

Kiva is not a bank nor a microfinance institution, so it does not receive or review applications for loans; the organization teams with Field Partners that administer loans. These loans vary in interest rates, amounts and requirements. The detailed table of Field Partners below, lists the relevant organizations based in Mexico. Assuming Isla Urbana will attempt to collaborate with some Kiva Partners, the criteria listed below captures some of the most important criteria to be aware of when negotiating.

Interest rates in Latin America are some of the highest for several reasons:

1. Banks and other lenders need to cover administrative and operating costs even though they provide very small loans. Incidentally, Mexico has one of the smallest average loans sizes and deepest market penetration for microloans. The smaller the loan, the higher the interest needed to cover all the associated costs—particularly in remote regions where traveling to borrowers is time intensive.
2. Interest rates are high because banks and other lenders are unable to take individual risk profiles into account, therefore they charge a higher interest rate across the board to cover risk default; sometimes as high as 120%.

### Financial Statistics of Relevant Kiva Microfinancing Lending Partners

	ACCIONA Microenergía México	Ecoblock International	Habitat for Humanity Mexico	Kubo Financiero	SGS Soluciones Patrimoniales
<b>Total Loans</b>	\$77,550	\$169,650	\$161,150	\$661,350	\$26,575
<b>Avg. Cost to Borrower</b>	13% APR	30% APR	6% APR	54% APR	35% APR
<b>% of Loans to Female Borrowers</b>	15.43%	65.09%	61.24%	58.81%	100%
<b>Avg. Loan Size</b>	\$103	\$1,060	\$1,811	\$918	\$1,063
<b>Avg. Time to Fund Loan (Days)</b>	2.42	9.86	12.42	6.79	9.25
<b>Avg. Loan Term (Months)</b>	9.12	13.14	49.83	9.51	25.15
<b>Default Rate (%)</b>	0	0	0	4.12	0

(Source: Kiva Field Partners <https://www.kiva.org/partners>)

The following section is comprised of detailed descriptions of the goals, specific focus areas, requirements and contact information of these aforementioned organizations.

#### Kiva Microfinancing Partner Profiles

##### 1. ACCIONA Microenergía México

#### Description:

Non-profit organization founded by Fundacion ACCIONA Microenergía (FUNDAME). FUNDAME—corporate foundation of leading Spanish companies in renewable energy and infrastructure sector. Established in 2008, operations through AMM to provide basic services such as energy, water and infrastructure in a sustainable way to isolated communities living in rural areas of Mexico.

#### Requirements/Process for Obtaining Loan/Funding:

- **Demonstrate need**
- **Specific geographic requirement**
  - Rural community in Mexico
- **Borrower meeting** with ACCIONA Microenergía representative to show how loan will be put to use
  - Meeting with representative will map out details of loan and repayments

#### Contact Info

- Julio Eisman, José Gabriel Martín, María José Olivar, Enrique Toledo
- Avenida de Europa nº 10 / 28108 Alcobendas (Madrid). España
- (0034) 916 57 64 60

**Description:**

Social housing company dedicated to providing marginalized communities in Mexico with opportunities to significantly improve housing conditions. Originated as Echale a Tu Casa (Echale) in 1997, develops affordable housing solutions for underserved communities through innovations in construction, technology and finance. Focuses its efforts in areas where families have little or no access to credit. Member of e Clinton Global Initiative and earned highest score amongst B Corp honorees for Best for the World 2013. The organization is also a: GIIIRS pioneer, B-Lab Corporation, Schwab Foundation entrepreneur and Ashoka Fellow. They also offer technical assistance to self-organized communities for managing and implementing improvements. Families can participate in all stages of construction and may receive pay for their work.

**Requirements/Process for Obtaining Loan/Funding:**

- **Proof of address (land ownership) and income**
  - Own a plot of land and can prove ownership
  - Monthly income: Beneficiaries need to earn at least 3 minimum wages. The beneficiary can be self-employed and there is no need to be an Infonavit or Fovissste beneficiary.
  - **Personal file: Very important!** organize your personal file with the following requirements:
    - CURP (individual number) (copy)
    - ID (IFE or Passport) (copy)
    - Address proof (it has to be already paid and have no more than 3 months of since issued) (copy)
    - Land plot ownership proof (copy)
    - Credit request sheet
    - Income statement
    - CIS (socioeconomic information questionnaire)
- **Approved for credit:** credit request sheet to pre-approve credit before can move to the next step
- **Savings Program:** recommended to have a sum of money up to 20% of value of home, saved over previous year.
- **Pre-loan program and training requirements**
  - Participate in financial workshop before start of program.
  - Helps clients prepare for housing and help Echale collect data about household conditions
  - Technician visit houses to assist with planning or prepare new housing plans
- **Borrower meeting** with Ecoblock representative

**Contact Info**

- Raffaella Piazzesi, Sofia Rodriguez
- Av. Revolución 793, Col. Nonoalco, México, D.F. 03700
- [raffaella@echale.com.mx](mailto:raffaella@echale.com.mx) / [informes@echale.com.mx](mailto:informes@echale.com.mx)
- +52 (55) 5611 5403

### 3. *Habitat para la Humanidad México (HPHM) (Habitat for Humanity Mexico)*

#### **Description:**

Non-profit organization providing low-income families living in overcrowded or inadequate housing financial support and technical assistance needed to construct safe and affordable homes. Loans can be used for new housing construction or home improvement (major and minor). HPHM aims to promote community development and education through the construction process with 3 stage structure:

1. Before credit approval, borrowers and their families are encouraged to join construction groups to learn technical construction skills and gain the financial literacy necessary to take out a loan.
2. Once approved, construction groups begin to build each borrower's home, working together to each house is safe and adequate.
3. Repayment of loan starts upon completion of construction.

Supports the communities it serves by offering financial education courses, community health improvement initiatives and reconstruction support following natural disasters.

#### **Requirements/Process for Obtaining Loan/Funding:**

- **Pre-loan program and training requirements**
  - Potential borrowers are encouraged to join construction groups to learn technical construction skills and gain financial literacy necessary to take out a loan.
  - Borrowers must complete a savings program to raise 5% of the loan amount.
- **Borrower meeting** with Habitat para la Humanidad Mexico representative
- **Approved for credit** by Habitat para la Humanidad's credit approval process

#### **Contact**

- Karla Aguilar, Marie Djemmali, Bibiana Garmendia, Ana Paula Gil Armendariz
- Del. Benito Juárez Soria No. 47, Colonia Alamos DF 03400 México
- [mdjemmal@habitatmexico.org](mailto:mdjemmal@habitatmexico.org) / [info@habitatmexico.org](mailto:info@habitatmexico.org)
- +52 (55) 5519 0113

### 4. *Kubo.financiero*

#### **Description:**

A regulated microfinance institution providing accessible and affordable loans to borrowers in Mexico. Loans can be used for working capital, fixed assets, education fees and supplies, and pre-payment for other loans that have higher interest rates.

Kubo uses an online platform and branchless banking to significantly reduce cost of lending. Kubo focuses heavily on the growing microfinance data in Mexico, and integrates that data and technology, positioning itself to support the more than 90% of Mexican businesses that qualify as small or micro-enterprises. With rapid internet penetration in Mexico, the organization has distinguished itself as an innovative lending platform.

#### **Requirements/Process for Obtaining Loan/Funding:**

- **Proof of address and income**
- **Approved for credit**
  - Good credit history
- **Specific geographic and personal requirements**
  - Living in DF or metropolitan area
  - Voter force (registered voter)

- **Borrower phone meeting** with Kubo.financiero representative
- Complete online application

#### Contact

- Vicente Fenoll, José Luis García, Rogelio Monroy, Federico Ramos, Gonzalo Salazar, Allan Seidman
- Barranca del Muerto 92, Colonia Florida, Álvaro Obregón, 01030 Ciudad de México, D.F., Mexico
- +52 (55) 6269 0024

### 5. SGS Soluciones Patrimoniales

#### Description:

A public company focused on providing financing for housing, small and medium sized businesses and payroll loans. SGS partners with organizations that specialize in building houses in rural areas in eco-friendly ways, as well as supporting local supply companies to keep spending localized. SGS was created with the goal of providing affordable housing loans in a region where these loans are expensive and difficult to come by. They have developed a brand called AMIFIN, which they are known as in Mexico.

Two different types of loans are administered by SGS: Housing improvement loans are provided to extremely vulnerable populations, including women who may be widowed, caring for their parents or single mothers. The second are house eco-improvement loans that help buy products that improve quality of life and health. Such products include latrines, solar panels, rain capture tanks, bio-digesters and energy and water saving systems.

#### Requirements/Process for Obtaining Loan/Funding:

- **Demonstrate need**
  - Show need for financing for housing improvement in eco-friendly way
  - What is housing improvement, and how is it eco-friendly?
- **Secured reliable local partners (IU)**
  - Identify and Partner with local supply/construction organization
- **Borrower meeting** with SGS Soluciones Patrimoniales representative
  - This meeting will qualify, plan details of loan and repayment schedules

#### Contact

- Cesar Alvarado, Pablo Serrano, Gerardo Suinaga
- [pserrano@amifin.com.mx](mailto:pserrano@amifin.com.mx)

#### 5.1.4 Audience Profiles: Microfinance

While Kiva is indeed one of the most popular hubs to facilitate microlending, the following audience profiles present other relevant organizations that would be favorable partners with Isla Urbana. These organizations could provide real possibility for market expansion, by offering financing opportunities for middle-income households, who might be unable to front the full cost of a system at once.

The organizations profiled are:

1. Water Credit
2. ABC Bank

# 5.1.5 Water Credit by water.org

## Contact information:

<http://water.org/solutions/watercredit/>

CEO: Gary White

Phone: +1 (816) 877 8400

Email: [gwhite@water.org](mailto:gwhite@water.org)



## OPERATIONAL/FINANCIAL MODEL

Water.org's WaterCredit program provides low-income individuals with microfinancing opportunities for WASH projects. WaterCredit enables microfinance partners to facilitate access to capital, with the aim of improving issues such as education, water conservation, sanitation, health, hygiene and access to water.

Water.org is well-versed in the microfinance and WASH sectors. Through its WaterCredit initiative, Water.org provides initial financing and technical assistance to partner organizations to build loan portfolios for WASH products and services.

WaterCredit empowers the poor with access to small loans for household water connections. WaterCredit is breaking the cycle of poverty and creating a cycle of opportunity – an opportunity to enhance one's health, education and economic position.

## FUNDING AVAILABLE

Total Water.org Investment: \$13 million

Implementing Partners: 54

Number of Loans: 757,000

Value of Loans Disbursed: \$156 million

Water Credit Beneficiaries: 3.3 million +

Cumulative Loan Repayment: 99%

Average Loan Size: \$206 USD

Loan Types: Joint Liability AND Individual

15% of loans disbursed went to borrowers earning less than \$1.25/day.

80% of clients living in households earning less than \$2/day.

## CONCERNS/KEYWORDS

- Health, sanitation and hygiene
- Water accessibility, water reliability, water independence, water cost
- Marginalized communities, community investment, poverty
- Microfinancing, Community investment

## RELEVANT SUSTAINABILITY METRICS

- Household income, access to credit
- WASH Impact of traditional water delivery infrastructure
- WASH Impact of households with consistent access to water
- Water Management Education
- Water and financial savings with implementation of RWH system

## IU'S APPEAL

IU's efforts align with several of WaterCredit's foci: water conservation, home-improvement, water access, sanitation and hygiene, and renewable and sustainable technologies.

Microfinancing will be able to leverage IU's existing relationships with low-income communities and scale the number of installations by facilitating access to capital. IU can capitalize on WaterCredit's pay-it-forward system, locally reinvesting loans that are paid back, creating momentum and helping people in ways that will last.

WaterCredit provides funding to NGOs and microfinance providers for capacity building and technical assistance. These partners then leverage funding from banks and capital markets to disburse loans to people in need.

IU can benefit from WaterCredit partners to conduct health and education campaigns to complement the financing with community education, which increases product demand and engages community involvement.

Although WaterCredit is not currently in place in Mexico City, there is potential for IU to facilitate their entry into Mexico by outlining the strengths below.

## KEY POINTS

- IU has yet to enter the microfinance space.
- Water.org, WaterCredit and their field partners have history working with low-income residents in need of small loans.
- IU's potential with field partners to facilitate access to capital and therefore funds for Rainwater Harvesting installation.
- IU's 'financial barrier' broken down for constituents without access to capital and can scale up installations in give neighborhood.
- IU can broker relationship between field partners and low-income residents without any further work in the financial area.



## 5.1.6 ABC Capital

### Contact information:

Division of ABC Capital S.A. Institución de Banca Múltiple

<http://www.abccapital.com.mx/>



### FINANCIAL MODEL

Offers micro loans for housing upgrade with no prepayment penalty for up to 65% of the cost of the project. Annual Percentage Rate (APR) and fees will be determined based on the creditworthiness of individual. Nonetheless, access to loans is also designed to serve low-income families. The maximum loan amount is US\$ 560,000.00. If home improvements are for sustainable upgrades, clients qualify of a 2.5 APR points reduction.

### FUNDING AVAILABLE

Net funding available US\$14,833,368.00

Net deposits US\$29,176,508.00

### CONCERNS/KEYWORDS

- Creating a special program tailored to IU's clients needs
- Limiting the APR level so loan can be access by low-income families
- Transforming the qualification requirement to meet Isla client's characteristics
- Can loans cover 100% of units?

### RELEVANT SUSTAINABILITY METRICS

- Household income
- Credit worthiness conditions
- Impact of traditional water delivery infrastructure
- Offset through RWH to water demand
- Offset through RWH to storm water runoff

### IU's APPEAL

ABC Capital's goal is to become the key financial organization in Mexico to offer home improvement loans at large and small-scale featuring client niche specified APRs. It also seeks to be the leader in providing green loans for sustainable home construction improvements. This goal especially matches IU's clientele's needs as it seeks to provide individuals with financing options and customized APRs based on income levels and home improvement project characteristics.

IU's RWH system could easily meet the sustainable home improvements requirements by ABC, allowing IU to use this point as a selling argument to persuade ABC to create tailored financial tools that can be used to pay for their RWH systems.

As ABC seeks to position itself at the top of the financial organizations in Mexico, it can offer IU niche oriented financing tools. These tools would shape nonexistent financing options into credit lines that would help catapult both organization's goals, and allow the rainwater harvesting systems to be seen as both an environmental necessity and as a sustainable home improvement supplement to Mexico City's current faulty water infrastructure.

IU's proposal should emphasise how the creation of micro-loans for IU's client niche can also add to ABC's CSR objectives as it can collaborate with the promotion of the social and corporate message of this organization.

A partnership with this organization would need to focus on the social and environmental related aspects of providing marginalized communities with increased access to water. Therefore, a proposal or successful joint project might involve further educational material development that would include the impact of RWH at environmental and household economy levels to decreased dependence on non-potable piped water or trucked water.

### **5.1.7 Infonavit & The Formal Working Community**

Tangential to highlighting the potential for microfinancing, the following is in-depth look at Infonavit and the formal working community. Although rainwater harvesting is not yet an approved technology on Infonavit's "Green Mortgage" eligibility list, this profile's significance is more to provide the granular details surrounding the program and its application process. That way, once rainwater harvesting becomes an approved technology Isla Urbana will be able to immediately promote this benefit to existing and potential customers; thus helping expand the market for rainwater harvesting. Additionally, profiling the formal working community helps contextualize the demographic that would likely be interested in both microfinancing opportunities, as well as Infonavit's Green Mortgage program.

# 5.1.8 Infonavit: Green Mortgage Program

## Contact information

Eduardo Lastra y Lastra  
Strategy and Evaluation Manager  
flastra@infonavit.org.mx



## FINANCIAL MODEL

Green Mortgage is a financing opportunity developed by INFONAVIT to support the use of energy efficient systems in low-income households. A family that purchases a home with INFONAVIT can receive an additional “green” mortgage to be used towards a list of pre-approved eco-technologies.

## FUNDING AVAILABLE

Maximum funding amount per household is \$1,250 USD  
As of July 2014, more than 1.6 million Green Mortgage credits have been issued.

## CONCERNS/KEYWORDS

- Proliferation of eco-technologies throughout Mexico
- Adoption by the formal worker demographic

## RELEVANT SUSTAINABILITY METRICS

- GHG emissions abated from reduced pipa truck deliveries
- Money saved on fuel expenditures for pipa trucks
- Household costs avoided from pipa truck deliveries
- Data that captures the offsets for flooding and erosion in and around Mexico City
- Cost of the different RWH systems and the weekly maintenance-time required
- Precedential data that portrays acceptance of Isla Urbana’s RWH systems, as well as user satisfaction information (surveys)
- Sensitivity analysis showing catchment potential (in mm<sup>3</sup>) at different percentages of system adoption (25%, 50%, 75%) relative to monthly rainfall to highlight potential amounts of water diverted (stress removed) from the larger system

## IU’S APPEAL

The Green Mortgage program matches a range of eco-technologies to a customer base that is required to install energy efficient systems into their homes in order to access an additional mortgage of up to \$1,250 from INFONAVIT. This program provides families with the ability to install environmentally-conscious technologies that may have otherwise been beyond their financial reach. As of July 2014, more than 1.6 million credits had been issued by the Green Mortgage program.

Because of the scale of this initiative, Isla Urbana’s involvement would facilitate extended opportunities for awareness and adoption of the RWH systems throughout the entire country of Mexico.

## KEY POINTS

To qualify as an available eco-technology within the Green Mortgage program, IU’s rainwater catchment system must be approved based on a list of set criteria. This process, as of now, has not yet been developed for RWH systems. In the interim IU will need to report on a variety of metrics that demonstrate the social, environmental, and economic benefits of rainwater harvesting to be ready to move forward with the application process once it is in place.

## 5.1.9 Formal Worker Community

1. Pending the acceptance/approval of IU's RWH technology as one of Infonavit's "Green Mortgage" options, the goal here is to provide the formal worker constituency with the resources they need to apply for the mortgage.

2. Regardless, it is still important to reach the formal worker community in the hopes of encouraging widespread acceptance of RWH. In order to best capture their attention, a communications strategy that highlights not only the ecological and financial benefits of RWH, but also explains the process of obtaining a system from Isla Urbana would be most effective. Some of the relevant points could be:

- In-depth information that describes the required maintenance process for RWH systems (and how much time will need to be allocated per week)
- The cost breakdown, and an explanation of services that go along with the system
- Other options for financing, i.e. microloans or standard bank loans
- The payback period for an IU system (i.e. given the financial offset of the pipa truck, how long will it take for the customer to break even? How long to receive a positive NPV?)
- Environmental benefits for the community (i.e. less local flooding)

### **Sustainability & Financial Metrics**

- Household costs reduced from pipa truck deliveries
- Capacity to take out and pay bank loans
- Climate and precipitation of zones where formal workers live?
- Costs of the different systems and weekly maintenance time required
- Data that portrays acceptance of Isla Urbana's RWH systems, as well as user satisfaction information (surveys)
- Relevant data on building codes to ensure that IU's products align with what is acceptable in the region
- Average weekly water consumption by family in this specific demographic
- GHG emissions abated from reduced pipa truck deliveries and how it will impact air quality in beneficiaries' area

### **In Summary/Mission Statement**

Decentralization of the water supply leads to individual empowerment, as families will likely "...exercise conservation more efficiently and effectively since they'll be the owners and operators of these systems ." One of the key messages here will be convincing homeowners of the many qualitative benefits that come from installing one of these systems, which will then be married with the quantitative benefits (both environmental and financial). Most significantly, this demographic must know, in granular terms, what is required of them, in terms of both time and financials. Lastly, it would be relevant to capture the social justice elements to RWH, specifically citing examples of conflict and unrest in the region, thus offering Isla's products as a practical and strategic way to mitigate conflict for future generations.

### 5.1.10 Water Models

Similar to the way in which the CBA and GHG emissions analysis in Chapter 4 aimed to help construct a quantitative argument in support of rainwater harvesting, the following model examines data that demonstrates the positive environmental impact of rainwater harvesting on an aggregated scale. Specifically, this model argues that Isla Urbana's technology provides a meaningful alternative aquifer drawdown, in addition to relief of the city's overburdened sewers. Isla Urbana should utilize this data to further broaden the market for rainwater harvesting. Also, this model could be used to strengthen the case for rainwater harvesting in delegations that might be averse or unfamiliar with the technology.

#### Context

Mexico City receives a flow rate of 30.5 cubic meters per second to supply water to its residents, approximately 9 million in population. 67% of this flow is supplied by underground sources through a complex system of wells and pipes. According to the Mexico Valley Water Basin Council, the aquifer that supplies Mexico City has an overexploitation rate of 348%, meaning that the city is extracting about three times more water than what the aquifer is recharging. The aquifer is recharged through infiltration during the rainy season, thus in an ideal scenario, actions should be taken to allow this natural process to occur. Furthermore, the overexploitation of underground sources is causing the city to subside, with some areas sinking at about 2.5 cm per month.

Mexico City's current water infrastructure continually fails to meet the demands of its 9 million residents, 12% of which have no access to the water grid. With the amount of rainfall that the city experiences during months of May through October, rainwater harvesting could help alleviate the stress on the city's aquifers by providing an alternative source to supply water to households during the rainy season.

#### Introduction to the Models

Water models have been developed to quantify the potential impacts that rainwater harvesting could have on a city-wide scale; which could be achieved if Isla Urbana were to increase its capacity. Both models account for rainfall data during the rainy season (May through October), as the scenarios were created using varying percentage of installation rates for the rainwater harvesting systems. The first model deals with water supply, and it illustrates the feasibility of using rainwater harvesting to divert supply from the local aquifers and thus reduce aquifer drawdown. The second model illustrates the feasibility of using rainwater harvesting to meet the water demands of Mexico City during the rainy season.

#### Purpose of the Scenarios

The absence or limited market and demand for rainwater harvesting is one major barrier that IU will have to address if they are seeking to scale up their operations, on top of increasing their installation capacity and funding sources. This limitation is accounted for in the model by using catchment area as one of the variables; as it is one of the limiting factors in the expansion of Isla Urbana's impact.

In both models there is a proposed scenario for IU, where it is able to supply 6% of Mexico City's households; an equivalent of half of the households in the city without access to the water grid. The results of the models show that if Isla Urbana is able to achieve this target, they will be able to divert 1.8% of the aquifer drawdown, and provide 8% of the city-wide water demand during the rainy season. However, at their current installation capacity of 18 units per week, it will take them 157 years to complete the installations, thus proving the limitations of its current capacity. Therefore, the scenarios have varied installation rates, which illustrates the range of potential that IU could achieve by scaling up their capacity. The results of these models could be used as Isla Urbana's argument for expanding rainwater harvesting to a city-wide scale, which is further elaborated in our proposed development plan.

A detailed explanation about the two models can be found in the **Appendix, Section A4**.

## 5.2 Organizational Capacity

### 5.2.1 Maintenance Offerings

A key factor in accomplishing a city-wide sustainability impact will be the need to keep installed systems in a high state of repair to avoid abandonment. This pertains to all customers served by IU, in both project-based and one-off installations. Below is an outline for continuing to incorporate maintenance as a key part of the work of the organization, in an attempt to ensure both a low-rate of abandonment and in the hopes of collecting useful feedback for continued operational and system design improvements.

### 5.2.2 Project Installations: Follow-up and Data (Non-Profit)

Additionally, IU needs to move to a model in which follow up is included in the cost of installations when working for government partners and conducting other large-scale, subsidized installations. IU has evidence-based findings, which suggests that follow-up within six months is key to avoiding system abandonment. Therefore, the cost of such follow-up should be part of the project cost. As the government has proven resistant to even the current price of system installation, this is perhaps something that could be layered into **proposals to foundations and corporate giving programs**. For example, if a large Mexican company wanted to invest in rainwater system installation in marginalized communities, they could be considered partners with the government on an upcoming project installation. Provided both agree to the co-branding, the corporate funding could then go to cost of maintenance, while the government funding went to the cost of the actual systems. However, it would be important to make the corporate partner invested in the actual system installations, which will likely have a more tangible outcome than maintenance alone; an aspect that is unlikely to find a large reserve of independent funding. Having a singular project and budget, and two funders with differing constraints on giving will be a necessary part of building flexible but resilient funding strategies in the future.

Including maintenance as a part of the total package will also be conducive to funding data collection. Use of a **lean data platform**, or through training youth to collect very specific information, could be part of the initial proposal to non-governmental funders.

### 5.2.3 Junior Water Watchers (Youth Training Program)

On the non-profit side, there is the possibility of combining IU's work with the youth in the communities it serves, to fulfil the need to make filters and other maintenance supplies available to those with previously-installed systems. Making this a voluntary program, perhaps in which a group could keep part of the proceeds from maintenance supply sales, will have the advantage of getting the young people more invested in the scaling up of the rainwater harvesting process. This could also reduce the time and monetary costs of having staff conduct follow-up visits to each residence with an installation.

Additionally, whether or not families with systems decide to buy maintenance supplies, having young volunteers visit the houses with systems presents an opportunity for a small amount of data collection. They could be trained to enter answers to such questions as whether the RWH system is still in use, how much of the family's water it provides on a monthly or annual basis, and what sort of savings the family has experienced from having a system; all of which can be simply entered into a phone or iPad for later analysis. The data they collect would need to be initially validated by staff to evaluate its quality, and provided it meets a certain standard, could be useful in maintaining a picture of ongoing rainwater harvesting activity and impact in neighborhoods with existing installations.

## 5.2.4 SMS Lean Data Collection

### Background

Monitoring and evaluation of IU's projects are not only important for external accountability (to donors) but also internally, to measure progress and identify areas of strengths and weaknesses.

Ideally, as IU grows and takes on larger and larger projects there should be a position dedicated to monitoring and evaluation. While that may not be possible at the present time, laying the groundwork for that level of complexity certainly is.

### Metrics

IU should focus on 2-3 key metrics that are both demonstrative and easy to measure. A good starting point can be found in the WHO/Unicef Joint Monitoring Program (JMP) [“Proposed indicator framework for monitoring SDG targets on drinking water, sanitation, hygiene and wastewater”](#). Examples of indicators that may be relevant to Isla Urbana are:

- Percentage of population using safely managed drinking water services
- Percentage of pupils enrolled in schools with basic water services

IU may choose some indicators of its own for its internal monitoring. However, it is important to include at least a few indicators that can be globally compared and relate to the Sustainable Development Goals, specifically SDG 6 (Clean Water and Sanitation).

### Data collection

Mobile data collection is a burgeoning sector in the development industry. There are many international companies offering these services, including [Souktel](#), [Magpi](#), and [FrontlineSMS](#). There are often smaller local companies that can offer this service as well. The technology can work through SMS or phone apps. The organization will set up a survey, then send out an SMS to members on your phone list to complete the survey through SMS or touch-tone audio. A web interface allows you to view the results, which can be also be exported to Excel. Some companies may also help in developing outreach campaigns to get more participants.

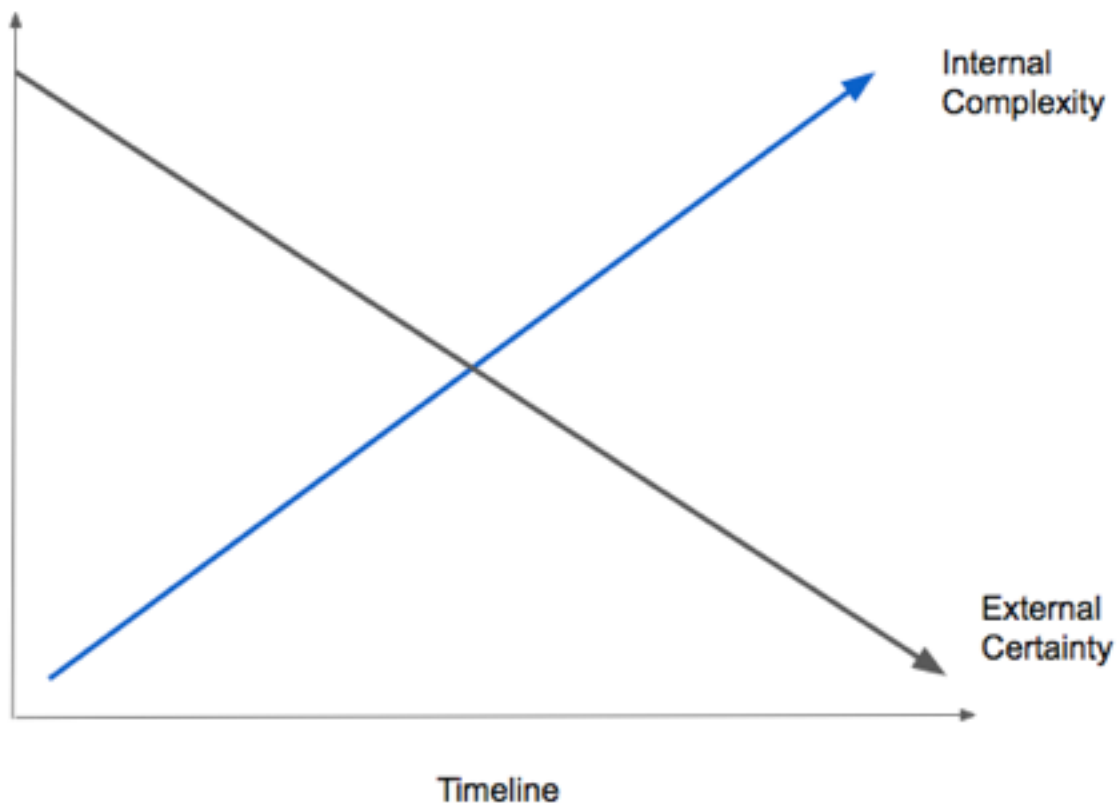
Souktel recently set up a project in Malawi managed by the international non-profit CARE that monitored teacher attendance, with the ultimate goal of reducing absenteeism. The project used a SMS survey to ask parents and PTA members about the attendance of their children's teachers. This data was collected and used by CARE to advocate for policy reform on teacher absenteeism to the Malawi Ministry of Education. Pricing can vary depending on the size and complexity of the campaign. For example, Magpi's pricing ranges from a free option, with limitations on the number of respondents to services for \$5000 USD/year. Frontline SMS offers its software for free, and a \$25 USD/month subscription fee to its FrontlineCloud service. Often, smaller NGOs can secure funding for mobile data projects as part of donor-funded project budgets. For example, IU can include this monitoring and evaluation cost into grant applications.



### 5.2.5 Organizational Structure: Board Development

A board of directors, responsible for the governance and oversight of operations is vital body of a not-for-profit organization. Ultimately, the members of the board of directors are the organization's trustees, having both the legal and moral obligations to administer it, solely for its stated objectives. The board is tasked with constituting the bylaws, the collection of internal governance rules and procedures, which should ideally be published on an organization's website for the sake of transparency. A not-for-profit organization board containing from about 10 to 15 members, including its president, is a reasonable size for a smaller organization<sup>1</sup>.

At this stage in Isla's growth, a board would contribute even more formal structure and process, most significantly demonstrating a level of organizational transparency. This would be attractive to potential funders and new external stakeholders. Having a board at this time would also be crucial to maintaining the continued growth and momentum of Isla's initiatives, by ensuring that the organization is well-equipped to handle additional expansion. Isla will face increasing internal complexity and declining external certainty as it moves into this phase of development, and a diverse board with strong connections, experience and resources will be key to making it more resilient in the face of new and growing challenges.



<sup>1</sup> What is the Right Size for Your Board? <http://www.blueavocado.org/content/whats-right-size-board>

## What are a board's key responsibilities?

According to a McKinsey tool for evaluating board effectiveness, key board responsibilities include<sup>2</sup>:

### 1. Shaping mission and strategic direction

Clarifying mission and vision

Participating in and approving strategic and policy decisions

### 2. Ensuring leadership and resources

Selecting, evaluating, and developing new CEO's, when needed

Ensuring adequate financial resources

Providing expertise and access for organizational needs

Reputation building

### 3. Monitoring and improving performance

Overseeing financial and risk management

Monitoring organizational performance

Improving board performance

## What is the process for creating a board?

Board members should offer expertise and experience needed to advance Isla's mission. The process of selecting new members for a board involves looking into the qualifications and establishing the commitment of the individual who has potential as a member of the board, as well as cultivating the interest of that person in joining your board as an active advocate and ambassador. Such individuals may already be involved with Isla in some way, or could be asked to take on projects or responsibilities for Isla in advance of being added to the board to ensure that they are effective and energetic in their duties. Members should be willing to continuously learn about the organization's activities and those it serves, as well seeking to make decisions that are in Isla's interests in terms of its assets and plan for the future. Once they join the board, there should be an orientation to introduce them to all aspects of the organization's functioning.

Once initial members are chosen, board members themselves will need to continuously seek and cultivate new potential members, though they should only be offered positions after a formal decision by all board members per whatever bylaws are established, usually after they are reviewed by a designated committee<sup>3</sup>.

## What types of people and positions should the board include?

Besides someone who serves as president, member should also occupy the position of treasurer, being responsible for overseeing the financial management of the organization. Additionally, one of the most important functions of a board is fundraising. This does not mean that all, or even most, of the members of the board need to be wealthy and capable of large individual donations, but that all should make some contribution to fundraising, as discussed in the articles below:

### 10 Fundraising Responsibilities of Every Board Member

(<http://www.gailperry.com/2013/11/fundraising-responsibilities-every-board-member/>)

### 15 Ways to Transform Your Board of Directors into Fundraising Champions

(<http://nonprofithub.org/fundraising/transform-your-board-of-directors-into-fundraising-champions/>)

Other board positions should be designated to match specific tasks related to the organization's activities or to represent the most relevant stakeholder groups affected by the organization's activities (private, public, community, indigenous, scientific, between others). For example, it would be desirable to include a community leader from an area such as Tlalpan where Isla has done a great deal of work as a board member.

Also, the board should have something in the vein of a governance committee, to ensure that the board upholds effective governance practices and is fulfilling its role for the organization. They will need to monitor things such as board attendance, effectiveness, usefulness to staff and organization, and accountability.

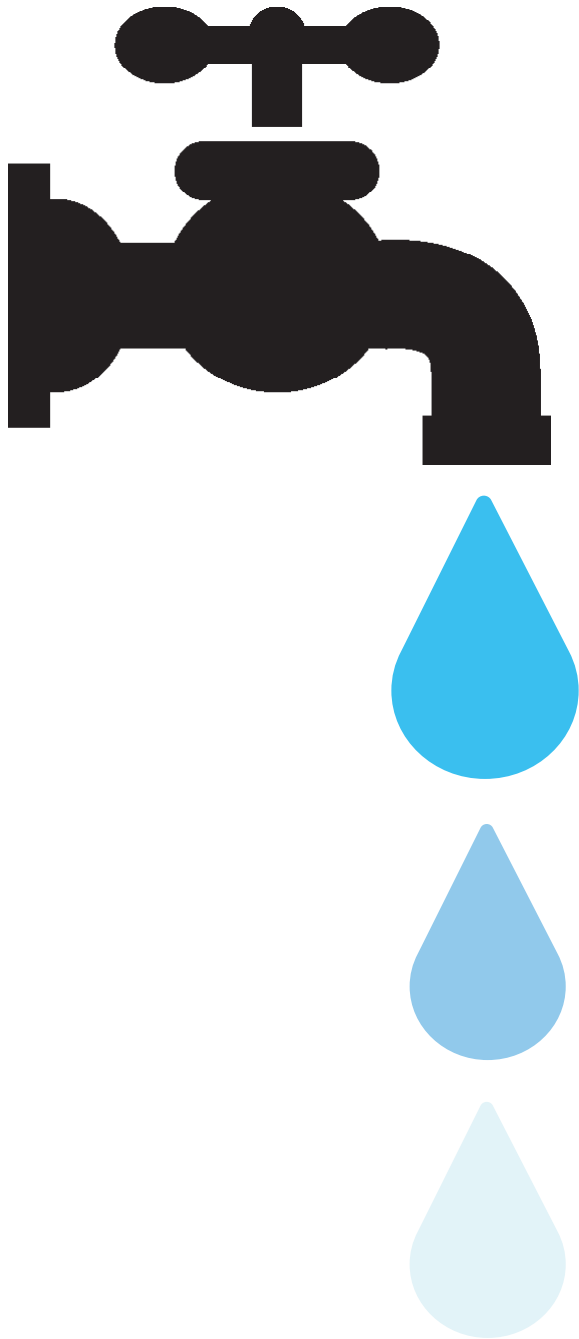
A well-functioning board is ultimately a vital step towards building an organization's credibility.

<sup>2</sup> McKinsey and Company Nonprofit Board Assessment Tool. [http://www.boardnetusa.org/graphics/attachments/boardselfassess\\_long.pdf](http://www.boardnetusa.org/graphics/attachments/boardselfassess_long.pdf)

<sup>3</sup> Finding the Right Board Members for Your Non-Profit. <https://www.councilofnonprofits.org/tools-resources/finding-the-right-board-members-your-nonprofit>

# **Chapter 6: Long Term (10 - 14 years)**

*Exponential growth; Change-Makers  
& Influencers*

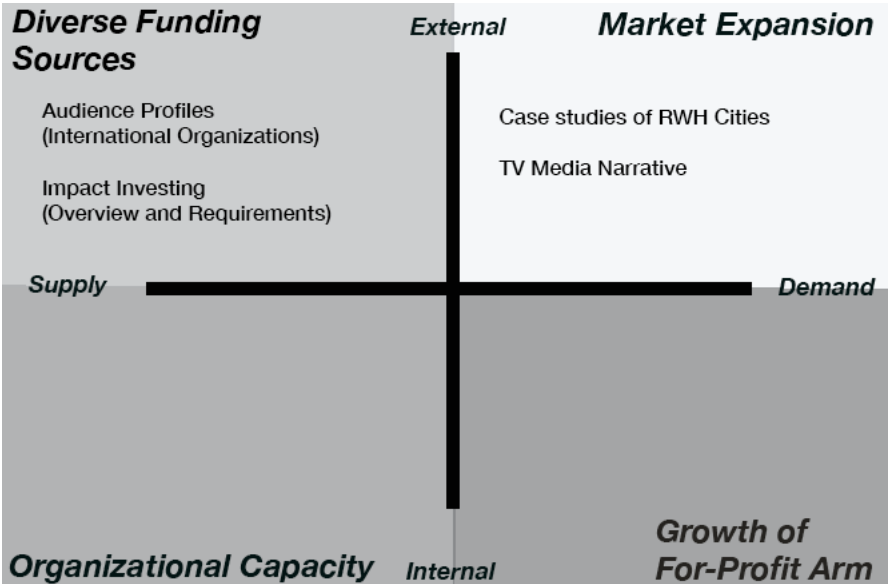


The tools provided in the short and medium terms will position Isla in a strategic way to fully take advantage of new opportunities, and the long term portion of the plan focuses on the challenge of meeting Isla’s mission of providing “Rainwater for all.”

Our long term deliverables include a group of profiles that explore a variety of actors from international organizations to impact funds. This will help Isla to communicate effectively with a diverse group of possible partners. This section also contains an idea for media integration, which aims to help to make rainwater harvesting technology understood and accepted. Relevant city case studies of RWH practices also provide evidence to position IU as the best choice for investments of time, money and resources.

By this point, we hope that following the recommendations from short and medium term will lead to minimal changes necessary in this organizational capacity. The for-profit arm will be functioning and operating with “IU care”, as well as other streamlined data collection methods and product offerings. Since the push factors for rainwater harvesting (aquifer depletion, failing traditional infrastructure, lack of water access) are not going to be remediated in the next decade, IU has to be prepared to meet increasing demand in this time frame. Taking on new financing through international organizations and impact investors will present IU with larger projects. Therefore, the organization needs to be prepared to handle the complexities and accountability required for these kinds of endeavors.

6.1 Market Expansion



The final phase of market expansion concentrates on utilizing relevant case studies as inspirational templates to foster higher adoption rates, in addition to a recommendation that focuses on utilizing integrative media strategies to reach new audiences. The goal here is to capitalize upon the short and medium term growth, since Isla Urbana’s organizational capacity should be better positioned to take on the increased demand that additional market expansion would bring.

## **6.1.1 City Case Studies: Rainwater Harvesting Adoption in São Paulo, Bangalore & The Netherlands**

### **Introduction**

The following case studies look at the water issues in four cities (São Paulo, Brazil; Bangalore, India; Amsterdam and Rotterdam, The Netherlands) and how these cities have incorporated rainwater harvesting in addressing those issues. These studies focus on the process of adoption and how they can inform Isla Urbana's own advocacy efforts in Mexico City.

São Paulo and Bangalore were chosen as case studies due to their similarities to Mexico City. In the case of São Paulo, these similarities are in terms of population and urban development – where a large number of the population are living in growing peri-urban developments that lack proper water infrastructure. This is leading to bottom-up rainwater harvesting programs. Bangalore has similar water access issues to Mexico City, as it must pipe water from a distant source and up to the city located 900 meters above sea level. Its groundwater sources have also been drastically depleted. Bangalore has made strides in making RWH a solution to its water issues through government buy-in and regulation.

Amsterdam and Rotterdam in the Netherlands do not face the same water access issues as Mexico City. They were included as a case study because of the innovative ways the two cities have integrated rainwater harvesting into public spaces as part of their stormwater management systems. As flooding is also a problem facing Mexico City, the Dutch example can stand as a model.

### **6.1.2 São Paulo, Brazil**

With almost 20 million inhabitants (2010 census), São Paulo, Brazil is not far behind Mexico City's 22.5 million residents (2014 census) as one of the most populated metropolitan areas of the Americas. Although São Paulo annually receives around 75% more rain than Mexico City, both cities are extremely water stressed. São Paulo relies on a complex system of reservoirs, basin interconnections and pumping stations. From 2014-2015, the most extreme drought event in the city's history revealed potentially catastrophic shortcomings in the São Paulo water system. At the peak of the crisis, half of the city's inhabitants almost completely ran out of water until last minute rains alleviated the situation.

São Paulo is located on the Brazilian highlands, about 760 m above sea level.<sup>3</sup> In the warmer months (December - March), monsoon rains bring moisture from the Amazon Rainforest, contributing to the abundant annual average precipitation of 1441 mm.<sup>4,5</sup> An urbanization-induced heat island effect is the probable cause of rain patterns trending towards shorter, but increasingly intense, events.<sup>6,7,8</sup>

The Sistema Cantareira (Cantareira System) is the main water supply system of São Paulo, serving around 9 million people. SABESP, the São Paulo State water company, manages the system's interconnected reservoirs and five other smaller systems that complement São Paulo's water supply to a total of 25.3 million people.<sup>9,10</sup> The Cantareira is mostly gravity fed, but requires the pumping of its full capacity (33 m<sup>3</sup>/s) over the 120 m obstacle posed by the Cantareira Mountain Range before the water reaches São Paulo. In 2015, SABESP consumed 1,751 GWh of electricity in water management, enough to supply the needs of about 3.4 million residential consumers.<sup>11,12</sup> This contrasts with the 2,113 GWh per year required to support the pumping-intensive Mexico City water management, roughly 16% of the city's total electric energy consumption in 2010.<sup>13</sup>

The city's extreme population density translated to the water availability per capita being similar to semi-arid regions of the world. While the U.N. recommends that the minimum water supply necessary for ideal risk management is 1.5 million liters per capita annually, the São Paulo supply is ten times smaller (150 thousand liters per capita annually).<sup>14</sup> In Mexico City, the supply is 115 thousand liters per capita annually,<sup>15</sup> also below U.N. standards by about 13 times.

From 2014 up to late 2015, São Paulo underwent emergency adaptations to mitigate the most extreme

hydrological crisis of its history. Benedito Braga, president of SABESP's board, described the situation as a “paradigm shift.” The exceptionally low pluviometric and inflow indices throughout 2014 and early 2015 were about 50% below the “worst case scenario” used for hydrologic risk assessment, based on 80 years of data,<sup>16 17</sup> highlighting the fragility of hydrologic risk assessment tools.

Throughout the crisis reports and complaints about commercial and residential water supply interruption skyrocketed, especially on the peripheries, elevated and less developed regions of the city. Such shortages were caused by pressure reductions in the system, and not the complete interruption of the flow. SABESP was heavily criticized for deliberately favoring the richest parts of São Paulo by deliberately focusing the pressure reductions in detriment of poorer regions. In 2014 alone, SABESP invested R\$3.2 billion in São Paulo's water supply infrastructure and plans to invest R\$13.5 billion more up to 2019 in hopes of increased the water supply by 30% by the end of the decade.

### **Rainwater Harvesting in São Paulo**

Although the city's climate is favorable for rainwater harvesting, the adoption of this technology in São Paulo is in its infancy. Shortcomings include: public policy; laws and regulations; design standards; implementation, operation and maintenance standards; research on regional data and additional data, such as water quality and runoff coefficients; professional training. Most of the momentum on rainwater harvesting has been observed in the public domain.

One of the highlights is the Rational Use of Water Program - PURA (Programa de Uso Racional da Água – PURA), which promotes structural readjustments in public buildings to reduce water losses, stimulate conscientious consumption, and install technology for alternatives sources such as rainwater. Starting in 1996, the program implemented changes in over 7,014 buildings throughout the State, 2,935 of those being in the Metropolitan Region of São Paulo, but it is not transparent how many of those received rainwater harvesting systems. According to the São Paulo Water Company, the water crisis of 2014-2015 has increased the importance of sustainability initiatives.

As a response to the drought, in March 2015 the São Paulo State government launched another program, the State Program of Rational Use of Water Promotion (Programa Estadual de Fomento ao Uso Racional das Águas), signed into law by Governor Geraldo Alckmin under decree #61180 of 20/03/2015. The program aims to allocate resources for rainwater catchment systems and reuse of water in public facilities, such as kindergartens and public schools; hospitals, municipal health posts and units; agencies and entities of the direct public administration and municipal indirect, and housing projects of social interest, all through agreements with municipalities. Initial funds are of R\$ 8.7 million from the State Fund for Prevention and Control of Pollution (Fecop). According to the water resources professor Antonio Carlos Zuffo, the funds may seem small, but the cost of rainwater harvesting actions is low. The professor estimates the construction cost of a cistern (of unstated capacity) to be about R\$ 300 (around \$85 in April 2016) in São Paulo.

### **Application to Mexico City**

Similar to efforts to date in Mexico City, when it comes to residential application of rainwater harvesting technology, the initiatives in São Paulo tend to be highly decentralized. Most of the activity is focused on sharing information and capacity building towards a “do-it-yourself” approach. One of such initiatives is the “Cisterna Já” (Cistern Now) movement, an independent initiative of concerned citizens that aims to increase urban resilience as a response to the water crisis. The basic premise is that centralized solutions will be unable to serve the entire population in a possible emergency shortage scenario. Their website is intended to promote capacity building for the harvesting and use of rainwater, and lists the contacts of trusted installers.

The Institute of Technological Research (Instituto de Pesquisas Tecnológicas - IPT), linked to the Department of Economic Development, Science, Technology and Innovation of the State of São Paulo, recently launched a comprehensive manual for the emergency harvesting and domestic use of rainwater. However, like other similar initiatives, the manual may also be considered a “do-it-yourself” approach to rainwater harvesting.

### 6.1.3 Bangalore India

Bangalore, the capital of India's southern Karnataka state, faces many water access issues. Firstly, the city is situated on a ridge about 900 meters above sea level. To meet the water demands of the city's 8.5 million inhabitants, roughly 810 million liters of water is pumped into the city daily, from a tributary of the Arkavathy River located 95 km away and 300 meters below the city's elevation. Equity of the water supply is also an issue, with slums and lower-income areas receiving the least amount of water per capita. Some peri-urban areas are able to access water through groundwater sources, however these are plagued with pollution problems such as high levels of fluoride and nitrate, which nullify it as a safe source of drinking water. Moreover, with such high rates of groundwater extraction, the water tables are falling in many parts.

City authorities, recognizing the severity of the situation, have integrated sustainable water management in their Master Plans. They currently have a goal of obtaining over 25% of their water supply from rainwater harvesting. The Bangalore Water Supply and Sewerage Board (BWSSB) determined that rainwater harvesting, combined with campaigns to reduce water consumption, reducing system loss, and recycling water would be the most effective methods to tackling their water supply issues.

Rainwater harvesting is not a new concept to Bangalore, which has an average annual rainfall of about 970 mm. Facilitated by local and international NGO efforts, RWH tanks started appearing on individual houses in the 1990's. Adoption into official government policy only began in the 2000's, but now RWH forms a part of the State water policy, building by-laws, and 'the rhetoric of city planners and managers'. For example, since 2004 a city by-law makes it compulsory for all new buildings to incorporate RWH systems into their design. The Karnataka State Industrial Board has also made it mandatory for new industrial buildings to have RWH systems. Any built areas in the catchment area of the Arkavathy River, are also mandated to have RWH systems.

In addition to using RWH for personal consumption, it is also used to help recharge the aquifer, through both stormwater drains and roof top RWH. Stormwater drains have been installed in some neighborhoods and by institutions and industries. They are abutted by a recharge well of 1 meter in diameter and 6 meters in depth. Some houses filter the rooftop rainwater into recharge wells, which are able to recharge the water table with about 200,000 liters of water per year. Houses that use this system have seen a positive impact on their bore wells.

The peri-urban areas of Bangalore rely most heavily on groundwater sources. However, high levels of nitrate and fluoride mean that they still do not have access to a clean source of water for drinking and cooking. RWH, however, has proven to be an effective source of drinking water. The combination of available rooftop space and annual rainfall provides more than enough water to comply with Karnataka state's water policy of 55 liters/person/day.

Industry has also benefitted from the use of RWH. Bangalore has experienced a high level of industrial growth, with most of these industries building up around the periphery where there is often no connection to the water system. These industries rely on groundwater or purchasing water from water trucks. Those that are connected, however, pay some of the highest rates for water in India. Implementing a RWH system to supply water for industrial and non-industrial (sanitation and hygiene) uses has been a huge cost-saving measure for Bangalore industry.

#### Application to Mexico City

The widespread use of RWH in Bangalore and throughout Karnataka state is due in large part to the buy-in of the state and municipal governments and their inclusion of RWH in building codes and bylaws. However, it was the initial groundwork of civil society organizations in introducing RWH to Bangalore that led to government recognizing their water supply problem and how RWH could alleviate it. The lesson to be gained for Mexico City – and Isla Urbana – is the role civil society organizations can play in advancing the dialogue on sustainable water management



## 6.1.4 The Netherlands: Amsterdam & Rotterdam

### Water Infrastructure in the Netherlands

The Netherlands has one of the most reliable water supply and sanitation services in the world. National water consumption is amongst the lowest within the developed countries, at 128 liters per capita per day and leakage in their distribution network is at 6%, compared to the average European average of 12% leakage, making it one of the most efficient water systems in the world.

### Rainwater Harvesting and Green Infrastructure

However, with increasing climate change and 60% of the country living below sea level, the Netherlands must continue to develop sustainable integrated water management systems to adapt to more extreme weather patterns. As the Netherlands is a case where water supply is not an issue, rainwater harvesting is instead used as a method of stormwater management.

Major cities such as Amsterdam and Rotterdam have integrated rainwater harvesting into their urban infrastructure, using new green infrastructure development in various forms. These include green roofs, rainwater harvesting and reuse systems in the airport, and large scale stormwater catchments in the form of canals, which can also serve as a recreational activity for residents and visitors in the city. For example, Westerpark in Amsterdam is an example of a recently developed park built on the location of a former gas works site, which uses rainwater and stormwater catchments as a key element of the design. The park exemplifies innovative ideas, such as using former gas tanks as ponds that serve as habitat for wildlife, and a bar is built on top of a wetland pond system, which uses water as the main attraction element. Essentially, the site is used as an “urban beach” in the center of Amsterdam. The park is a great example of a successful use of landscape design as a natural urban drainage system, using rainwater to compliment the design of the space.

As part of its Climate Proof program, Rotterdam has integrated the use of rooftop rainwater collection into its flooding and drought protection strategy. Through a combination of regulation and government incentives, green roofs have been installed throughout the city. All municipal buildings are required to have green roofs, and the City of Rotterdam subsidizes green roof installation at 30 euros per square meter for privately owned properties.

Like Amsterdam, the City of Rotterdam has also encouraged the use of rainwater harvesting in public spaces with water plazas. The Benthemplein water square, as it is known, is the first public space of its kind in the world. It consists of a sports field sunk 1 meter into the ground on one end and a playfield at the other made up of several spaces built at different levels. During heavy rainfall, the differing heights ensure that the square floods gradually, until completely full. The square can hold up to 1000 m<sup>3</sup> of rainwater until it can be discharged into the closest water body. Benthemplein was developed with public consultation, including the input of a local school and college.

### Application to Mexico City

While Mexico City and The Netherlands have very different climatic and geological characteristics, both are faced with the increasing challenges that come with climate change. As demonstrated by the innovations in Amsterdam and Rotterdam, however, extreme weather events such as heavy rainfalls have the potential to be used advantageously through technologies such as rainwater harvesting.

As illustrated by the case studies, using rainwater harvesting as part of green infrastructure is an effective way to manage stormwater. Mexico, however, lacks the top-down enforcement and regulations on water that made widespread implementation of rainwater harvesting in the Netherlands so successful. Civil society organizations like Isla Urbana are well placed to act as a conduit between the government and the public to start this dialogue on the use of public space for rainwater harvesting. Isla could be an important advocate for change with its public and private partners. This would allow for a greater focus on the potential of using rainwater harvesting as a stormwater management tool. The “urban beach” seen in Westerpark in Amsterdam could be an attractive model to implement in Mexico City. At this scale, Isla Urbana could have a larger impact on reducing storm runoff in Mexico City, while also grasping the opportunity to present rainwater as an aesthetic element that complements the urban landscape.



## 6.1.5 Media Integration: RWH Acceptance and Popularization

### Television in Mexico

Since television is often deeply rooted in culture, it is a powerful communication vehicle that holds the potential to reach a wide variety of audiences in creative ways, which may leverage the effectiveness of the messages conveyed.

### Integrative Storylines: Rainwater Harvesting

Amongst all forms of promoting a product or idea on television, product integration is of the most creative and flexible. This technique is less intrusive on the viewers since it is non-interruptive marketing, as often times a product is interwoven into a program's storyline. The main content is **not** interrupted in order to display what is promoted.

Rainwater harvesting may benefit from product integration in television, as it could spark interest and curiosity within viewers, encouraging them to seek out more information about rainwater harvesting.

Building RWH harvesting into a storyline could also be a catalyst for existing users, reminding them of maintenance duties. Some potential storylines could be:

1. Main characters' neighbors get a RWH system, and all the households in the community must shower there since their *pipa* didn't arrive.
2. Scenes where characters compete to see who has the cleanest roof
3. Introducing a new plumber character into a program
4. A post-apocalyptic show where rain is the only remaining source of water on the planet

## 6.2 Diversified Funding Sources

Successful utilization of the various tools, models and recommendations found in earlier chapters will have expanded the market for rainwater harvesting in Mexico City, while simultaneously fortifying and growing Isla Urbana's capacity to supply enough systems to meet the market demand. Fruitful partnerships with multiple corporations and organizations in the short and medium terms, will undoubtedly earn Isla Urbana the experience and legitimacy to successfully seek capital from funders with a larger propensity to give.

These last remaining tools focus on seeking capital from international organizations as well as impact investors; funders that likely have more stringent and competitive requirements, but might have a larger propensity to finance attractive projects and organizations.

### 6.2.1 International Organizations

International organizations tend to work through the federal government, generally on large-scale projects with budgets in the millions. Since the demand for rainwater harvesting and other green technologies that address the water scarcity issue in Mexico City and around the country will only continue to grow. This places Isla Urbana in a good position to start working with international organizations on large-scale projects that will allow the organization to apply its expertise to advancing the development of water management in Mexico.

#### Process

Organizations will usually put out a call for tenders, which can be found on individual organizations' websites, or may be managed through the Mexican Agency for International Development Cooperation.

The application process often involves a concept note as a first stage, where a general outline of your proj-

ect, its purpose, beneficiaries, rough budget and resources needed are sketched out. Specifics surrounding the format will be usually be dictated by the organization.

If a concept note is accepted that is followed by the formal project proposal, which will follow the format as outlined by the organization. It is often necessary to include an organizational profile and financial details as part of this proposal package, as part of transparency and accountability requirements.

### **Different Types**

There are two types of international organizations: Governmental organizations are the development agencies of foreign governments. These are organizations like GIZ, AFD, and USAID. They work through Mexican government agencies and their programs are aligned with government strategy. They may occasionally engage directly with local NGOs, but generally engagement takes the form of partnerships between the agency, government, and/or private sector, and/or NGOs.

The second group are non-governmental organizations like OXFAM, World Vision, and the UN. Although the UN is a multi-governmental organization, it is not ruled by one single government's agenda, and rather operates similarly to other international NGOs. These organizations receive their funding from private donors and their own fundraising efforts, but often a large chunk of their cash flow is from government foreign aid budgets. They will engage directly with local NGOs but also implement projects in cooperation with the federal or district governments.

### **Advantages & Disadvantages**

Working with international organizations will give Isla Urbana access to funding and projects that would otherwise be difficult to obtain and coordinate on its own. It is an opportunity for the organization to expand its sphere of influence within Mexico and the Latin American region, where the Mexican Agency for International Development Cooperation is active in implementing projects. Often these projects involve a capacity building component, and can be very beneficial in building the skills of your organization. They are generally multi-year and can provide a reliable source of income to the organization during that time period.

Dealing with international organizations and the large-scale projects in which they are involved requires the right organizational capacity and skills. Project proposal writing, project management, and even meetings with partners are time consuming. Isla Urbana needs to develop the groundwork as it grows in order to fully benefit from and contribute to these kinds of projects. The organizations covered in the following audience profiles are:

1. GIZ
2. UNICEF
3. Agence Française de Développement

## 6.2.2 GIZ (German Development Agency)

### Contact information:

GIZ Office México  
Corinna Küsel, Country Director  
Tel. (52) 5536 2344  
giz-mexiko@giz.de



### FINANCIAL MODEL

GIZ works in Mexico through the Mexican Agency for International Development Cooperation (AMEX-CID). As an emerging economy, Mexico is no longer considered a traditional beneficiary of international development financing. Instead, in cooperation with GIZ, Mexico participates as a donor in 'triangular cooperation,' where they share their experience and knowledge with other countries in the region.

GIZ works on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) and the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) to implement development projects in Mexico and Central America.

### CONCERNS/KEYWORDS

- Climate change
- GHG Reduction
- Water management

### RELEVANT SUSTAINABILITY METRICS

- GHG Emissions Abated From Pipas Avoided

### IU'S APPEAL

Of particular interest to Isla Urbana is GIZ's focus on environmental protection projects, including water management. GIZ works exclusively through the triangular cooperation format to introduce sustainable water solutions to other countries in the region. For example, a project to be completed in 2016 has seen Mexico and GIZ help to introduce recycled wastewater as a source of irrigation to Bolivian farmers, which also included the participation of Mexican civil society organizations. As an expert in rain-water harvesting, especially for the kinds of rural communities GIZ is targeting, IU has an opportunity to expand its sphere of influence in the region and increase its visibility. The best way to achieve this is through making connections with AMEXCID to stay on top of funding opportunities as well with other NGOs working in the water sector throughout Latin America to form potential partnerships.

GIZ has also been supporting the Mexican government with the National Climate Change Strategy, including its ambitious target of halving the country's greenhouse gas emissions by 2050. IU's work in reducing reliance on the inefficient and polluting pipa trucks can help play into this narrative.

## 6.2.3 UNICEF

### Contact information:

Tel. (52) 5284 9530  
Paseo de la Reforma 645, Col. Lomas de  
Chapultepec; 11000 México, D.F.  
mexico@unicef.org



### FINANCIAL MODEL

Unicef funds various WASH projects throughout the world in the context of health and sanitation for children. In Mexico, Unicef pays particular attention to health and sanitation issues for children in indigenous communities, including obesity. Their work includes helping children and their families access healthier food and educating them on nutrition.

Unicef was also integral to helping families during the severe flooding of 2007 in Tabasco and Chiapas. In response to the huge impact on children from those disasters, the organization has added a focus on risk prevention. In 2015, Unicef also undertook environmental risk assessment studies in the states of Guerrero and Oaxaca, with a specific focus on schools that may be threatened by natural disasters.

Unicef is of course heavily involved in children's education programs. In previous projects, Unicef has partnered with civil society organizations, private sector, and government to promote education in a variety of topics, including leadership skills. In their education programs there is also a significant focus on gender equality and female empowerment.

### CONCERNS/KEYWORDS

- Gender equality
- Risk mitigation
- Education
- Health and sanitation
- Water security
- Food security

### RELEVANT SUSTAINABILITY METRICS

- Number of schools with RWH systems
- Before and after RWH installation: assistance rates in schools
- Before and after RWH installation: access to water/improved hygiene
- Flood risk mitigation

### IU'S APPEAL

IU has already worked extensively with schools, both in terms of installing RWH units for schools and implementing environmental education programmes. Moving forward, IU and Unicef could develop a mutually beneficial relationship to scale-up each other's efforts in this area. Additionally, with Unicef's work in promoting health and nutrition, there is a possibility of tying RWH to household and/or community level agriculture and growing healthy foods.

RWH can act as a potential flood mitigation tool, and with Unicef's expanded interest in environmental risk mitigation, especially for schools, this is also an area in which IU can explore possibilities of partnerships with Unicef.

## 6.2.4 Agence Française de Développement

### Contact information:

Jean-Marc Liger, Country Director,  
AFD Mexique  
Tel. (52) 5281 1777  
afdmexico@afd.fr  
<http://mexique.afd.fr>



### FINANCIAL MODEL

AFD works through the Mexican government and its associated agencies to finance projects in line with the government's climate change strategy. AFD works in three different strategic areas:

#### *Supporting the Mexican Climate Plan and Preserving Biodiversity*

Under this strategic umbrella, AFD has funded several projects, including 50 million USD towards sustainable agriculture, including the sustainable use of natural resources in agriculture.

#### *Reform and development of the Infrastructure Sector*

AFD has also funded the sustainable development of infrastructure in Mexico, with an emphasis on GHG reductions. In 2014, AFD and KfW (the German Development Bank) contributed 100 million euros each to a program to reform Mexico's water infrastructure, with a specific focus on climate change resiliency.

#### *Solidarity and Support of NGOs*

AFD also works with and funds NGOs (both international and local) to implement various social programmes in Mexico.

### CONCERNS/KEYWORDS

- Climate change
- GHG Reduction
- Resiliency
- Agriculture

### RELEVANT SUSTAINABILITY METRICS

- GHG reductions (through pipas avoided)
- Freshwater saved
- Reduced strain on water system

### IU'S APPEAL

IU's work relates directly to the Agency's strategic objectives for Mexico. There is limited scope for civil society organizations to participate in the large-scale projects funded under the first two strategic areas listed. Therefore, A proposal to AFD would most likely fall under their Solidarity and Support of NGOs strategic area. Outlining how Isla Urbana's work can help to achieve some of the National Climate Change Strategy's objectives (for example, reducing GHG emissions through avoided pipas and/or reducing the vulnerability and increasing the resilience of strategic infrastructure) would make for a very strong appeal.

Moreover, with the Agency's focus on sustainable agriculture, IU could potentially look at RWH projects for irrigation for small-scale farmers.

6.2.5 Impact Investment Funding

The following tool will provide Isla Urbana with a comprehensive assessment of the impact investing landscape. By pursuing impact investors to collaborate with, Isla Urbana can better position itself for exponential growth in years to follow. It has the potential to fortify a significant revenue stream, while simultaneously providing IU the opportunity to partner with an individual or group of stakeholders that see true value in the business, as well as its potential to make meaningful human and environmental impacts.

6.2.6 Making the Case For IU: An Introduction to Impact Investing

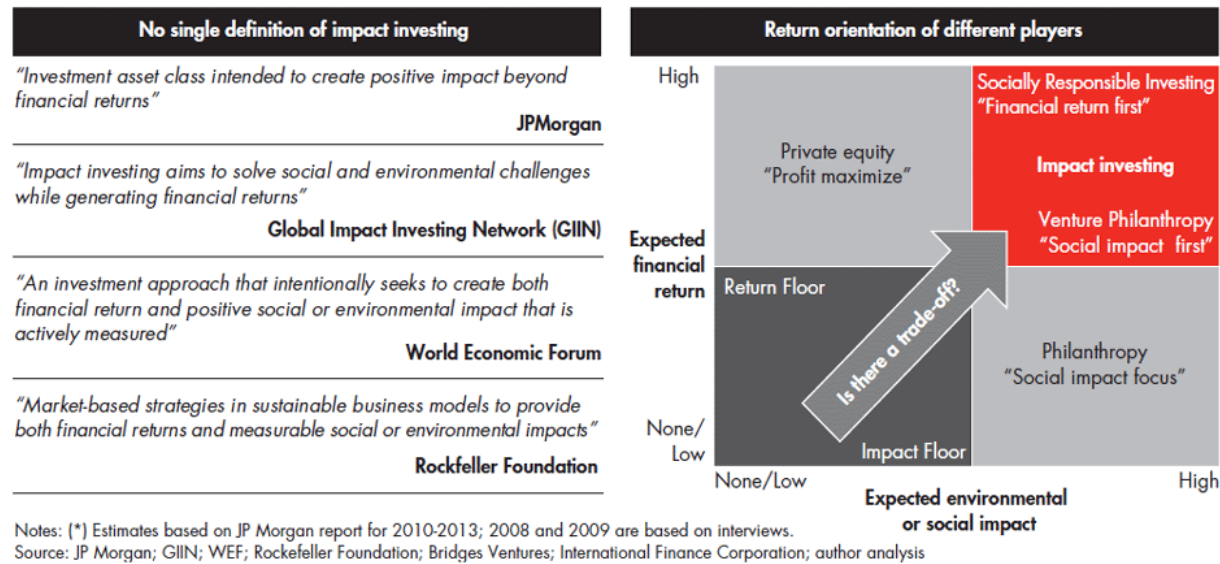
In the **long term** Isla Urbana must prepare for **large scale growth**, to achieve the sustainability benefits found in the water models. Large scale growth appealing to Impact Investors for necessary growth capital

IU acts as both a **product** and a **service** company, as well as a **not-for-profit** and **for-profit** company. This hybrid model offers both opportunities and challenges in terms of scaling up. With a product company, scaling up is limited by one's ability to grow the size of the market, while service companies face limitations in terms of their own capacity limitations. As previously mentioned, installation rate capacity is one of IU's greater constraints. This is where we envision impact investing becoming useful, providing IU with an amount of capital to allow for dramatic scaling and capacity enhancement in the long term.

This section aims to provide a brief introduction to impact investing, what it would mean for IU and how it would use our toolkit to be prepared to approach impact investors.

6.2.7 What is Impact Investing?

The Global Impact Investing Network (GIIN) defines impact investing as “investments made into companies, organizations, and funds with the intention to generate social and environmental impact alongside a financial return.”



Source: <http://www.bain.com/publications/articles/the-state-of-impact-investing-in-latin-america.aspx><http://www.bain.com/publications/articles/the-state-of-impact-investing-in-latin-america.aspx>

The diagram above offers some insight into the general understanding of impact investing as a concept. The term itself has gained increasing traction over recent years, but remain inconsistent in exact definition, as seen by the column on the left. The graph on the right shows the apparent trade-off that investors accept - between financial returns (y-axis) and environmental or social impact (x-axis). Impact investing aims to achieve both

types of returns, through investments in social enterprises, like IU, with a high potential of creating change.

**The following four characteristics describe the core expectations that impact investors generally have in terms of social or environmental returns and financial return:**

1. **Intentionality:** Investors in this field enter with the intention to have a positive social or environmental impact through their investments.
2. **Return Expectations:** Companies are expected to generate a financial return on capital or at minimum, return of capital alone.
3. **Range of Return Expectations:** Impact investors target returns from companies that range from below market (grant support, equity, loans etc.) to risk-adjusted market rate (fixed income, public equity, private equity etc.)
4. **Impact Measurement:** Impact investors expect to see reports and measured progress of their underlying investments, to ensure transparency and accountability.

### **6.2.8 Who is in the Impact Investing Network?**

Impact investing is a new and evolving field which offers social enterprises a number of different services. However, before IU decides to go through with the process, they will need to conduct research addressing the following points in order to find an investor with the right fit.

- a. Funds desired and required
- b. Expected returns generated and required
- c. Sector interest
- d. Geographic interest

This area of financing is one that can be highly beneficial, but must come from a cultivated relationship between the **investor** and the **entrepreneur**. Given IU's close-knit operating nature, it is imperative that this decision's importance be emphasized as it has the potential to seriously change the mode of operations. Certain investors such as Acumen, may come in to assist with specific transitional phases of company growth, ultimately leaving once this is considered complete. Terms and extent of investor control should be negotiated before investments take place.

Given our recommendations in the short and medium-term, we envision an IU that is equipped with multiple tools that will prepare them to meet the requirements set out by the following four different types of impact investors organizations:

1. **Connectors and Facilitators**  
SVX: <http://www.svx.mx/what-we-do/>  
Toniic: <http://www.toniic.com/100-impact-network/http://www.toniic.com/100-impact-network/>  
ImpactBase: <http://www.impactbase.org/>
2. **Expertise Base Builders and Accelerators**  
Agora: <http://agorapartnerships.org>  
Connovo: <http://www.connovo.org/portfolio-intro/>
3. **Impact Venture and Fund**  
Adobe: <http://www.adobecapital.org/>
4. **Multi-Function**  
Acumen: <http://acumen.org/about/http://acumen.org/about/>

### **6.2.9 What Are Impact Investors Looking For?**

This section will explore the requirements set out by different impact companies, and how IU can use our tools to take advantage of these opportunities. While this cannot be taken as a fully comprehensive overview, it aims to offer some insight into how the impact investing process works. In order to obtain growth capital in prepa-



ration for dramatic scaling, IU must be prepared for stringent guidelines and expectations for the company, set out by impact investors.

### **What They Want to Know About IU:** *Operations and Organizational Structure*

#### **Who?**

Who are the key team members?

What are their roles?

#### **How?**

How does the organization deal with inherent risks and challenges?

How does IU plan to respond and offer alternatives?

#### **What?**

What is IU's geographic area of operation?

What is the process of following up with a new contract?

### **What They Want to Know About IU:** *Financials*

#### **Who?**

Who is IU getting funding from?

Who are IU's clients?

#### **How?**

How much money does IU need?

How is IU's revenue changing?

How is IU's business going to grow in terms of revenue (to account for growing costs)?

#### **What?**

What does IU spend on?

What are the reasons for this spending?

#### **When?**

When does IU expect market demand to change (timeline), and how?

When demand changes, do expenses change in the same way? Are infrastructure expenses growing at expected rate e.g. warehouses for storage?

## **6.2.10 What Does Impact Investing Mean For IU?**

Once investors come on board, IU should be prepared for them to be engaged with business operations. Generally, investors would require the company to hold quarterly meetings, and provide them with quarterly financial statements. Negotiations will occur before the investment takes place, determining the terms and extent of investor control and oversight in IU. Independent members and existing IU members may have seats on the board, which represent a certain percentage of ownership of the company. The board will be able to make executive decisions which can affect the direction of the company.

## **6.2.11 Using The Tools to Meet the Impact Investor's Different Requirements**

Tools that are **bolded** have been provided in our short and medium term section; those italicized are recommendations we feel will be beneficial for IU to pursue.



Requirement	Tool	Next steps for IU	Requiring organizations
<b>Strong Entrepreneur and Team</b>	<i>Short biography on team members</i>  <b>COO appointment</b>	Describe strong, close-knit and passionate team; and their specific roles	<b>Acumen Adobe Agora</b>
<b>Commercially viable and scalable business model</b>	<i>Annual financial report</i>	Explain expected growth projects, cost projections, business model  Explain not-for-profit and for-profit hybrid model	<b>Adobe Agora</b>
<b>Potential to reach and maintain financial sustainability</b>	<i>Sustainable financial road map</i>	Explain business model and diversified revenue sources  Highlight expansion into microfinance, CSR etc.	<b>Adobe Agora</b>
<b>Innovative product and description</b>	<i>Product profiles</i>  <b>"IU Care"</b>	Present product profile (and service) in a way which clients can easily understand what IU has to offer	<b>Acumen</b>
<b>Strong knowledge of customers</b>	<i>Market research: Psychology of customers</i>	Demonstrate clear understanding the customers' mentality and immediate need  Explain community engagement efforts and existing strong local relationships	<b>Acumen</b>
<b>Competitive Advantage</b>	<i>Market research: IU's Competitive advantage</i>	Demonstrate how congested the market for RWH is  Highlight IU's competitive advantage - local knowledge and innovative design for first-flush system  Strategic partnerships and existing relationship with local and city-level government	<b>Acumen SVX</b>

<b>Operations and Distribution</b>	<i>Operational details</i>	<p>Explain logistics and distribution strategy; to be linked with business plan and growing costs</p> <p>Demonstrate flow of materials and product, from suppliers to storage to installations</p>	<b>Acumen Adobe</b>
<b>Measurable impact</b>	<p><b>Results from GHG emissions and CBA</b></p> <p><b>Calendar</b></p> <p><b>Lean Data</b></p>	<p>Highlights the importance of sustainability indicator collection and the use of GHG and CMA models to measure impact</p> <p>Calendar and Lean Data can be used for follow-up to determine household impact</p>	<b>Adobe Acumen SVX Agora</b>
<b>Capacity to generate quality employment opportunities</b>	<p><i>Jobs for Women Plumbers</i></p> <p><b>Maintenance follow-up job opportunities</b></p>	Explain ability to provide job training and opportunities for local residents, potentially in the plumbing field, as well as through maintenance follow-up (e.g. sale of filters)	<b>Adobe</b>
<b>Scalability of Company</b>	<i>Sustainable financial road map</i>	<p>Acknowledge and highlight awareness of IU's inherent risks and limitations</p> <p>Explain the relationship with the government; and steps taken to reduce reliance</p>	<b>Acumen Agora</b>
<p><b>Specified Capital Need</b></p> <p><b>*Note:</b> SVX: \$250K min. Agora: \$300K average (\$50K to 1mil.) Acumen: \$250K to \$3 mil.</p>	<p><i>Annual Financial Report</i></p> <p><i>Market Research: Size of market Growth Projections</i></p>	<p>Demonstrate an understanding of growth and expense projections, market size</p> <p>IU's projected growth capital could be based on projection to install systems on 6% of Mexico City's roofs</p>	<b>SVX Agora Acumen</b>

<b>Existence of traction</b>	<i>Market Research: Evidence of market demand</i>	Explain documented growth of demand for RWH systems - via increased number of government contracts and/ or increase in number of installations/ year	<b>SVX Agora</b>
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## 6.2.12 Key Points / Recommendations

### Advantages of Impact Investing for Isla Urbana

*Exploring impact investing options can help further diversify funding sources:*

1. Increasing the financial sustainability of IU
2. With a synergy of private institutions, local NGOs, governmental institutions in Mexico (and internationally) and corporate capital

*Provide a network of organizations that IU could tap into for various purposes:*

1. Increase funding
2. Further utilize expertise of consultants
3. Build capacity

### Immediate Next Steps

*Prepare to answer key questions and requirements set out:*

1. How much investment does IU need, for its next phase?
2. What is IU planning to do with the money?
3. Prepare to conduct more in-depth market research and provide operational details
4. Create a product profile for Isla, to clearly explain its operations and business to potential investors and customers

The overall goal here is to balance access to capital against the implicit partnership that the sale of equity. Therefore, it would be prudent to first consider approaching impact investor accelerators and capacity-builders. Exploring options to work with an accelerator such as **Agora** could better prepare the organization to scale, equipping them with necessary skills and tools. The Agora Accelerator provides social entrepreneurs with resources such as access to the knowledge, networks and capital; and is perhaps the perfect place for Isla Urbana to begin its journey of seeking impact investments.



## Chapter 7: Conclusion Growth and Change

The selected tools, models and recommendations throughout this business plan have been developed and curated to bolster Isla Urbana's organizational growth, while simultaneously broadening and expanding the market for rainwater harvesting to meet the city's water demands and realize a multitude of sustainability benefits.

Incorporating system monitoring and maintenance into the process for each installation, and creating easily replicable pricing, installation, maintenance programs, will lead to more standardized products for customers, as well as for the processes around gathering data for analysis. Utilizing quantitative models and qualitative stories will also help IU build a stronger case to expand into other delegations, while attracting new potential investors

More formalized fundraising processes and goals will help bolster fiscal transparency, which should further open the doors for even more funding opportunities. Furthermore, this playbook reinforces the significance of leveraging outside advisors to help IU maintain a constant awareness of its risks and vulnerabilities the organization faces as it continues to grow.

We hope that Isla Urbana will utilize this playbook as a guide to ultimately serve its social mission, by improving the lives of Mexico City's citizens through increased water security, independence and resiliency in the face of an increasingly uncertain hydrological future. Despite the ambitious scope of expansion recommended here, we know that the heart of this organization is an indistinguishable fire that will forever burn for the people of Mexico City. No matter how large Isla becomes.

On a more personal note, this has been a valuable and fulfilling experience for us that will undoubtedly shape our thinking and experiences in the future. Together we will achieve *lluvia para todos!*

To quote the late David Foster Wallace: "[We] wish you way more than luck."

Capstone 2016

### ***A1.0 Stakeholder Mapping***

The exercise of analyzing and understanding rainwater harvesting in Mexico City started with a literature review (located at the end of the appendix). One of the goals was to identify various stakeholders and relevant organizations in terms of both funding potential (donors, partners) as well as system users (beneficiaries). In depth analysis led to grouping them according to their level of access to financial capital. These are:

1. International Organization and Private Capital (Corporations with CSR and Impact investors)
2. Governmental Organizations
3. Formal Workers
4. Low-Income / Informal Workers

Within these different categories, each group of stakeholders demands of IU its own set of communication and financing challenges. Each speaks to different possibilities for IU's potential to obtain funding and market share, thus allowing for rainwater harvesting to provide a solution to water access as well as urban resilience and sustainability.

After identifying these audiences, the information was consolidated to best represent the case for IU to:

1. Convince donors and partners that IU's work aligned with their vision
2. Convince beneficiaries why they should want to sign up for RWH with IU

Understanding the need for both quantifiable and emotionally engaging arguments, the information was structured into specific vehicles to address business, financial, social and environmental concerns.

## A2.0 CBA

### Approach / Methodology<sup>1</sup>

In this CBA standing has been assigned to the citizens of Tlalpan, as well as the local government. The objective is to determine whether the cost of continuing subsidized water truck deliveries is more or less costly over a 30-year time horizon than installing rainwater harvesting systems for households in the district of Tlalpan at varying degrees of scalability (25%, 50%, 75%). The costs of fuel and water, in addition to the social cost of pollution are the primary metrics utilized in this analysis. We also have used a discount rate of 10%.<sup>2</sup>

- In Tlalpan about 156,393 households are registered
- 154,192 of these households are common houses or apartments, 2,212 are without floor and about 11,608 consist of one room only
- 145,086 of the normal households have sanitary installations, 134,021 are connected to the public water supply, 146,306 have access to electricity
- The economic situation allows 62,283 households to own a computer, 115,438 own a washing machine and 145,136 households are equipped with one or more televisions<sup>3</sup>

### Assumptions

The accompanying CBA takes into account varying degrees of assumptions.

For the rainwater harvesting (RWH) systems we have accounted for installations in year zero and again in year 15, to account for an average product lifespan of 15 years in this 30-year time horizon. We have also assumed direct transfers and reallocations of labor, service, and time costs, from *pipas* to RWH-related tasks.

One significant metric to highlight is that most households experience an average wait time of 5-30 days for a *pipa*. While this window is arguably unreasonable, the situation causes further inconvenience, since someone must be home to receive the truck in order to have the household's cistern replenished. Therefore, there is potential for adults to miss work and/or children to miss school, as they are forced to wait for the truck's arrival. Despite this situation, in order to calculate a more conservative CBA, we have assumed that any time spent dealing with *pipas* will be directly re-allocated to tasks that involve RWH system maintenance<sup>4</sup>. The following section explains the assumptions we made as well as the logic/process we used to justify our assumptions and calculations. ***Please reference the tab entitled: "Final Summary of Data Points," in the accompanying excel spreadsheet.***

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<sup>1</sup> Boardman, Anthony; Greenberg, David; Vining, Aidan; Weimer, David (2010-08-17). Cost-Benefit Analysis, 4/e (The Pearson Series in Economics) (Page 6). Prentice Hall. Kindle Edition.

<sup>2</sup> <http://dcid.sanford.duke.edu/articles/study-dcid-faculty-leads-change-mexico%E2%80%99s-discount-rate>

<sup>3</sup> <http://www.en.nuestro-mexico.com/Distrito-Federal/Tlalpan/>

<sup>4</sup> Interview with Enrique Lomnitz, March 2016

## **A - I**

We assumed that each system installed would represent a single household. Therefore, assuming that each household would require one delivery per month, we determined that one system installation would remove 12 *pipa* trips annually (one truck per household, per month).

27.5% of households in Tlalpan do not have access to piped water inside their homes. Therefore, for the purpose of this CBA we have only considered unconnected homes. However, piped water delivery continues to become more infrequent in Mexico City, which suggests that *pipa* deliveries are becoming increasingly more prevalent amongst connected households. This suggests that there are even more potential households that could utilize rainwater harvesting than what is represented in this analysis.

## **A - II**

In calculating the per-household number of *pipas* removed from the road, at different percentages of installation (25%, 50%, 75%), we simply multiplied the number of households by 12 (the annual *pipa*-per-household estimate).

## **A - III (Reference Section 4.2)**

Based on data from the US Environmental Protection Agency, the social cost of carbon at a 5% discount rate is \$11 in 2015 dollars<sup>5</sup>. Since the discount rate used by the Mexican government is 10%, we divided the social cost of carbon in half and rounded down, to account for doubling the interest rate. Utilizing the data figure of 24,474.41 metric tons from the GHG Analysis in Section 5.2.5, we determine the approximate cost of carbon per varying percentages of RWH system installation, as previously mentioned.

## **A - IV**

This calculation determines the approximate cost of each RWH system to the Tlalpan government. The price in pesos is \$8200<sup>6</sup>, which has been converted to US dollars. The current exchange rate was taken on March 25, 2016, which was \$17.266 USD to \$1 MX.<sup>7</sup>

## **B - I**

Based on household water truck expenditure data in Tlalpan, provided by Alyssa Huberts, we used a cost of \$14.55 (\$259 MX) each time a family orders a subsidized *pipa* truck to deliver water to their home. As previously mentioned, since this expenditure is subsidized, we assume that there are additional costs of service to the *pipa* providers that the government takes on. In order to utilize a conservative figure to account for these costs, we assume that the government pays one-third of what

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<sup>5</sup> <https://www3.epa.gov/climatechange/EPAactivities/economics/sec.html>

<sup>6</sup> Conversation with Enrique Lomnitz, March 2016

<sup>7</sup> <http://www.bloomberg.com/quote/USDMXN:CUR>



individual households pay to the *pipa* providers \$14.55 (\$259 pesos) to the *pipas* providers, which accounts for both fuel and water expenditures.

We did not account for the costs of truck maintenance, replacement, or general programmatic or administrative costs to the *pipa* providers, since they do not have standing in this CBA. We are assuming a direct transfer of government-employed labor from *pipa*-oriented jobs to administrative and skilled vocational positions needed to manage and service RWH systems.

## **B - II**

We have estimated a one-time annual cost of filter replacement for the system, which would either be paid for by the government, household, or perhaps a combination of both. The filter price of \$16.92 (or \$300 MX) comes from a direct conversation that we had with Enrique Lomnitz, Isla Urbana's founder.

Lastly, in addition to the cost of filter replacement, we assumed a yearly annual maintenance cost that is 5% of the initial per-household installation cost (\$474.91). Although, we are assuming that the transfers of labor, time, and other residual costs would be a direct transfer between *pipas* and rainwater harvesting sector, we have added this extra figure in as a means of padding any missed costs in this CBA.

Please remember, as mentioned in the beginning of this section this is an extra conservative estimate, as the time spent waiting for and obtaining government subsidized *pipas* can be quite time consuming, and for some households, unreasonably costly.

## **Results**

Assuming that no households in Tlalpan receive RWH system installations, the net present cost (calculated over the 30-year time horizon) of existing *pipa* program is: **(\$118,749,293.27)**. This is the cost of serving 100% of the homes not connected to the water grid. In the context of this analysis, it serves a negative net present value (NPV) to the delegation of Tlalpan.

If 25% of the unconnected homes receive RWH installations, it serves a positive NPV of: **\$18,000,998.68**. This figure represents the amount of money the delegation of Tlalpan would save (over the 30-year time horizon) by removing 25% of Tlalpan's *pipas* from the road.

If 50% of the unconnected homes receive RWH installations, it serves a positive NPV of: **\$36,001,997.44**. This figure represents the amount of money the delegation of Tlalpan would save (over the 30-year time horizon) by removing 50% of Tlalpan's *pipas* from the road.

If 75% of the unconnected homes receive RWH installations, it serves a positive NPV of: **\$54,002,996.21**. This figure represents the amount of money the delegation of Tlalpan would save (over the 30-year time horizon) by removing 50% of Tlalpan's *pipas* from the road.

### **Conclusions**

Ultimately, the benefits for RWH outweigh the costs. Based on this CBA model, we have determined that it is more cost effective to provide rainwater harvesting systems for the households in Tlalpan, and perhaps greater Mexico City if this model is applied to other districts and regions. This is a financial proof of concept, suggesting that rainwater harvesting provides positive monetary offset to existing system of *pipas* trucks.

### ***A3.0 Interactive Calendar Content***

The following comprises conceptual ideas for calendar content. A water-color mockup of the calendar can be found at the end of the Spanish translations, which follows the text in English.

## ***JANUARY***

### **For Adults**

Happy New Year! We hope that capturing rainwater continues to bring joy, security, and independence to you and your family. Please don't hesitate to contact us at Isla Urbana should you have any questions or concerns about your system. We are here to help!

### **For Children**

Water is also known as H<sub>2</sub>O, which means it is created by two hydrogen atoms and one oxygen atom. Color the molecule shown here.

(Note: provide outline of hydrogen molecule to be colored)

## ***FEBRUARY***

### **For Adults**

Did you know you are a part of a larger community of households that want to be in control of their own water supply? As of 2016, there are over 2,000 systems capturing rainwater installed around Mexico. Thank you for being one of them.

### **For Children**

Around the world, February is a month that represents love and new beginnings. Draw a picture that shows what clean water means to you and discuss why it's important with your family. (Note: leave blank space for drawing)

## ***MARCH***

### **For Adults**

March 22 is World Water Day. Write down 5 reasons you are thankful to have water.

(Note: leave blank space for making a list)

### **For Children**

Spring is here! Water is necessary for plants, animals and people to grow and remain healthy. Draw some of your favorite things in nature.

(Note: leave blank space for drawing)

## ***APRIL***

### **For Adults**

The rainy season is coming soon! Remember to keep your roof clean so that the water you capture can be clean, too.

### For Children

Circle the things that should be removed to ensure a clean roof.

(Note: draw a graphic of a roof with several items that need to be removed to keep the roof clean: a dog, a cat, a pile of leaves or debris, a rake, plastic bottles, an old bike, etc.)

## MAY

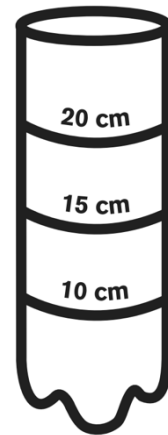
### For Adults

Let the first two rains flow through the system before capturing it, in order to flush out any toxins from city pollution. You can use this water for your plants or to wash outside areas.

### For Children

This month, make a homemade rain collector using a plastic bottle. Cut off the top and invert it, then draw a line for every five cm, starting from the bottom. Place it outside somewhere safe to collect water. Using your homemade rain collector, record the total amount of rainfall you receive this month.

(Note: include a similar graphic to visually explain)



## JUNE

### For Adults

Make a 'to-do' list with all tasks you can complete with the rainwater. Move the tasks around in order of highest to lowest priority.

(Note: leave space for list)

### For Children

Water is important in every culture. Here is a list of how they say water in a variety of languages.

(Note: list the name for water in several languages – ex: eau (French), wasser (German))

## JULY

### For Adults

Collecting rainwater helps to provide water security to families now and in the future. The more systems in place, the more substantial the benefits. Tell your friends about your experiences with the Isla Urbana system so that they too can capture the rain. If you'd like to get community members together to discuss rainwater harvesting, contact Isla Urbana to help!

### For Children

Can you find the water-related terms in this word find?

(Note: create a word find with words such as: agua, lluvia, cisterna, bomba, techo, Isla Urbana, capturer, pipas, familia, seguridad de agua)

## AUGUST

### For Adults

Access to clean water is integral to the health of future generations, but the waters of our planet are being polluted and consumed at unsustainable rates. Is there someone in the family (an abuelo or abuela) that can remember when access to water was different? Have them tell a story to the rest of the family so everyone can understand the changes we are facing.

### For Children

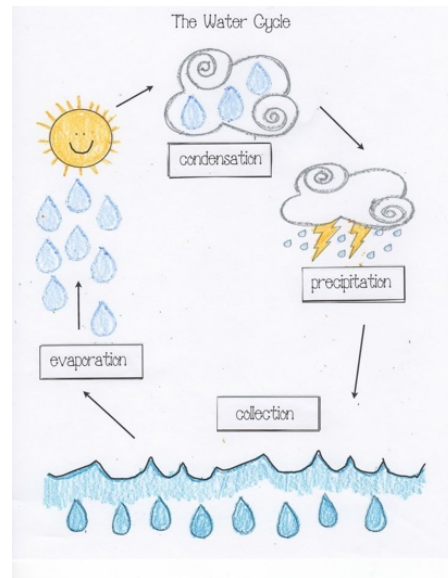
Draw a picture showing how important water is to your household. Isla Urbana will choose a few entries to be featured in next year's calendar!

(Note: leave space for drawing)

OR

Color the provided water cycle.

(Note: outline a similar water cycle to be colored)



## SEPTEMBER

### For Adults

As Mexico celebrates its independence, you too should celebrate your water independence!

### For Children

Water cisterns are a good place to show artistic expression. Use this template and illustrate a colorful picture.

(Note: draw the shape of a cistern, which can then be colored)

## OCTOBER

### For Adults

The dry season is coming! Remember to conserve water by turning off the taps when not in use, recycling water for plants, and refraining from washing heavy items such as blankets and rugs.

### For Children

Parts of the world with the lowest rainfall are called deserts. Draw plants and animals that live in the desert.

(Note: leave space for drawing)

## **NOVEMBER**

### **For Adults**

Water experiment! Arrange a competition between your family members to see who can take the quickest shower. Do something special for the winner, like cook them their favorite meal, and then discuss strategies for making shower times shorter across the whole family.

### **For Children**

Arrange a contest between you and your friends to see who can find the most different kinds of litter (plastic bottles, soda cans, etc.) and then discuss why it is important to keep these items away from the water system. Remember to dispose of it properly when finished and wash your hands. List what kinds of things you found here.

(Note: leave space for a list)

## **DECEMBER**

### **For Adults**

The end of the year is here! Reflect with your family on the most successful water-saving strategies you implemented throughout the year and prepare to make new goals for the next year.

### **For Children**

Draw a Christmas tree with rain-shaped ornaments to represent the gift of clean water.

(Note: leave space for the drawing of a tree)

*Potential Spanish Translations:*

## ENERO

### Para Adultos

¡Feliz año nuevo! Esperamos que la captura de agua de lluvia continúe trayendo alegría, seguridad, e independencia para ti y tu familia. Por favor, no dudes en ponerte en contacto con nosotros en Isla Urbana en caso de tener alguna pregunta o inquietud acerca de tu sistema. ¡Estamos aquí para ayudar!

### Para Niños

El agua también se conoce como H<sub>2</sub>O, lo que significa que es una molécula creada por dos átomos de hidrógeno y uno de oxígeno. Colorea la molécula mostrada aquí.

## FEBRERO

### Para Adultos

¿Sabías que formas parte de una gran comunidad de hogares que desean estar en control de su propio suministro de agua? Desde el año 2016, hay más de 2.000 sistemas de captación de agua de lluvia instalados en todo México. ¡Gracias por ser uno de ellos!

### Para Niños

En todo el mundo, febrero es un mes que representa el amor y nuevos comienzos. Haz un dibujo que muestre por qué te gusta tener agua limpia. Platica junto a tu familia por qué es importante para ustedes.

## MARZO

### Para Adultos

El 22 de Marzo celebramos el Día Mundial del Agua. Haz una lista de las principales 5 razones por las que agradeces tener acceso al agua.

(Nota: dejar espacio en blanco para la lista)

### Para Niños

¡La primavera está aquí! El agua es necesaria para las plantas, los animales y las personas crezcan y se mantengan saludables. Dibuja algunas de tus cosas favoritas de la naturaleza.

## **ABRIL**

### **Para Adultos**

¡Ya viene la temporada de lluvias! Recuerda que debes mantener tu techo limpio para que el agua que captes también esté limpia.

### **Para Niños**

Marca con un círculo las cosas que deben ser eliminadas para asegurar un techo limpio.

## **MAYO**

### **Para Adultos**

Deja que las dos primeras lluvias fluyan a través del tlaloque, ya que éstas pueden traer contaminación del aire de la ciudad. El tlaloque te ayudará a separar ésta agua de la que entrará a tu cisterna. Puedes utilizar el agua de estas primeras lluvias para regar tus plantas o para lavar tu patio.

### **Para Niños**

En este mes vamos a hacer un pluviómetro casero usando una botella de plástico. Corta la parte superior de la botella y voltéala. Dibuja una línea cada cinco centímetros, comenzando desde de la parte inferior. Coloca tu nuevo pluviómetro afuera de tu casa, en un lugar seguro. Usa tu colector de lluvia casero para registrar la cantidad total de lluvia que ha recibido en este mes.

## **JUNIO**

### **Para Adultos**

Haz una lista con todas las actividades que puedes realizar con el agua de lluvia. Ordena las actividades de acuerdo a la importancia que tienen para ti.

### **Para Niños**

El agua es importante en todas las culturas. Ésta es una lista de cómo dices la palabra agua en una variedad de idiomas.

## **JULIO**

### **Para Adultos**

La captación de agua de lluvia ayuda a proporcionar seguridad hídrica a las familias ahora y en el futuro. Cuantos mas sistemas existan instalados, más tangibles son los beneficios. Comenta con tus amigos sobre tu experiencia con el sistema de captación de Isla Urbana, para que también se animen a capturar la lluvia. Si deseas más información para que los miembros de tu comunidad también se involucren en la recolección de agua pluvial, contacta a Isla Urbana!

### **Para Niños**

¿Puedes encontrar los términos relacionados con el agua en este busca palabras?



## **AGOSTO**

### **Para Adultos**

El acceso al agua limpia es esencial para la salud de las futuras generaciones, pero el agua de nuestro planeta está siendo contaminada y la consumimos a un ritmo insostenible. ¿Hay alguien en la familia (un abuelo o abuela) que puede recordar cuando el acceso al agua era diferente? Platica con ellos y reflexionen juntos sobre sus experiencias.

### **Para Niños**

Haz un dibujo mostrando la importancia del agua para tu hogar. ¡Isla Urbana elegirá un par de ellos para incluirlos en el calendario del próximo año!

## **SEPTIEMBRE**

### **Para Adultos**

Así como México celebra su independencia, tu también puedes celebrar tu independencia hídrica. ¡Viva la lluvia para todos!

### **Para Niños**

Las cisternas son un buen lugar para mostrar tu talento artístico. Utiliza esta plantilla e ilustra una imagen para tu cisterna.

## **OCTUBRE**

### **Para Adultos**

¡La temporada de sequía se acerca! Recuerda conservar el agua cerrando bien las llaves, reusar el agua para regar las plantas y evitar lavar prendas grandes como colchas o alfombras.

### **Para Niños**

Las regiones del mundo con los niveles más bajos de precipitación se llaman desierto. Dibuja algunas plantas y animales que viven en el desierto.

## **NOVIEMBRE**

### **Para Adultos**

¡Hagamos un experimento de agua! Organiza una competencia entre los miembros de tu familia para ver quién puede tomar una ducha más rápido. Hágan algo especial para el ganador, como prepararles su comida favorita, y discutan las estrategias para lograr que las duchas de todos sean más cortas.

### **Para Niños**

Organiza un concurso entre tus amigos para ver quién puede encontrar la mayor parte de los diferentes tipos de basura tirada en la calle (botellas de plástico, latas de refrescos, etc.) Luego platiquen por qué es importante recoger la basura para que el agua fluya en la ciudad.

Recuerda desechar la basura adecuadamente y lavar sus manos al terminar. Hagan una lista de los tipos de cosas que encontraron.

## ***DECIEMBRE***

### **Para Adultos**

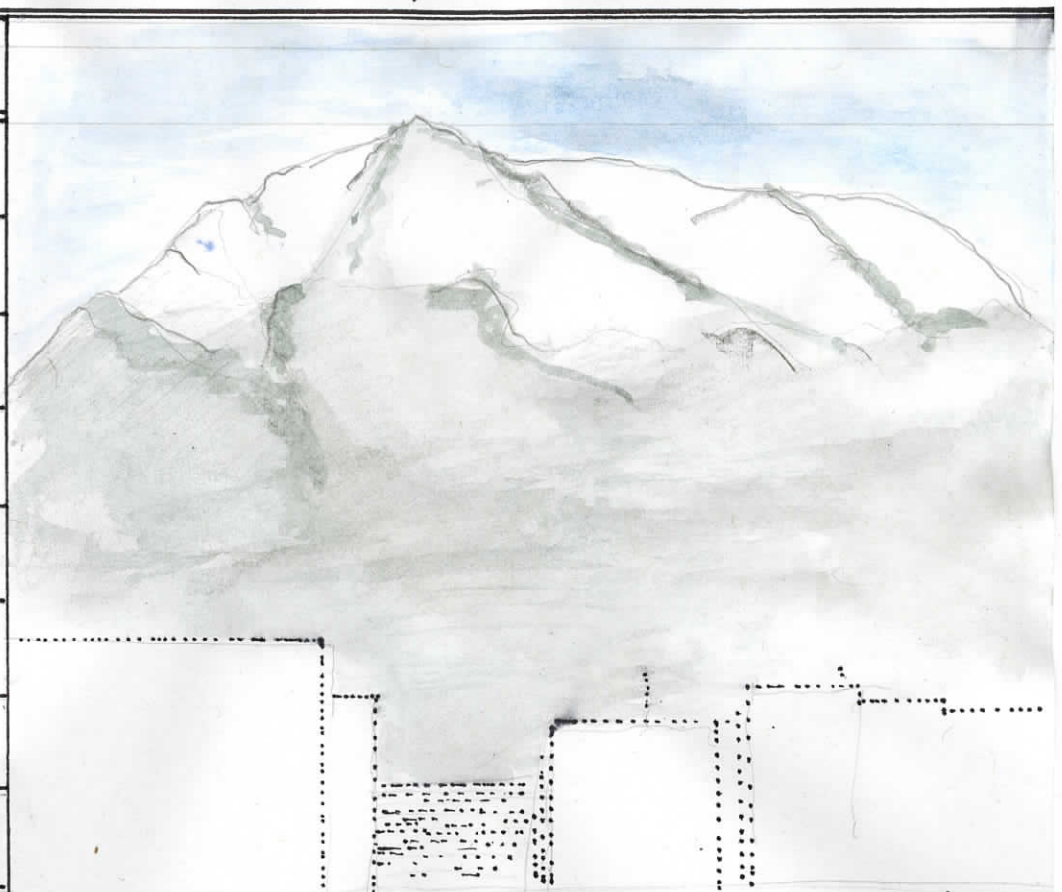
¡Llegamos al final del año! Reflexiona con tu familia sobre las estrategias más exitosas que resultaron en ahorro de agua durante todo el año. Preparen juntos nuevos objetivos para el próximo año.

### **Para Niños**

Dibuja un árbol de navidad y adórnalo con gotas de agua. Estas gota-esferas representan el regalo de tener agua en casa.

(Nota: Dejar espacio para dibujo)

	Mama	Papa	Enrique	Jenny	Niall
1 <sup>S</sup>					
2 <sup>D</sup>					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
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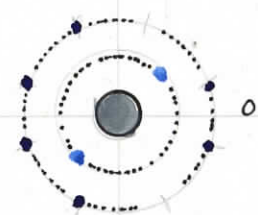
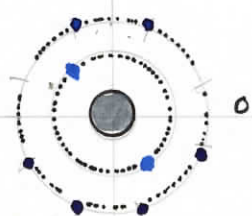
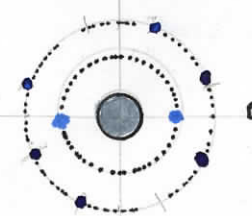
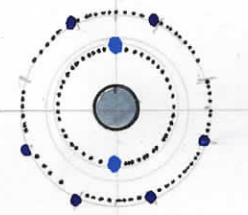
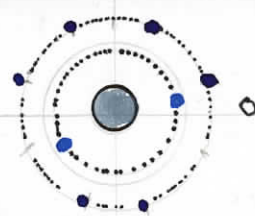
¡Feliz año nuevo! Esperamos que la captura de agua de lluvia continúe trayendo alegría, seguridad e independencia para ti y tu familia. Por favor, no dudes en ponerte en contacto con nosotros en Isla Urbana en caso de tener alguna pregunta o inquietud acerca de tu sistema.

¡Estamos aquí para ayudar!

El agua también se conoce como  $H_2O$ , lo que

significa que es un  
molecula creada  
por

dos átomos hidrógeno  
y uno de oxígeno.



## **A4.0 Water Model**

The following explanations delve into the details surrounding the water models on both the supply and demand side.

### **A4.1 Water Supply Offset Model**

#### **Purpose**

Mexico City receives a flow rate of 30.5 cubic meters per second of water to supply its population of approximately 9 million. 67% of this flow is supplied by underground sources through a complex system of wells and pipes.<sup>8</sup> According to the Mexico Valley Water Basin Council, the aquifer that supplies Mexico City has an overexploitation rate of 348%, meaning that the city is extracting three times more water than what the aquifer is recharging.<sup>9</sup> The aquifer recharges during the rainy season, and thus in a sustainable management scenario, actions should be taken to allow this natural process to occur. Additionally, the overexploitation of underground sources is causing subsidence, with some areas of the city sinking at about 2.5 cm per month.<sup>10</sup>

Reducing aquifer extraction is one of the most pressing water management challenges for Mexico City, and rainwater harvesting could help alleviate this situation. ***This model provides estimations about the potential of RWH as a substitute of aquifer extraction during the rainy months (May to October).***

#### **Approach / Methodology**

The model was constructed by calculating the potential precipitation flow rate for Mexico City during the well-defined rainy season that goes from May to October. Precipitation data (mm) for each of the sixteen delegations or municipalities of Mexico City was taken from the meteorological system of Mexico, SMN.<sup>11</sup> The following formula was used to calculate the precipitation flow rate for each delegation:

$Q_p = \text{Area (m}^2\text{)} \times \text{Runoff coefficient} \times \text{Precipitation (m)}$ ; where  $Q_p$  is Precipitation flow ( $\text{m}^3$ )

To calculate the percentage of the supply that could be diverted from aquifer extraction by using rainwater harvesting (RWH), the model compares the precipitation flow rate with the aquifer flow rate provided by SACMEX (2015):  $20.5 \text{ m}^3/\text{s}$ . This flow-rate includes all underground sources: Mexico City aquifer, Lerma system wells, La Caldera, Chiconautla and Barrientos.<sup>12</sup>

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<sup>8</sup> SACMEX, "Rescatando el agua de la Ciudad de México", La Jornada, September 2015

<sup>9</sup> <http://cuencavalledemexico.com/informacion/cuenca-del-valle-de-mexico/situacion-del-recurso-hidrico-2/acuiferos/>

<sup>10</sup> Niall, Nolan, *Potential for potable water savings by Using Isla Urbana rainwater harvesting systems in Tlalpan*, Mexico City.

<sup>11</sup> [http://smn.cna.gob.mx/climatologia/catalogos/cat\\_df.html](http://smn.cna.gob.mx/climatologia/catalogos/cat_df.html)

<sup>12</sup> SACMEX, "Rescatando el agua de la Ciudad de México", Op. Cit.

The model constructs various scenarios that consider different percentages of houses adopting RWH systems and different installation rates. The resulting estimations answer the following questions:

- What percentage of the supply from underground sources could be diverted by using RWH?
- How many years would it take, considering Isla Urbana's current installation rate?

### **Assumptions**

The model is predicated on the following assumptions:

Supply System: The supply rates were taken from SACMEX, the city's water distribution authority. The model considers a supply flow of 20,500 l/s (20.5 m<sup>3</sup>/s) from underground sources and 1,000 l/s (10 m<sup>3</sup>/s) from surface water sources. Since the model aims to quantify the amount of water that could be diverted from aquifer extraction through rainwater, all comparisons and percentages are calculated using the underground aquifer supply (i.e. 20.5 m<sup>3</sup>/s).

However, the model does not consider that more than 40% of the supplied water to the city gets lost due to outdated pipes and leakages<sup>13</sup>. The model did not discount this percentage of the supply because we do not have the information about the distribution of these leakages among the water systems (i.e. what proportion of the leakages corresponds to the aquifer sources and what proportion to the superficial water sources). Thus, the model assumes that 100% of the described flow gets distributed among delegations. Additionally, it is considered that the same mix of superficial and underground water serves the 16 delegations of D.F.

The model also assumes that all the supply goes to household consumption, rather than distributing among different usages such as industry, commerce, services and agriculture.

Precipitation: The model was constructed taking the average rainfall per month for 50 CONAGUA climate stations within the 16 delegations of Mexico City. SMN data covers the time period from 1951-2010. The model only considers the average rainfall for the rainy months (i.e. May to October). To get the average precipitation for the rainy months, an average rainfall per delegation was calculated.

Households: The model considers the total number of particular houses registered in the 2010 population Census (i.e. 2,453,031 houses). The model assumes that all of these houses are particular houses and that all of them are suited to install rainwater-harvesting systems.

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<sup>13</sup> SACMEX, "Rescatando el agua de la Ciudad de México", Op. Cit.

***Rainwater-Harvesting Specifications:*** The model assumes an average rooftop surface of 65m<sup>2</sup> and that all rooftops are suited to install rainwater-harvesting systems. The average surface of rooftops mimics the assumptions made by Niall's paper on Tlalpan.<sup>14</sup> A runoff coefficient of 0.9 is also considered for the calculations.<sup>15</sup>

***Isla Urbana and Current Market Conditions:*** Although there are other providers of RWH technology in the city, the model assumes that Isla Urbana (IU) is the only one that provides reliable-high quality technology. This notion is based on conversations with our client. The model also considers IU's current capacity to install systems: 18 installations per week.<sup>16</sup>

## Results

The most idyllic scenario is the one where 100% of homes in Mexico City install rainwater-harvesting systems. The results show that rainwater harvesting could reduce the aquifer drawdown rate by 30%; however, it would take more than 2 thousand years to install systems in 100% of the houses under the current installation rate. On a more modest scenario, with 5% of houses invested in RWH, the proportion of the aquifer drawdown avoided is 1.5%. At the current installation rate, this would take 131 years to complete.

These results show that rainwater harvesting has a great potential to supply the city, but it needs a strategy in order to be a viable solution in the coming years. Since the city has a large range of rainfall depending on the altitude and local weather conditions, one way to prioritize the installation of systems is to focus the delegations with the most rainfall (as mentioned earlier) during the rainy season. These delegations are:

Delegation	Average precipitation in rainy months (mm)
Cuajimalpa	1,148.90
Tlalpan	935.92
Álvaro Obregón	870.97
Magdalena Contreras	846.10
Xochimilco	753.33

<sup>14</sup> Niall, Nolan, *Potential for potable water savings by Using Isla Urbana rainwater harvesting systems in Tlalpan*, Mexico City.

<sup>15</sup> Lancaster, Brad. *Rainwater Harvesting for Drylands and Beyond*. (n.d.) Retrieved from: <http://www.harvestingrainwater.com/wp-content/uploads/2009/07/Volume-1-pg-48.pdf>

<sup>16</sup> Isla Urbana Facebook page

A scenario with 100% of the houses within the 5 delegations adopting RWH systems would alleviate aquifer extraction by 9.39%, but would take 627 years under the current market conditions. A scenario with 5% of the houses adopting RWH would divert aquifer extraction by 0.47% in 31 years, and a scenario with 1% of the houses would do so by 0.09% in 6.3 years.

Taking into account these results, it is noticeable that the installation rate needs to improve in order to make RWH a viable and sustainable option for sourcing the city's needs in the upcoming years. We assumed an ambitious installation rate 25-times-that of IU current rate (450 systems installed per week), based on the list of the eco-technology providers certified by INFONAVIT under the Green Mortgages scheme.<sup>17</sup>

We believe this installation capacity could be covered by IU in the future, provided it has the funding and managerial organization needed. Alternatively, it could also be covered by a set of competitors or partners offering similar technology and operations; as long as they strive to be conservative in the use of water in their manufacturing process. Understanding the value in good water stewardship, the partnering organization or company would have to place a high priority in protecting the local water sources that they work with. Coca Cola Company (**see section 4.4.3**) has a global philanthropic body known as the Coca Cola Foundation that supports international efforts to empower communities, promote well-being, and make a positive impact on the environment. The foundation's core sustainability priorities are women (economic empowerment and entrepreneurship), water (access to clean water, water conservation and recycling), and well-being (active healthy living, education and youth development).

After assuming this installation rate as a potential goal, the model needed to consider a percentage of households within the city that would most urgently need a system. Considering that about 12% of the city's houses lack access to the water grid<sup>18</sup> we set an achievable, yet ambitious goal to analyze:

**To provide with water access to half of this population;** meaning an equivalent of 6% of houses in the city. If 6% of the total houses in Mexico City were invested in RWH, IU could help diverting 1.8% of the supply covered by aquifer pumping by installing more than 147,000 systems. With the scaled up, more competitive installation rate of 450 systems per week, this would happen within 6.3 years.

## Limitations

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<sup>17</sup> There are 25 eco-technology providers certified by INFONAVIT to install efficiency services and products under the Green Mortgages scheme. INFONAVIT public list was consulted on 4/9/2016: [http://portal.infonavit.org.mx/wps/wcm/connect/infonavit/trabajadores/saber+para+decidir/cuido\\_mi\\_casa/los+proveedores+y+sus+ecotecnologias](http://portal.infonavit.org.mx/wps/wcm/connect/infonavit/trabajadores/saber+para+decidir/cuido_mi_casa/los+proveedores+y+sus+ecotecnologias) (Note: repeated providers are only considered once)

<sup>18</sup> INEGI, Documentos del Censo Nacional de Población y Vivienda, Entidad: Distrito Federal [http://www.inegi.org.mx/prod\\_serv/contenidos/espanol/bvinegi/productos/censos/poblacion/2010/panora\\_socio/df/panorama\\_df.pdf](http://www.inegi.org.mx/prod_serv/contenidos/espanol/bvinegi/productos/censos/poblacion/2010/panora_socio/df/panorama_df.pdf)



Number of houses: The model considers that 100% of the houses have 65 m<sup>2</sup> of rooftops and are suitable to adopt a RWH system. However, according to the 2010 Census 67% of the city's inhabitants lived in independent houses, while 24% of them lived in apartments and the rest lived in other conditions<sup>19</sup>. This situation limits the accuracy of the results regarding the catchment surface and the number of years required for installation. However, apartment buildings normally would have a larger rooftop surface than the 65m<sup>2</sup> considered by this model.

Additionally, the model does not consider other buildings that might be suitable to install RWH systems, such as non-residential buildings like public and private offices, public buildings (e.g. offices, museums, markets, community kitchens), schools, malls, etc. However, the fact that the model does not make the distinction between independent and shared buildings should not undermine the logic and estimations derived from it.

Population and Housing Projections: The findings and recommendations are based on the houses registered in the 2010 Population and Housing Census. According to CONAPO, Mexico's agency for population, the number of homes is expected to increase in the following years due to the current age-distribution of the population.<sup>20</sup> This expected growth on housing, nor any other population projections are considered in the model.

Effects of Climate Change: Research suggests climate change may increase seasonal amplitude in Mexico City: rainy seasons may become shorter with more intense rain events and the dry season drier<sup>21</sup>. Changes in precipitation and drought effects (evaporation rates) are not considered in the findings of this model.

Storage: The model is constructed to demonstrate the potential RWH has to aid the aquifer recharge during the rainy season. Storage capacity is not taken into account; thus the results of the model might *underestimate* the potential of RWH systems as an alternative to cover the city's supply during the whole year.

Pipe Leaks: As explained before, the model does not account for the 40% of supplied water that is lost due to leaks in the water grid system. If some of all those leaks were repaired (repairs are planned for the future) one could assume that the current flow to serve the city's population would diminish and thus, the potential for RWH to divert aquifer extraction would be even larger than what the current results show.

## Conclusions

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<sup>19</sup> Other conditions include: room or house in vecindad, rooftops, adapted spaces (not built to be inhabited), mobile houses and shelters. <http://www3.inegi.org.mx/sistemas/mexicocifras/default.aspx?src=487&e=9>

<sup>20</sup> Gaceta Oficial del Distrito Federal, *Programa General de Desarrollo Urbano 2013-2018*, September 11, 2013 [http://www.consejeria.df.gob.mx/portal\\_old/uploads/gacetitas/522fe67482e50.pdf](http://www.consejeria.df.gob.mx/portal_old/uploads/gacetitas/522fe67482e50.pdf)

<sup>21</sup> Patricia Romero, "Water in Mexico City: what will climate change bring to its history of water-related hazards and vulnerabilities?", *Environment and Urbanization* 22, no. 1, 2010, pp. 157-178.



According to the findings, RWH can help alleviate Mexico City's current excessive extraction from the aquifer. As noted before, the estimations calculated in this model are modest and the potential of RWH to become part of a sustainable solution for Mexico City's water supply could be larger if:

1. Storage was taken into account,
2. Consumption was reduced and c. a leak-free supply was considered to make the comparisons.

In order to make RWH a viable solution for the upcoming years, the city needs to work on a strategy, prioritizing installations in the delegations with the most rainfall. This solution is of particular relevance for delegations like *Xochimilco*, where only 66.6% of the houses have access to piped water, and the average rainfall is around 753 mm during the rainy season.

On the other hand, and, independent from the government strategy to promote RWH, it is clear that Isla Urbana needs to escalate its efforts and grow its business if the organization aims to maximize the environmental benefits of its technology. As the model has demonstrated, IU requires to keep strengthening its partnerships with plumbers, training more people to install and maintain the systems and embracing competition so RWH can become a relevant alternative for the current water system. The model shows different outcomes according to different scenarios.

The most ambitious in terms of scaling up IU's efforts is the scenario with a much more competitive installation rate, where 450 systems are installed each week. At this rate, if 6% of the total houses in the city installed systems, it would take 6.3 years to complete the installations, thus reducing aquifer drawdown by 1.8% during the rainy months.

Finally, it is relevant to mention the importance of protecting the natural area of aquifer recharge: the conservation land, which constitutes 59% of Mexico City's territory. Between 1980-2000 76% of the new houses that were built in Mexico City were located in the seven delegations that hold most of the conservation land. Additionally, about 80% of the illegal settlements are located within conservation areas.<sup>22</sup> The city government estimates that if conservation land continues to be invaded by urban or agricultural development, by 2025 Mexico City would lose 14% of its forests and, amongst the many consequences this would carry, the aquifer's natural recharge cycle will be threatened.<sup>23</sup> As all matters in sustainability management, a sustainable and resilient water system for Mexico City will require the sum of many efforts and actors. Isla Urbana has positioned itself to be part of the sustainability contingent to provide the city and its inhabitants with the alternatives they so urgently need.

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<sup>22</sup> <http://islaurbana.mx/contenido/biblioteca/investigaciones/aguadf/Tortajada2006WaterManagementfortheMXcitymetropolitanarea.pdf>

<sup>23</sup> Gobierno del Distrito Federal 2003, *Op Cit.*

## **A4.2 Water Demand Offset Model**

### **Purpose**

Mexico City has an aging water infrastructure that continually fails to meet the city's household water demand. Currently, 67% of the city's water is supplied by the local aquifers<sup>24</sup>, which is estimated to be experiencing a 348% overexploitation rate<sup>25</sup>, meaning that the water is being extracted much faster than it is being recharged. In the absence of an alternative solution to meet the increasing water demand, this overexploitation rate is projected to increase, further exacerbating Mexico City's issue with land subsidence. The average per capita water demand in Mexico City is 320 L/capita/day<sup>26</sup> but in rural communities such as Tlalpan, the pilot site of Isla Urbana, residents consume much less at 25 - 50 L per capita per day<sup>27</sup>. Furthermore, as Mexico City's population continues to increase, the demand for water will also increase, presenting the need of a sustainable solution to address this issue.

Given Mexico City's abundant rainfall in the months of May through October, rainwater harvesting becomes a potential alternative solution to meet the city's increasing water demand while simultaneously helps to alleviate the stress on the overexploited local aquifers. This model serves to illustrate the viability of using rainwater harvesting as an alternative source to meet that demand.

### **Approach / Methodology**

We used monthly precipitation data from Mexico City's CONAGUA (Comisión Nacional del Agua), and average monthly household demand in the city to develop a simple mass-balance equation to determine the percentage of monthly city-wide water demand that could be met using rainwater harvesting. Inflow ( $I_t$ ) to the system is calculated using the following formula:

$$I_t \text{ (m}^3\text{)} = \text{Catchment area (m}^2\text{)} \times \text{Runoff coefficient} \times \text{Precipitation (m)}$$

From there, we calculated an average monthly household water demand in 2030, defined as the outflows from the system ( $O_t$ ), which is calculated using the following equation and is kept constant for calculations in the mass balance:

$$O_t = \text{Water consumption per person per day} \times 30 \text{ days} \times \text{population of Mexico City in 2030}$$

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<sup>24</sup> SACMEX, "Rescatando el agua de la Ciudad de Mexico", *La Jornada*, September 2015

<sup>25</sup> Consejo de Cuenca del Valle de México (CCVM). Retrieved from:

<http://cuencavalledemexico.com/informacion/cuenca-del-valle-de-mexico/situacion-del-recurso-hidrico-2/acuiferos/>

<sup>26</sup> CDMX Sustentable. Retrieved from: <http://cuidarelagua.df.gob.mx/consumo.html>

<sup>27</sup> Isla Urbana in discussion with the author, March 2016.

The model shows different scenarios with varying percentage of households in the city that uses RWH, which we see as the limiting factor. We also varied the installation rates of the RWH systems, to illustrate the limitations of Isla Urbana's current installation capacity, and show the potential impact that they could achieve by increasing their capacity. Our results helped us answer the following key questions:

- What percentage of water demand in the months of May through October could be met by RWH given X% of households that adopt the technology?
- How long would it take for Isla Urbana to achieve the stated goals, given its current installation rate?

## **Assumptions**

*Water Demand:* Calculations regarding water demand is based on a projected 1.8% annual increase population by 2030<sup>28</sup>. We calculated the population increase using the population in 2015 as a baseline<sup>29</sup>, and assume that water demand is an average of 320 L per capita per day, and recognize that using this average value may lead to an overestimation or underestimation of actual water demand. Moreover, since we are using a city-wide average water demand, our model doesn't take into account the distribution of water consumption within the delegations of Mexico City.

*Precipitation:* We used rainfall data of Mexico City from CONAGUA (Comisión Nacional del Agua)<sup>30</sup>, and used the monthly average values from May to October over 11 years (from 2004 – 2015) to determine an average monthly rainfall value for our calculations.

*RWH Specifications:* Our model assumes an average roof area of 65 m<sup>2</sup> and that 100% of those roofs will be used as a catchment surface for rainwater harvesting. The average area was derived using assumptions made by Niall in his report on Tlalpan<sup>31</sup>, and 0.9 is the runoff coefficient of concrete<sup>32</sup>, the most common roof material used in the pilot site of Tlalpan, Mexico City.

*Rainwater Harvesting Market in Mexico City:* This model assumes that Isla Urbana is the sole provider of quality RWH systems in the city, who has the capacity to install 18 units/week. Under more competitive conditions, we assume that Isla Urbana could achieve a 25 times increase in capacity, installing 450 units per week.

## **Results**

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<sup>28</sup> <http://www.city-data.com/world-cities/Mexico-City.html>

<sup>29</sup> <http://www.citypopulation.de/php/mexico-admin.php>

<sup>30</sup> Comisión Nacional del Agua. Retrived from:

[http://smn.cna.gob.mx/index.php?option=com\\_content&view=article&id=12&Itemid=77](http://smn.cna.gob.mx/index.php?option=com_content&view=article&id=12&Itemid=77)

<sup>31</sup> Niall, Nolan, Potential for potable water savings by Using Isla Urbana rainwater harvesting systems in Tlalpan, Mexico City

<sup>32</sup> Lancaster, Brad. Rainwater Harvesting for Drylands and Beyond. (n.d.) Retrieved from: <http://www.harvestingrainwater.com/wp-content/uploads/2009/07/Volume-1-pg-48.pdf>

*Scenario 1 – Current Installation Capacity:* The results from the model show that on a single household level, water demand will be fully met through rainwater harvesting during the rainy season. However, at Isla Urbana's current installation capacity, the organization is limited to undertaking smaller projects, thus limiting the amount of households that they could cater to.

The first series of scenarios illustrate the different outcomes of using Isla Urbana's current installation capacity of 18 units/week to undertake various size projects. To install in 0.1% of Mexico City's households, Isla would have to install a total of 2,453 rainwater harvesting units, which will take them 2.62 years to complete. This is still an acceptable timeframe for a short to medium-term plan; however, once we increase the scope of the project, we begin to see the limitations of Isla Urbana's current installation capacity. For example, if we were to install rainwater harvesting units in 6% of the households in Mexico City, which is estimated to be half of the population without access to the water grid in Mexico City, it will take Isla Urbana 157 years to complete installations – thus presenting the need for Isla to develop a strategy that could prepare them for increasing their installation capacity.

*Scenario 2 – Increased Installation Capacity:* The second series of scenarios illustrate the potential impacts that Isla could achieve if they were to significantly increase their installation capacity. We determined the capacity rate of 450 units per week to be representative of a more competitive market, where there is an established market for rainwater harvesting in Mexico City. At this installation rate, rainwater harvesting can still meet 100% of demand of the households with the systems installed in their home. The difference is that installations could be achieved at a much faster rate, allowing for more installations to be completed in a shorter period of time.

For example, to install the same 2,453 units for 0.1% of the households in Mexico City it will take Isla Urbana just over a month to complete, as opposed to 2.6 years. Moreover, if Isla Urbana could install rainwater harvesting units in 6% of the households in Mexico City, during the rainy season (May - October) the aggregate amount of water provided through rainwater harvesting per month will be able to meet 8.2% of city-wide household water demand during each month, and installations could be completed in 6.3 years, provided an increase in capacity starting immediately, which we recognize to be a very optimistic scenario.

## **Limitations**

*Catchment Surface:* This model assumes that each household lives in an independent home with an average rooftop area of 65 m<sup>2</sup> per household, and that 100% of that roof area is suitable to use as a catchment surface for rainwater harvesting. This assumption ignores the fact that 24% of the population of Mexico City live in apartment buildings<sup>33</sup>, thus limiting the accuracy of the outcome from the model. While apartment buildings

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<sup>33</sup> Instituto Nacional de Estadística y Geografía (INEGI). Retrieved from: <http://www.inegi.org.mx/est/contenidos/proyectos/ccpv/cpv2010/Default.aspx>

might have a larger rooftop area, it aggregates the number of households under the same roof, which may lead to an underestimation of the value for catchment area. The model also ignores other buildings that could serve as a catchment surface for rainwater harvesting systems, such as non-residential buildings such as schools, offices, markets, etc. However, while we recognize that this model is based on various assumptions, it provides a starting point in estimating the potential benefits that could be derived from implementing rainwater harvesting.

*Population and Housing Projections:* Data on households used in the model is based on the registered homes in the 2010 Population and Housing Census. The number of homes in Mexico City is projected to increase in the upcoming years, due to the current age-distribution of the population<sup>34</sup>.

*Household Water Demand:* The model assumes a constant demand amongst all households, which may be an overestimation or underestimation of actual demand. Moreover, it does not take into account different levels of consumption levels that may vary between seasons.

*Climate Change:* Various studies show that climate change will significantly affect Mexico City's climatic variability<sup>35</sup>, resulting in shorter and more intense rain events as well as more intense droughts, which are not accounted for in this model.

*Storage:* This model focuses on catchment surface as a limiting factor to implementing rainwater harvesting at a city-wide scale. It does not account for available storage capacity and assumes that all of the water captured is properly stored, which could result in an overestimation of the benefits derived from the model.

## **Conclusions**

Mexico City's increasing population comes with greater demand for water, an issue that is rapidly presenting itself as a major challenge for the current water infrastructure. The results from this model show that rainwater harvesting is a viable solution to meet water demand on the household-level during the rainy season. However, currently, rainwater harvesting does not have a well-defined market nor supply source to fully allow it to realize itself as a solution for Mexico City. As illustrated in this model, the main challenge for Isla Urbana is to increase its installation capacity, as it is currently a limiting factor that prevents the organization from fully realizing the potential benefits of rainwater harvesting.

Therefore, to achieve the benefits shown in this model, Isla Urbana needs to continue to refine their organizational capacity so that they are prepared to undertake larger scale

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<sup>34</sup> Gaceta Oficial del Distrito Federal, Programa General de Desarrollo Urbano 2013-2018, September 11, 2013 [http://www.consejeria.df.gob.mx/portal\\_old/uploads/gacetas/522fe67482e50.pdf](http://www.consejeria.df.gob.mx/portal_old/uploads/gacetas/522fe67482e50.pdf)

<sup>35</sup> Patricia Romero, "Water in Mexico City: what will climate change bring to its history of water-related hazards and vulnerabilities?", *Environment and Urbanization* 22, no. 1, 2010, pp. 157-178.

projects. IU also need to focus its efforts on community education in rainwater harvesting, and embrace competition; to allow for a wider acceptance and foster a more competitive market for the technology. Moreover, Isla Urbana should use the government of Mexico City's plans to promote best practices in water management by 2030 to leverage their growth.

## ***A5.0 Climate Change: The Future of Mexico City***

Climate change poses a critical threat to Mexico City for a myriad of reasons. With vulnerabilities to the existing water infrastructure and supply, extreme flood potential, and other water-related hazards, rainwater harvesting systems from Isla Urbana could play an important role in mitigating the impacts of climate change. Global warming is projected to induce increased climatic variability and could alter precipitation patterns in many regions of the world. Such changes may push the traditional weather paradigm away from the narrow band most urban infrastructure is designed for, thus exacerbating the stress to water systems.

While developing new large-scale infrastructure solutions could always be considered, such projects are often grossly expensive and plagued by both known collateral effects and unintended consequences<sup>36</sup>. Both water use efficiency and new decentralized (distributed) sources for urban water supply will play a key roles moving forward. Urban rainwater harvesting technology, defined by capturing and storing runoff from city structures such as domestic roofs, is a cost-effective solution that holds significant potential in mitigating added pressures induced by climate change.

### ***Climate Change and Water in Mexico City***

In Mexico City and the surrounding regions, research suggests climate change may increase seasonal amplitude: rainy seasons may become shorter with more intense rain events and the dry season drier<sup>37</sup>. Climate model projections further indicate an increase of average temperatures, which would augment evaporation, negatively affecting soil moisture availability<sup>38</sup>, which in turn could reduce aquifer recharge rates.

A projected increase in seasonal amplitude may exacerbate Mexico City's water paradox, further defining it as a water stressed region that also suffers from frequent catastrophic flooding. According to demographic projections and current water trends between 2005 and 2030, the population of Mexico City is expected to increase by 17.5

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<sup>36</sup> World Commission on Dams. Dams and Development: A New Framework for Decision-making: the Report of the World Commission on Dams. London: Earthscan, 2000.

<sup>37</sup> Lankao, Patricia Romero. "Water in Mexico City: what will climate change bring to its history of water-related hazards and vulnerabilities?." *Environment and Urbanization* 22, no. 1 (2010): 157-178.

<sup>38</sup> Field, C. B., V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee et al. "IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change." (2014). CH 12 p. 1080

percent, while between 2007 and 2030 water availability could be reduced by 11.2 percent.<sup>39</sup>

### ***Rainwater Harvesting Technology***

Rainwater harvesting, shows significant promise in mitigating water stress in Mexico City; adding both positive social and environmental spillover benefits. Although the rainy season is short but vigorous, a large portion of the rainwater runs off over already saturated surfaces, contributing little to groundwater replenishment and potentially causing problems such as flooding, erosion and landslides. Residential rainwater harvesting captures excess runoff, storing it for use in the dry season. Maintaining this reserve supply not only helps reduce household-level water stress, but also offers the potential mitigate some of the impacts of climate change.

- 1. Moderating Hydrological Extremes:** by capturing water during the rainy season and storing a fraction for use during the drier months, rainwater harvesting technology moderates the seasonal amplitude of the hydrological processes, which is expected to magnify under climate change. For example, “excessive” water in the rainy season can be stored, used and released during the dry season when soils tend to be less saturated, allowing for more infiltration and subsequent aquifer recharge.
- 2. Reducing Dependence on Aquifers:** since a large portion of Mexico City is dependent on overexploited aquifers, utilizing rainwater as an alternative source may contribute to reduce the pressure on groundwater sources, which is predicted to be exacerbated by climate change.
- 3. Mitigating Flooding:** roofs make up a significant amount of urban surface area. Capturing the roof run-off by rainwater harvesting may decrease total runoff in highly impervious urban locations, thus contributing towards the reduction of flood risk, which has already been rising due to increased extreme rain events caused by local (urban heat island effect) and global climate change.
- 4. Reducing Erosion:** reducing run-off is also a significant way to combat sediment transport, contributing towards the attenuation of problems caused by erosion, such as silting of the drainage systems, loss of soil fertility by leaching, and eutrophication of water bodies, all expected to worsen with the increase of extreme rain events.
- 5. Building Drought Resilience:** as a distributed (decentralized) source of water, rainwater harvesting may aid in increasing independency from the centralized large infrastructure projects that are usually designed to optimally

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<sup>39</sup> Partida, Virgilio, and Carlos Anzaldo. "Escenarios demográficos y urbanos de la zona metropolitana del valle de México." *CN Población, La situación demográfica de México* (2003).



operate under a narrow range of climate variability. Additionally, the installation of rainwater harvesting systems is less timely and expensive if compared to large infrastructure, thus being an adequate alternative for drought emergencies. The efficiency of rainwater harvesting may be undermined by extreme droughts in which stretches of dry days become too long. However, since roofs are impervious surfaces, rainwater harvesting is able to efficiently capture water that would not reach the aquifers under extremely low soil moisture availability scenarios.

## **A6.0 Definitions of Commonly Used Indicators** (Across Audience Profiles)

**Cost-Benefit Analysis (CBA):** A model that quantifies the costs and benefits of rainwater harvesting, by calculating both financial and qualitative factors. Some of which include: avoided fuel costs for water trucks, avoided carbon emissions of water trucks, cost of rainwater harvesting system installation to local governments, and offsets to flooding and erosion.

**Credit Conditions:** A household's ability to take on a loan or other form of credit as defined by:

1. The approximate **borrowing capacity** (size of the loan and the repayment rate) that is feasible given a household's current financial state
2. The value and type of **collateral** the household can put up
3. A household's overall **character** or sense of obligation it feels to repay a loan

**GHG Emissions Abated from Pipa Trips Avoided:** The approximate amount of greenhouse gas emissions abated from a reduction in water truck (*pipas*) deliveries. This can be measured at the individual household level, communal level, and/or regional level. Capturing this indicator is made feasible by estimating the average annual amount of water truck deliveries per household, as well as the approximate miles travelled per trip.

**Household Income:** Metric that measures the amount of money a household makes relative to its average monthly water expenditures. This data will help determine the degree of water stress a household is experiencing.

**Monetary Benefit to Communities:** The calculated financial benefit that rainwater harvesting has on a community. This can be measured both quantitatively and qualitatively in the form of avoided pipas costs, time saved from ordering and/or waiting for water truck deliveries, as well as newfound spending capacities due to marginal increases in available capital.

**Number of Households with RWH Systems:** The amount of households within a community and/or district that have installed RWH systems. Obtaining location-based data that captures the amount of installations within a given area will allow for more robust measurement of impact on: flooding, erosion, pollution (caused by *pipa* trucks), aggregate financial benefits, and whether water security has been improved/achieved.

**Number of Schools with RWH Systems:** An indicator that tallies the number of schools that have installed rainwater harvesting systems. This is significant as schools will usually have larger than normal rooftops, thus allowing for greater than average catchment capacity. Furthermore, school installations present educational opportunities for students to interact with, and learn about rainwater harvesting. This plays a significant role in promoting systematic adoption, as well as water value awareness.

**Offset Through RWH to Aquifer Extraction:** The measured reduction of reliance on aquifer-sourced water in a household, community, or district, in relation to the amount of rainwater that is harvested.

**Offset Through RWH to Drainage Overflow:** The measured amount of drainage-related flooding averted due to rainwater harvesting. By estimating the average roof size in a community or district, an approximated catchment capacity is determinable. This figure will provide an idea of how much water is diverted from the overstressed infrastructure.

**Offset Through RWH to Storm Water Runoff:** The measured amount of contaminated runoff flooding averted due to rainwater harvesting. By estimating the average roof size in a community or district, an approximated catchment capacity is determinable. This figure is particularly relevant in highland areas that lack proper wastewater infrastructure, and are more prone to erosion.

**Pipa Deliveries Avoided:** The measured impact potential for rainwater harvesting systems to alleviate stress and reliance on the existing water delivery system in Mexico City and the surrounding districts. When households harvest rainwater, the demand for truck-based water deliveries decrease, resulting in a reduction of fuel costs as well as carbon emissions.

**Reduced Strain On Traditional Water Delivery Infrastructure:** Measurement of the extent to which rainwater harvesting offsets common and institutional processes of getting water to households and communities. Rainwater catchment systems are intended to either replace or supplement the existing means of obtaining water, whether it is being fed from grid connections or delivery via *pipa* truck.

**Water Management Education:** Educating households and/or communities to value water by driving home the risks associated with institutional water dependence. Techniques that promote efficient water usage and management should be taught to instill water-saving habits that allow for household and/or communal self-sufficiency.

**Water Savings Through Rainwater Harvesting:** Approximate amount of avoided water use from Traditional Water Delivery Infrastructure. This indicator could measure estimated amounts of aquifer recharge attributable to widespread installations of rainwater harvesting systems.

## **A7.0 Literature Review**

The list of sources below catalogues the various articles, academic papers and case studies that have been compiled over the course of the Spring 2016 semester. The following literature review is complimentary to the word cloud database that will be distributed separately from this document.

### **A7.1 Rainwater Harvesting: A Global Perspective**

Nagar, Anoop, S. N. Bhattacharya, Poonam Sharma, S. Subramanian, M.S. Kumar, Saidul Hag, Faisal Abrar, and P. Yadaiah "Rain Water Harvesting and Artificial Recharge: Select Case Studies" Central Groundwater Board Ministry of Water Resources, New Delhi (2011). Retrieved February 5, 2016 from [http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Case\\_studies\\_on\\_rainwater\\_harvesting\\_and\\_artificial\\_recharge\\_CGWB\\_2011.pdf](http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Case_studies_on_rainwater_harvesting_and_artificial_recharge_CGWB_2011.pdf)

*Highlights case studies of RWH projects in India for aquifer recharge.*

Birch, Heidi, Maria Bergman, Antje Backhaus, Ole Fryd and Simon Toft Ingvertsen. "Sustainable Urban Drainage Systems: 8 case studies from the Netherlands" 2BG (2008). Accessed on March 12, 2016 from: [http://ign.ku.dk/forskning/landskabsarkitektur-planlaegning/landskabsteknologi/2bg-black-blue-green/filer/2bg\\_workingpaper1\\_holland\\_excursion.ashx](http://ign.ku.dk/forskning/landskabsarkitektur-planlaegning/landskabsteknologi/2bg-black-blue-green/filer/2bg_workingpaper1_holland_excursion.ashx)

*This working paper presents observations and experiences from a study trip to the Netherlands to look at eight sites with various sustainable urban drainage systems.*

Cain, Nicholas L. "A Different Path: The Global Water Crisis and Rainwater Harvesting," Columbia University Academic Commons, (2014). Retrieved from <http://dx.doi.org/10.7916/D8FF3S23>

*This study encourages the exploration of small-scale, community-scale projects as a complementary solution to centralized water infrastructure. Draws examples of rainwater harvesting cases in India.*

Development Technology Unit. "Very-low-cost Domestic Roofwater Harvesting in the Humid Tropics: Constraints and Problems," School of Engineering, Warwick University (2002). Retrieved February 2, 2016, <http://www2.warwick.ac.uk/fac/sci/eng/research/civil/dtu/pubs/reviewed/rwh/dfid/r2.pdf>.

*Focusing on Sri Lanka, Ethiopia and Uganda, this report hopes to guide the development of new technologies (for RWH) to directly answer some common problems highlighted. The report also identifies what information water professionals*

*and decision makers feel they need in order to sponsor rainwater harvesting projects with confidence.*

Domenech, Laia and David Saurí, "A comparative appraisal of the use of rainwater harvest in single and multi-family buildings of the Metropolitan Area of Barcelona (Spain): social experience, drinking water savings and economic costs," *Journal of Cleaner Production* 19 (2011): 598-608.

*Using the case study of different types of rainwater harvesting in Spain, the authors discuss user opinions on their systems as well as give information on governmental programs that support (or require) the implementation of rainwater harvesting systems.*

Fielding, Kelly, John Gardner, Zoe Leviston and Jennifer Price. "Comparing Public Perceptions of Alternative Water Sources for Potable Use" *Water Resource Management* 29 (2015): 4501-4518.

*This source covers factors that contribute to public acceptance of using alternative water sources, including rainwater, for drinking and other uses. Relative levels of comfort with the alternative water sources was consistent across the four studies examined: comfort was always highest for drinking rainwater and lowest for drinking recycled water (treated wastewater), with comfort with drinking treated stormwater and desalinated water sitting between these two.*

Fuentes-Galván, María Lina, Xitlali Delgado-Galván, Hilario Charcas-Salazar, Jesús Mora-Rodríguez, José Luis Flores and Antonio Cardona Benavides. "Rooftop Rainwater Harvesting Acceptance in Three Localities of Guanajuato, Central Mexico" *Interciencia* 40(6) (2015): 403-408.

*Public acceptance of rainwater for different uses specific to Mexico, including pricing possibilities.*

Garrett, V., P. Ogutu, P. Mabonga, S. Ombeki, A. Mwaki, G. Aluoch, M. Phelan, and R. E. Quick. "Diarrhoea Prevention in a High-risk Rural Kenyan Population through Point-of-use Chlorination, Safe Water Storage, Sanitation, and Rainwater Harvesting." *Epidemiology and Infection* 136, no. 11 (2008): 1463. PLOS Medicine.

*Paper on water quality for RWH storage units focused on diarrhea prevention with safe water storage and sanitation.*

Kahinda, Jean-Marc Mwenge, Akpofure E. Taigbenu, and Jean R. Boroto. "Domestic Rainwater Harvesting to Improve Water Supply in Rural South Africa." *Physics and Chemistry of the Earth, Parts A/B/C* 32, no. 15-18 (2007): 1050-057. Science Direct.

*As part of the effort to achieve the MDGs, the South African government has committed itself to provide financial assistance to poor households for the capital cost*

*of rainwater storage tanks and related works in the rural areas. Despite this financial assistance, the legal status of domestic rainwater harvesting (DRWH ) remains unclear and DRWH is in fact illegal by strict application of the water legislations. This paper explores challenges to sustainable implementation of DRWH and proposes some interventions which the South African government could implement to overcome them.*

Lye, Dennis J. "Health Risks Associated With Consumption Of Untreated Water From Household Roof Catchment Systems." Journal of the American Water Resources Association J Am Water Resources Assoc 38, no. 5 (2002): 1301-306. Wiley Online Library.

*Paper looks at the health risks associated with RWH, microbial disease, mosquito propagation and other illnesses.*

Partzsch, Lena. "Smart regulation for water innovation - the case of decentralized rainwater technology," Journal of Cleaner Production 17 (2009): 985-991.

*A discussion of the pros for decentralized water systems, evaluating three actions that can be performed by government to spur the growth of related technologies: subsidies, water extraction fees, and separate water/effluent fees.*

Saidan, Motasem N., Radwan A. Al-Weshah, and Ibrahim Obada. "Potential Rainwater Harvesting: An Adaptation Measure for Urban Areas in Jordan." Journal - American Water Works Association Jawwa 107 (2015). Research Gate.

*Case study overview for RWH from roofs in Jordan.*

Srikantaja, V. and Sarah Martin. "Providing Supplementary Water for Bangalore, India: Towards Water Sensitive Urban Design." Retrieved from [www.rainwaterclub.org](http://www.rainwaterclub.org).

*Case study of rainwater harvesting in Bangalore, India.*

Tang, Christina "Water Quality Study and Cost-Benefit Analysis of Rainwater Harvesting in Kuttanad, India," BSc thesis, Brown University (2009).

*An in-depth study of water quality in Kuttanad, India, followed by a CBA of using RWH as a viable alternative to provide access to clean water. This study formed the basis for the creation of Rainwater for Humanity (R4H).*

Uende A.F. Gomes, Leo Heller and Joao L. Pena. "'A National Program for Large Scale Rainwater Harvesting: An Individual or Public Responsibility?'" Water Resources Management 26 (2012): 2703-2714.

United Nations Environment Programme. "Rainwater harvesting and disaster management" (n.d.). Retrieved February 5, 2016 from [http://www.unep.org/pdf/RWH/disaster\\_management.pdf](http://www.unep.org/pdf/RWH/disaster_management.pdf)

*Very brief overviews of rainwater harvesting projects in a variety of areas worldwide. Provides diverse perspectives on how the technology has been used in different contexts.*

Yaziz, M.i., H. Gunting, N. Sapari, and A.w. Ghazali. "Variations in Rainwater Quality from Roof Catchments." Water Research 23, no. 6 (1989): 761-65. Science Direct.

*The quality of rainwater from a tile and a galvanized-iron type roof catchments were analyzed over a period of 5 months. The concentration of various pollutants were high in the first liter but decreased in subsequent samples. Lead concentrations were high in all samples collected and exceeded the WHO guidelines by a factor of 3.5. For the roof area studied, a "foul flush" volume of 51 liters would be the minimum to safeguard against microbiological contamination but the high metals content in the water indicate the need for some form of treatment. Rainfall intensity and the number of dry days preceding a rainfall event significantly affects the quality of runoff water from the catchment systems.*

## **A7.2 The State of Water in Mexico City**

100 Resilient Cities, Evaluación Preliminar de Resiliencia CDMX, August 2015.

*Document about the first stage of the resilience evaluation and strategy for Mexico City.*

Abedrop, Salomon coordinator, El gran reto del agua en la Ciudad de México, SACM, 2012

*Review of the history of the water infrastructure and challenges of the city, as well as the government views for solutions.*

Baverstock, Alasdair. "A Bloody War for Water in Mexico." Vice News, May 26, 2014, Retrieved February 8, 2016 from <https://news.vice.com/article/a-bloody-war-for-water-in-mexico>.

*This article covers violence that erupted in San Bartolo Ameyalco because of government plans to pipe water from the local spring to high-income homes.*

Campbell, Monica. "Mexico City residents brace for water cuts that will leave them dry for days," PRI's The World, January 29, 2016. Retrieved February 3, 2016 from <http://www.pri.org/stories/2016-01-29/mexico-city-residents-brace-water-cuts-will-leave-them-dry-days>.

*Water systems in Mexico City being shut down to allow for maintenance.*

Conan, Rebecca. "Coca-Cola Mexico harvesting 1.25Bl/y of rainwater," BNAméricas Water & Waste, August 12 2011. Retrieved March 20 2016, <http://www.bnamericas.com/en/news/waterandwaste/coca-cola-mexico-harvesting-125bl-y-of-rainwater>.

*This article shows commercial viability for rainwater harvesting as demonstrated by Coca-Cola.*

Delgado, María Del Lourdes Becerra, compiler, Estrategia Local de Acción Climática Ciudad de México 2014-2020, Centro Mario Molina para Estudios Estratégicos sobre Energía y Medio Ambiente, June 2014.

*Mexico City's Local Strategy for Climate Action (ELAC) provides the scientific and institutional background for the city's government Climate Action Program (PACCM), the policy instrument for climate change mitigation and adaptation.*

Environment Ministry of Mexico City, 2025 Vision for Mexico City on Climate Change, 2015

*The document presents the current situation of GHG emissions of the city as well as its goals and strategy in terms of climate change and resilience.*

Ibarrarán, María Eugenia. Climate's Long-term Impacts on Mexico's City Urban Infrastructure. (2011).

*Overview of the dangers posed by climate change to Mexico City's already stressed infrastructure.*

LEAD Mexico. "Mexico City: Opportunities and Challenges for Sustainable Management of Urban Water Resource."

*Explaining the water crisis in Mexico City and the need for sustainable and integrated management of the system as a whole.*

León, Cuauhtémoc, coordinator, Pobreza Urbana y Cambio Climático para la Ciudad de México, November 2010.

*Research that presents the challenges of social inequality in the face of Climate Change, highlighting vulnerabilities and potential risks for the urban poor in Mexico City*

Mario Molina Center. "Energy Assessment on the Current Urban Water Systems and Management Proposal for Water Resources in Mexico City," Mario Molina Center, (2011) <http://centromariomolina.org/english/wp-content/uploads/2012/05/12.-Energy->



[Assessment-on-the-Current-Urban-Water-Systems-and-Management-Proposal-for-Water-Resources-in-Mexico-City.pdf.](#)

*Estimates of energy use in the Mexico City water system.*

Mexico News Daily. "Water trucks stolen for transporting fuel," January 23, 2016. Retrieved February 8, 2016. [http://mexiconewsdaily.com/news/water-trucks-stolen-for-transporting-fuel.](http://mexiconewsdaily.com/news/water-trucks-stolen-for-transporting-fuel)

*Current events: oil and gas thieves stealing pipa trucks to transport fuel.*

Moreno, Jorge Adrián Ortiz. Analisis de la viabilidad de la Incorporación de Sistemas de captación pluvial en los desarrollos inmobiliarios bajo el programa de hipoteca verde del INFONAVIT, 2013.

*Analysis of the economic and energy efficiency benefits of installing RWH systems in INFONAVIT residential developments.*

Páramo, Arturo. "Pipas venden de modo indebido 40% de agua completan abasto de agua," Excelsior, September 6, 2014. Retrieved February 8, 2016 from <http://www.excelsior.com.mx/comunidad/2014/06/09/964082> .

*A discussion on the use of pipas in different parts of Mexico City.*

Pezzoli, Keith. "Sustainability, Livelihood and Community Mobilization in the Ajusco Ecological Reserve", in Peter Evans (ed.) Livable Cities? Urban Struggles for Livelihood and Sustainability, University of California Press, 2002.

*The story of the communities of Los Belvederes in the Ajusco area, and the changing human geography of the Ajusco reserve illuminate both the potential and the contradictions of local-level actions in pursuit of livability.*

Romero, Patricia. "Water in Mexico City: What will Climate Change bring to its history of climate-related hazards and vulnerabilities" in Environment and Urbanization, International Institute for Environment and Development (IIED), Vol 22(1):157-178.

*Over the last six centuries, Mexico City has faced wet years and floods alternating with episodes of drought. It also had abundant water resources. The floods and droughts have been aggravated by land use changes induced by primary activities and urban growth that have caused irreversible changes in the hydrological cycle. The paper introduces a historical and sociological approach to the analysis of factors determining vulnerability of the city and the different adaptive capacities of its population.*

SACMEX, La Jornada, "Plan Agua para el Futuro", Rescatando el Agua de la CDMX, p. 15, September 2015.

*Summary of the multiple challenges Mexico City is facing with the distribution of water.*

Watts, Jonathan. "Mexico City's water crisis – from source to sewer," The Guardian, November 12, 2015. Retrieved February 1, 2016, from <http://www.theguardian.com/cities/2015/nov/12/mexico-city-water-crisis-source-sewer>.

*Summary of the issues in the water system affecting Mexico City, explored through following the path of water as it moves through the city.*

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