

Tzununa, Lake Atitlán,  
Guatemala

Water Treatment Project

# PROJECT PROPOSAL

## AGUA SANA ATITLÁN - PILOT #1

**PROPOSED BY:**

Regenera,  
WellKind &  
Water 4 Life Global



# THE TEAM COLLABORATION



Wellkind Guatemala ONG is a grassroots organization empowering local leaders around Lake Atitlán to affect positive change in their communities, mainly in the areas of ecology, education, and local economy.

The team will take the lead on raising community awareness of the program, supporting in organization and education. Leveraging their existing network of community leaders to ensure the participation and follow through in the program by community members.

Wellkind Guatemala will assist with logistics and manage incoming funding because it is also a legal Guatemalan NGO.



Water 4 Life Global is a 501(c)3 nonprofit working on the ground in Guatemala to provide indigenous people with access to clean water, through the distribution of water filter technology and community collaboration.

The organization focuses on providing sustainable solutions for families living around Lake Atitlán. This includes delivering household water filtration systems, natural sanitation products and providing water education programs.

Through water testing and GIS surveying, they work with local village leaders to determine the best solution to each area's contaminated water issue.

The Water 4 Life Global team will take lead on data organization, donor management and creating marketing material to showcase the project.

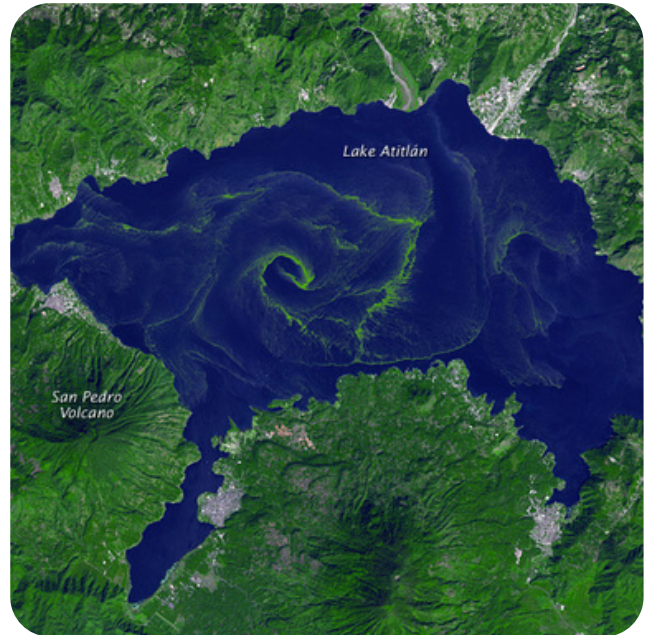


Regenera is a team of permaculture design and consultancy experts who live and work out of their small farm in Tzununa, Lake Atitlán.

With over 30 years of combined experience, the Regenera team has spent the last four years working with local teams in Tzununa to build permaculture havens through restoring natural resources like water systems, landform and planting of culturally and ecologically significant species.

Because of this unique experience, this team is poised to spearhead and manage the implementation of well designed and multi-phase projects. More importantly it is their passion to work with the community to improve and beautify the watershed of Tzununa.

# THE ISSUE



Located in the Guatemalan Highlands of the Sierra Madre mountain range, **Lake Atitlán** is the deepest lake in Central America, and it has become one of the country's most visited tourist destinations. It serves as an untreated source of drinking water for more than 70,000 people, and many communities living around the lake have no other choice than to use the water for both consumption and washing.

As of 2009, this lake is an official contaminated water source due to the large amounts of cyanobacteria in the water. Cyanobacteria are single-celled organisms that proliferate in still water with a high phosphorus and nitrogen concentration. They have caused large 'blooms,' which enhance algal growth and added a thick layer of sludge to the top of the lake.

A series of water samples taken by the Watershed Authority, AMSCLAE, in association with the University del Valle de Guatemala, showed that the bloom causes eutrophication, or excessive nutrient richness of the lake, leading to the dense growth of plant life and animal death due to lack of oxygen. If left unchecked, this will cause toxification of the lake, making it unsuitable for human use.

The nutrients come from wastewater entering the lake untreated and the inflow of fertilizers and displaced soil from cropland, which then enters and further toxifies the water supply.

# WASTEWATER

Lake Atitlán is an endorheic lake which is fed by rivers and seasonal rain and has no outlet. One of the rivers it is provided by is the Tzununa river.

The most significant environmental problem within the lake communities is wastewater management, and there is no structured garbage system. Raw sewage flows straight from the river into the lake.

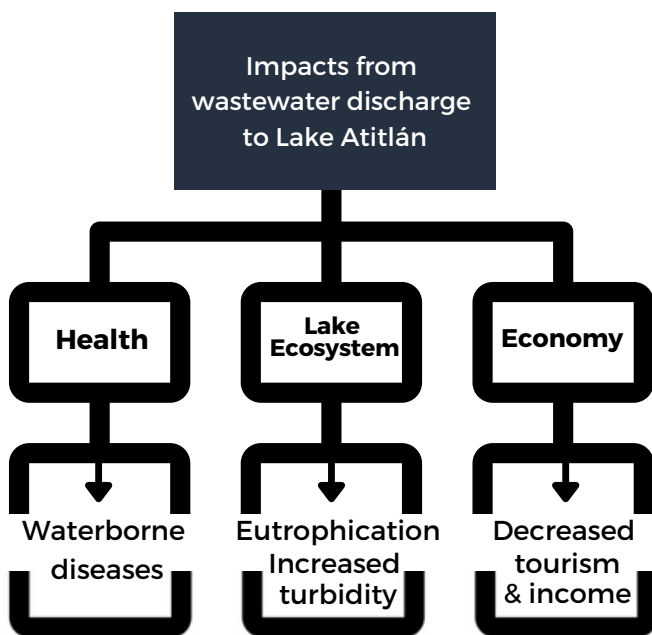
This wastewater input hurts the overall economy of the lake, as well as a decrease in tourism and changes in the overall health of the ecosystems.



This mismanagement results in severe health risks for those consuming the water of this significant river drainage basin.

The need to reduce the input of raw sewage into Lake Atitlán is more critical than ever. Many different plans have called for the construction of new WWTPs (wastewater treatment plants) in the basin and a switch to organic farming to mitigate the input of phosphorus into the lake. Still, nothing has been largely successful so far.

We attempt to approach this issue with an alternative solution.



# Map of Tzununa

As shown in Figure 1, Tzunana as a watershed can be divided into 4 different categories or zones.



## Zone 1 - Lakeshore

**Problem:** In these shallow lake waters, discharged nutrients accumulate and are consumed by aquatic plants, algae, and eventually cyanobacteria causing eutrophication or lake death syndrome.

**Solution:** Harvest and compost excess biomass of plants/algae and plant native reeds to stabilize shore, filter nutrients, and build a habitat.

## Zone 2 - Flatland

*(approaching the lake, located near residential areas)*

**Problem:** The land in and around residential areas discharge greywater and displaced soil into the river and erosion gullies leading to the lake.

**Solution:** Target discharge at point-source locations and create individual treatment and reintegration systems for irrigating cash crops and native forest plantings.

## Zone 3 - Riparian Zone

**Problem:** River and tributary banks erode, causing more turbidity, discharge, and river displacement.

**Solution:** Stabilize river and tributary banks by planting native riparian species, constructing retaining walls, and check dams in critical locations.

## Zone 4 - Steep hillsides

**Problem:** Many of these areas are poorly managed and planted with annual grains like corn. This practice along with road construction leads to erosion and runoff.

**Solution:** Implement erosion control techniques in critical locations to prevent gully formation and plant and maintain local trees needed for sustainable resources to stabilize hillsides and prevent landslides.

# PROJECT ELEMENTS

## GREYWATER TREATMENT SYSTEMS

01

The first element involves grey and black water interception and treatment using the slow it, spread it, and sink it method. The goal is to create up to 7 greywater treatment systems installed within the Tzununa community. This includes the planting of native vegetation to act as a biological water filtration system with the capacity to intercept contaminated water from the community's upstream.

## RESTORATION PLANTING

02

The intention of this component is to utilize native plant species as a natural filter of the underground water. There will be two main areas of focus: the riparian zones, which are the areas bordering rivers and other bodies of surface water, and the planting of native trees on hillsides to prevent agricultural runoff and support erosion control. The community can also use these plants as a valuable resource.

## LAKE WATER REMEDIATION

03

This element of the project focuses on mitigating the environmental damage of Lake Atitlán caused by the overabundance of nutrient-dense vegetation. The process will involve harvesting the algae as an asset and using it for compost production and planting of beneficial species along the lakeshore.

## EDUCATION & ECO-TOURISM

04

The objective is to use the integrated and ecologically harmonious methods of permaculture design to create a landscape that will support the local community with job opportunities and enhance eco-tourism. This element will also encompass an educational component for community members, children and travelers to learn about environmental health and regeneration plans.



# EXECUTIVE SUMMARY

We propose using permaculture design principles to combat these issues to form an integrated set of solutions in Tzununa, Sololá. This village includes the Tzununa River that feeds directly into Lake Atitlán.

## **Goal**

This initiative aims to regenerate aspects of the Tzununa valley watershed and its contributions to the Lake Atitlán basin. We will achieve this through a multifaceted approach targeting various watershed zones, each with different strategies and success metrics projected on a 5-year timeline.

## **Mission**

The mission is a collaboration of various teams to better our local environment, strengthen the local economy through eco-tourism, and create resources by remediating threats to ecosystem health.

## **Strategies**

This mission will be executed in a series of phases, and the main strategies used will be remediation and infiltration. Once shown to be effective, these systems can be scaled up and implemented in all the other towns and communities.

## **Supplemental**

Support from the Tzununa local and ex-pat community is necessary to accomplish such a plan. We feel confident that we have a network through our relationships and collaborations that will allow this project to be achievable and gain critical mass.

## **Economic Benefits**

By meeting our objectives, we can ensure that there will be a decrease in harmful bacteria in the watershed and more economic opportunities for the town of Tzununa. Sustainable water solutions play a pivotal part in ending systemic poverty by allowing community members to utilize their environmental systems better. Access to clean water is the first step to improving health, expanding educational opportunities, creating lasting jobs and wages, and enhancing the community's evolution. We can increase the vitality of marine life with healthy waterways, which improve food consumption and increase pay for local fishermen. Through the completion of this successful blueprint, we can empower other communities to find solutions to similar problems and resolve the core issues of water contamination and environmental degradation.

# PILOT PROJECT #1

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As a safety measure and to make sure that *Agua Sana Tzununa* projects are completed with precision, it's essential to build the capacity through **pilot phases for each element**.

Pilot projects are designed to provide feedback for the 'rollout' phase of the proposal. We will also utilize the pilot phase to begin the surveying and staging for subsequent project sites in order to be as efficient as possible with our time. Though unlikely, there may be drastic changes to designs and strategies for elements after the pilot phase has finished, and our main proposal can be adjusted accordingly.

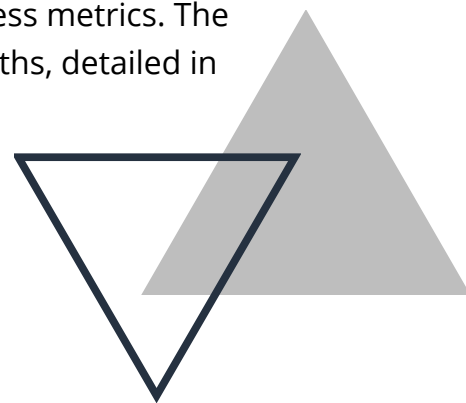
This process of initiating the pilot projects consists of:

- An initial survey of all sites
- Creation of individual teams of workers
- Implementation of each pilot project
- Completing a record of the material used, salary spent, and time needed to complete the tasks.

Before and after each project, **research and development** work is carried out to track success metrics for each task and improve concepts by researching other designs.

**Education** is a crucial component of this project and will be implemented each step of the way. This pilot will incorporate an awareness campaign and educational materials around the importance of mitigating dirty water flow and preserving Lake Atitlán's health. Empowering the next generation with knowledge and skills to create a life of success and independence will be achieved through a strong educational component within the community. The education component will focus on training and inspiring individuals for competency in the field, thus, supporting informed, caring, and responsible citizens.

For this pilot project #1, we will focus on element #1, which involves constructing and installing one **grey water interception and treatment system** in the Tzununa community. The designing and implementation stages of this are outlined in the following pages, including an estimated budget and accurate success metrics. The time frame allocated for these objectives will span over three months, detailed in the timeline included.





# 01 GREYWATER TREATMENT SYSTEMS

Numerous small communities live in Tzununa, and all of these communities produce untreated wastewater that runs in streams. This part of the project will focus on deriving benefits from native plants for natural water purification and aid in erosion control. This will occur in **zone 2** - the flatland approaching the lake and located near the residential areas.

## THE PROBLEM

With growing contaminants entering the lake, we must focus on point-source domestic wastewater. In rural towns and villages in Guatemala, residual greywater from barrios is generally sent downhill into ravines or drop-off in the landscapes. Often municipal systems collect too high volumes of water to treat and rely too much on mechanical filters and expensive equipment. These systems require regular maintenance and usually fail due to unreliable funding.

## THE OPPORTUNITIES

The goal is to intercept the grey and black water from the community's upstream before it reaches Lake Atitlán. Our teams will locate suitable pieces of land where this water can first be treated in a septic tank to remove solids. The water from the septic tanks will then be sent into an underground irrigation system, where native plants can be used to filter the water while providing valuable resources to the land owners.

If we focus on dealing with these small-scale sinks of dirty water at their source, we can create solutions that require little to no maintenance and rely on plants and soil to clean the water.

The key is to allocate the system near the source. Each GWS will intercept 3,000-3,5000 liters per day of flow, and the size of one system will accommodate between 6 and 9 households.

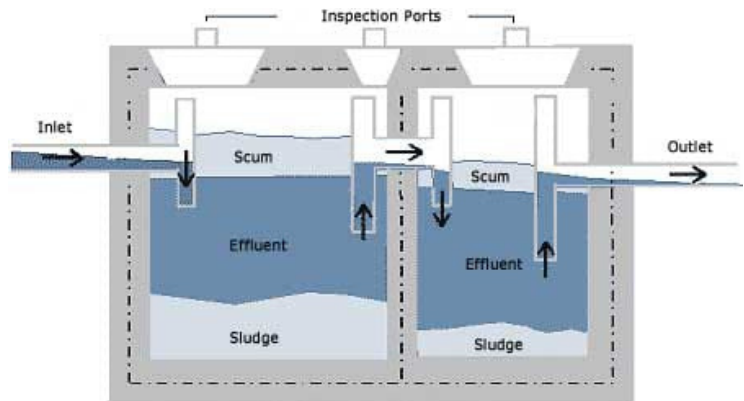


# HOW IT WORKS

We use the mantra: **SLOW IT, SPREAD IT, SINK IT!**

These are the three parts:

1. Settling tanks
2. Distribution and infiltration
3. Planting area



## SLOW IT

The settling tank acts to separate the solid material, whether floating or sinking.

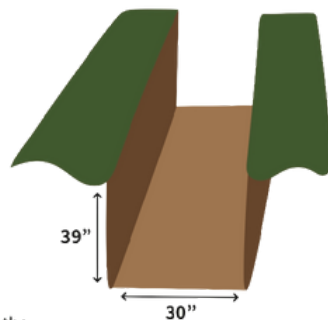
The system is the size to decompose material before it can build up.

## SPREAD IT

Next, we disperse the water across a large span of landscape in our gravel trench system. This way, only drops of water fall onto the earth at a time. We *generally use 2 meters of trench per household member.*

### STEP 1: DIG TRENCH

Dig a trench **39" deep** and **30" wide** with length defined by soil type and number of residents using the system (as mentioned in overview).



#### SLOPE

The trench must be on a contour so that the water can rest equally across the ground.

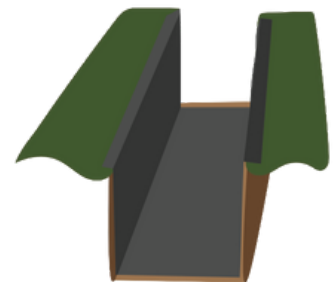
### STEP 2: LAY GEO-TEXTILE FABRIC

Geo-textile fabric is used to allow water through while preventing soil and roots from entering trench.

Cut fabric to be at least **14' wide**. Make sure fabric is laid flat on the ground and has enough excess material to fold over top.

The length should be **as long as your trench plus 70" extra** to fold at the ends.

(It's like making a burrito)

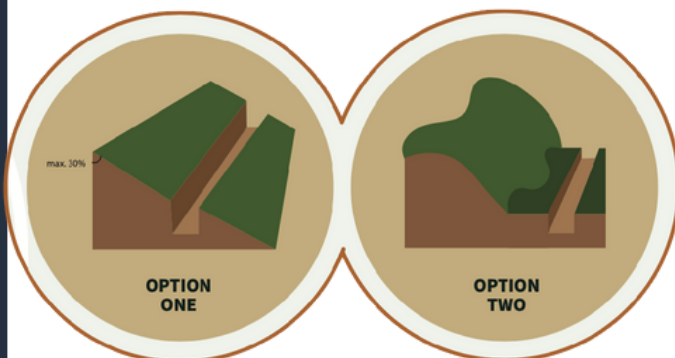
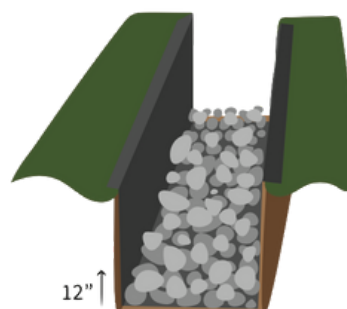


### STEP 3: LAY FIRST LAYER OF GRAVEL

Lay **3/4" gravel up to 12" deep** and laid flat across the entire length of the trench.

Make sure that the gravel is compacted, so it does not shift.

Use a contractor/masoner if inexperienced in laying a level base.



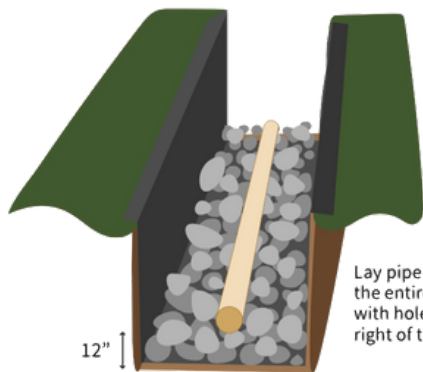
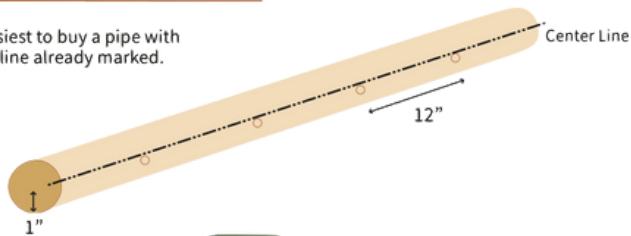
## STEP 4: DRILL AND INSTALL PIPE

Take a 3" pipe and drill holes **every 12"** using a **1/4" diameter drill bit**. The top of the holes should meet the bottom of the center line on both sides. Make sure all holes are equal distance from the bottom of the pipe.

Perforations must be exact so that water distributes evenly along pipe.

WATCH THIS VIDEO TO SEE HOW TO DO IT

It is easiest to buy a pipe with center line already marked.



Lay pipe evenly across the entire length of trench with holes on the left and right of the pipe.

## STEP 5: CONNECT INFLOW TEE AND CAP ENDS

5a) Cut **3" pipe** and connect both pieces with inflow tee. Secure tee connection with PVC cement. Attach cap ends.

5b) Add partial **1 1/2" pipe** into the top of the inflow tee and secure with PVC cement.

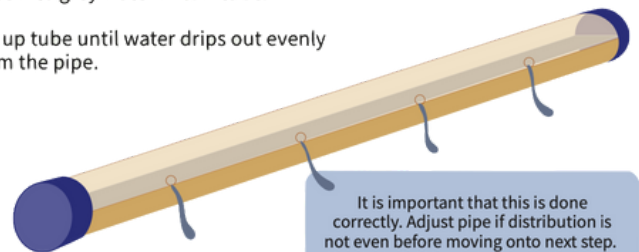
5c) Attach **90° elbow connection** to pipe with PVC cement.

5d) Flush system with water to test that the water **distributes evenly** across all perforations.

To do this, simply run a garden hose into grey water inflow tube.

Fill up tube until water drips out evenly from the pipe.

GREY WATER INFLOW

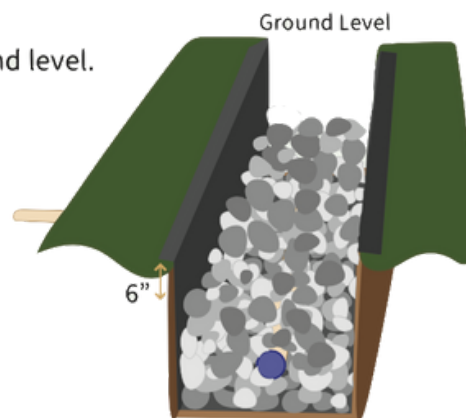


It is important that this is done correctly. Adjust pipe if distribution is not even before moving onto next step.

## STEP 6: FILL IN TRENCH

Fill in trench with rubble, rocks, and/or gravel to **6" below** ground level.

It does not matter too much if rocks are level after you lay the pipe.

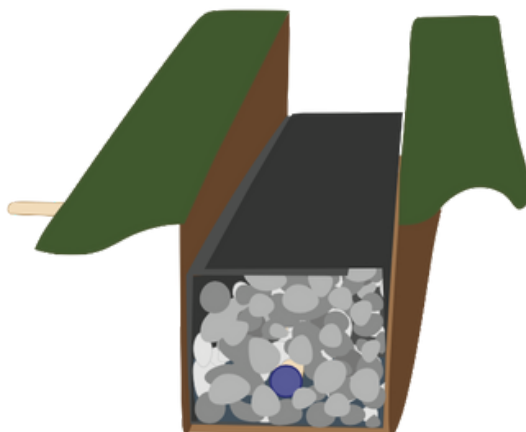


## STEP 7: FOLD GEO-TEXTILE FABRIC OVER TOP

Fold geo-textile fabric over top of gravel.

It is essential that fabric overlaps substantially to prevent soil and roots from blocking perforations.

You should have **approximately 6" of space** remaining for soil.



## SINK IT

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Finally, we plant various water-loving plants downhill from or around the trench. These plants act to consume the nutrients and contaminants from the water and use their roots to allow the water to infiltrate the water deeper into the ground.

The shallow nature of the trench allows plants to absorb all the soluble nutrients in the water, thereby filtering excess nutrients and leaving the water cleaner. This system is also an effective way of infiltrating excess roof water, allowing it to be stored in the healthy vegetation of your garden.

If all parts are functioning correctly, this system requires no maintenance and is beneficial to the landscape, the lake, and the people by creating resources from the water.

### STEP 8: FILL IN TOPSOIL AND PLANT TREES, FLOWERS, AND BUSHES

Build a path above trench by laying down cobblestones without mortar, so you can access trench, if needed for maintenance.

Choose deep rooting plants and trees for your climate that thrive with excess nutrients and water like:

- Bananas
- Mulberry
- Willow
- Bamboo
- Fruit Trees

Or flowering plants like:

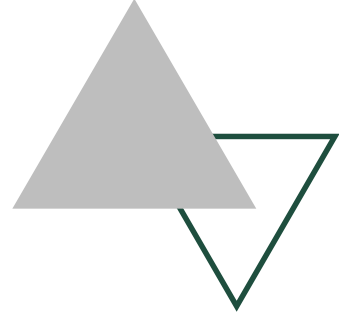
- Ornamental Ginger
- Horsetails
- Canna Lillies
- Calla Lillies
- Heliconias
- Comfrey
- Any water-loving perennial species



# EDUCATION

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## A PIVOTAL COMPONENT



### **The Background**

Human-induced environmental damage is highly prevalent in the communities settled around Lake Atitlán. Consumption of waste and ecological pollution go hand in hand in the rural regions of Guatemala since most of the area lacks efficient and purposeful trash management programs. For this reason, many unaware people who live on these lands are habituated to releasing waste and contaminants into their surrounding streets and waterways. Additionally, the lake is at a lower elevation than the surrounding steep mountains, so everything expelled upstream flows downhill directly into the lake. There are several ways to support the environment and surrounding communities in Guatemala. Still, we know that for any of these efforts to be successful and sustainable, there must be a proper element of education and involvement.

### **The Local Community**

Our team will focus on empowering the local community organizations and individuals to lead social and environmental programs that enhance the diversity, resiliency, and integrity of the local economy, ecology, and community of Tzununa. By including local Guatemalans in every step of the project process, we can ensure that they understand our intentions and purpose for installing these greywater systems on their land and gain their support and participation. Often populations that suffer socially and economically are also lacking access to education, so by creating opportunities for sharing knowledge and awareness, we can help to improve the overall well-being of Guatemalans while providing natural clean water solutions.

### **The Tourist Community**

Travelers who visit the lake for experiential, spiritual, or personal reasons do not have many opportunities to learn about common environmental issues. The villages around the lake are becoming more saturated with short and long-term tourists looking to visit or stay at an exclusive nearby retreat, leisure, or learning centers. With the tourism industry being so significant in a country that is still affected by high poverty levels, we ask the question: *How can people travel in Guatemala in a way that is both ethical and has a positive environmental and economic impact on the people that need it most?* By providing them with the possibility to learn about our project and its importance, we can weave the native and tourist communities together with the common purpose of helping revitalize the land, encouraging everyone to live more mindfully and inclusively.

# RAISE AWARENESS

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Raising awareness within the younger generations will be particularly key to sustaining the effectiveness of this project for years to come. We will educate the schools about watershed health, recycling, and current water issues in Guatemala. Additionally, a house-to-house campaign will inform the community members about our projects and share informational material.

## SCHOOL PROGRAMS

The project steps will involve:

- Twice a month, environmental awareness and informational class will be led by the Wellkind Local Team with guest speakers from AMSCLAE, Amigos de Santa Cruz, and other organizations.
- An art scholarship program with an in-school assessment supported by the teachers and school directors.
- Weekly art classes for the qualifying students in the program.
- Monthly trash cleanups with local students on the trails of Tzununa.
- The creation of a school garden and tree planting in the Tzununa community.
- A community mural with the theme of water and the lake's ecology will be painted.

## CHILDREN'S ART BOOK

We will also add an art component represented as a children's book created by a local artist to illustrate the significance of clean water and environments.

This book will be written and created by children in Guatemala through a workshop held by the local artist. This workshop will give the children the opportunity to discuss the book and determine what they believe to be solutions to the water issues and why it is important to them. The artist will conduct interviews with Mayan elders and water activists to support the greater vision of the project. With a focus on cultural preservation, this book will be created in various Mayan languages to further educate students on their native language while learning the importance of clean water.



# SUCCESS METRICS

To track the progress of Agua Sana Tzununa, it's paramount that we articulate the project's goals with specific success metrics to meet, projected onto a timeline.

## Success Metrics for the GWS

A simple and effective success metric for this zone is to **determine how much residual water flowing into the river and lake can be intercepted**. This is the most crucial goal of the project. Once immobilized, we can analyze the effectiveness of the treatment processes by examining the outflow of the settling system, the efficacy of reed bed systems, and residuals found in soil downhill from infiltration zones. Because living systems become more powerful over time, data collection must continue for five years to chart increased effectiveness.

### Specific Metrics

- Interception of 4,000,000 liters of domestic greywater per year in the first year
- Reduction in turbidity, particulate matter, phosphates, and nitrogen levels after passing through the settling system.
- Neutralization of pH after treatment tank.
- Another reduction in all factors after phytoremediation.
- A reduction of turbidity, phosphate, and nitrogen levels in river water after one year.

*(Specific quantities of each must be analyzed)*

## Success Metrics for Education

This project component will be continuous and multi-faceted, running adjacent to each of the other elements in the Agua Sana Tzununa, so quantifying the results within a 3-month timeframe will be approached differently. To determine the success of our education program, we must monitor the amount of traction our projects have gained, how each part is completed and prepared for upscale, and what lasting impact can be made. Documentation through media content will be provided and digital copies of all educational materials.

### Specific Metrics

- 8-12 students will receive weekly art classes for the three months after qualifying for the program via an in-school assessment.
- One mural is painted in town in a very public and visible area.
- At least 60 houses have been visited in the house to house campaign.
- A minimum of 36 completed and laminated educational posters promoting environmental awareness are posted in and around town.
- A total of 6 in-school trainings are done for both elementary and middle schools.
- The children's book timeline is laid out and valuable information is generated through the initial interviews with local elders, students, and families.

# PROJECT TIMELINE

The time-line is subject to change based on analyses of pilot projects and trial processes.

## MONTH 1

### **GREYWATER SYSTEMS**

- A full assessment of target zones and selection of project sites for the first GWS.
- Material staging - transferring the necessary materials to the site.
- Complete the design and begin construction for GWS #1.
- Collection of water samples and data collection at survey sites.

### **EDUCATION**

- Coordinate with the elementary and middle school director and create the plan for environmental awareness and informational classes.
- Educational posters about the environment and water will be created and posted throughout schools and community spaces.
- Connect with art teachers and school directors to assess students interested in art and want to enter into extracurricular art training classes. Identify 8-12 children and begin classes.

## MONTH 2

### **GREYWATER SYSTEMS**

- Construction and implementation of the GWS at initial site.

### **EDUCATION**

- Begin house to house campaigns to raise awareness about water and the environment.
- Hand out educational material and lead talks with small groups.
- Wellkind will leverage its local leader network to organize small groups for educational purposes.

## MONTH 3

### **GREYWATER SYSTEMS**

- Complete construction and begin analysis of GWS #1.
- Begin the design and research phase for two more GWS.

### **EDUCATION**

- Twice monthly art classes are in effect, and all promotional and educational material has been distributed.
- House to house campaigns and small educational groups come to a close.
- Continuous art classes and one completed mural painted in town.



# PILOT PROJECT BUDGET

These are estimates based on research and a basic understanding of the project's methodology. Total calculations could fluctuate as the implementation stage begins. Each future project site will have land-use variables and may need additional investments to secure project success. Capacity building involves conceptual creation, research, and surveying which is reflected in the following budget breakdown. We also believe that follow-up research on results will be advantageous to the advance of this project.

Expense Description	Amount / Duration	Overall Cost
<b>Element 1 - GWS</b>	<b>3 months</b>	<b>\$14,700</b>
Planting Zone	1 GWS	\$200
<u>Settling Tank</u> <ul style="list-style-type: none"> <li>Labor Cost - 2 people - \$900</li> <li>Materials and Equipment - \$2,800</li> </ul>	1 GWS 3 months	\$3,700
<u>Trench System</u> <ul style="list-style-type: none"> <li>Labor Cost - 5 people - \$4,600</li> <li>Gravel (.5 cubic meters) - \$900</li> <li>Geotextile (4 squared meters) - \$387</li> <li>Tubing - \$113</li> </ul>	1 GWS 3 months 45 m 45 m 45 m	\$6,000
Capacity Building & Training	3 months	\$900
Research Personnel & Environmental Chemist	3 months	\$3,000
Cost Contingency & Misc. Purchases	3 months	\$300
<b>Element 4 - Education</b>	<b>3 months</b>	<b>\$6,600</b>
Publicity & Awareness Campaign	3 months	\$2,100
R&D for Children's Book	3 months	\$1,500
Educational Personnel	3 months	\$3,000
<b>Advertising and Marketing</b>	<b>3 months</b>	<b>\$3,000</b>
<b>Overhead</b>	<b>3 months</b>	<b>\$700</b>

**TOTAL COST FOR PILOT PROJECT #1 = \$25,000**

# TEAM RESPONSIBILITIES



- Responsible for the designing, implementation, operation, and maintenance of the hiking eco-touristic trails, including:
    - Construction of the lookout points and resting benches
    - Designing a detailed map for hikers to follow
    - Making a visitor center near the dock
  - In charge of the scholarship program for certified guides and educational workshops.
  - Create marketing material to share nationally.
  - Develop workshops for students with educational speakers.
  - Organize trash cleanups and tree planting with local schools.
  - Create a school garden in the primary school of Tzununa.
- In charge of organizing the logistics of the project into a clear proposal.
  - Will complete frequent excursions to Tzununa for project check-in and provide progress reports to the team.
  - Assist in fundraising efforts and donor management involving:
    - Completing grant applications
    - Maintaining donor relations
    - Creating and presenting project progress reports for investors
  - Content creation management includes:
    - Social media
    - Photography and video
    - Websites
  - Oversee children's book education program.
  - Assist with data collection and creation of comprehensive reports.
  - Facilitate and organize team meetings.
  - Assist in admin support through the extension of the project.
- Management of the GWS implementation process involving the following:
    - Surveying the lands suitable
    - Designing the systems
    - Facilitating material purchases
    - Supervise construction
  - Responsible for the development of the harvest process, including:
    - Surveying the lakeshore docking and transportation
    - Creating logistics and maintenance oversight
    - Forming the compost production team
    - Facilitating the material and equipment purchases
  - Design of pilot riparian zone
    - Survey of river bank properties
    - Budget analysis
    - Team assembly and implementation supervision
  - Create documentation of project spending and analytical data.
  - Monitor the overall progress of the projects at a high level.

# PROJECT PERSPECTIVES

This pilot project will focus on the initial GWS and preliminary education component. Still, to understand Agua Sana Tzununa in its entirety, we must discuss the additional features that will contribute to the larger vision. All four elements expressed on page 5 play a pivotal role in completing the goal of this project. The following aspects of restoration planting, lake water remediation, and eco-tourism will be emphasized in the steps following our primary pilot.

02

## RESTORATION PLANTING

This element will stabilize the river bank by creating a rich and diverse riparian area. Riparian areas are transitional zones from aquatic to terrestrial habitats and characteristics. This area will allow the river to flood more safely and convert excess water flow into valuable resources. The entire river shore will be converted into a beautiful public walkway, leading from the lakeshore to the surrounding waterfalls, contributing to the environmental aesthetic and encouraging more tourism within the community. This will occur in zone 3- the areas bordering the land and the river or lake.

This design will involve the widespread planting of native trees and erosion control plants on the hillsides and agricultural terrain. Tall and robust trees with deep root systems are vital to stopping erosion. With their deep roots, they can avoid deterioration caused by landslides, and with their tall structure, they can prevent erosion caused by wind.

03

## LAKE WATER REMEDIATION

The plants thrive under the excess nutrients that exist in the water of river mouth eco-zones. As the vegetation grows from the lake bottom up to the surface, it switches from producing oxygen and habitat for a higher life to decaying and becoming infested with algae that cause eutrophication.

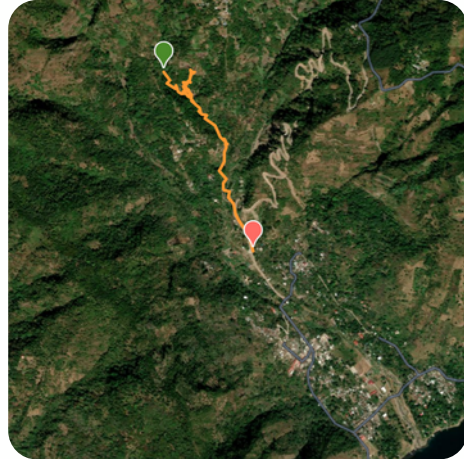
There is a critical point in which human intervention can aid in these plants' abilities to sequester nutrients/contaminants in solution but not reach the end of excess in which environmental degradation occurs. This vegetation represents an incredible resource for compost production. These aquatic plants are known to host a great diversity of minerals in their biomass that equates to invaluable macro and micronutrients for compost production. Additionally, this vegetation can be sourced as a supplement for chicken feed. If not directly applicable, this biomass can be used to breed insect life that is already known to be a necessity for organic egg production.

This project element will focus on the aspects of education, tourism, and positive experience for the visiting and local communities. By creating opportunities for people in Guatemala to learn about the importance of environmental health, we can promote responsible tourism and improve overall awareness. The following are how we will execute this plan and the subsequent beneficial impact.

### BUILDING TRAILS

Tzununa is full of natural beauty and nature paths alongside the river. Utilizing this landscape, we can design hiking trails that will attract viewers and provide opportunities for walking education tours. The project steps will involve:

- Making four different trails with ranging levels of difficulty.
- Providing scholarship programs to 6 young locals to become certified guides on the trails.
- Implement educational workshops to teach biology, geology, ecology, and more classes.
- Creating five lookout points on the eco-tourist trails.
- Building and installing ten benches on trails for resting and breaks.
- Designing an eco touristic map will include critical spots like restaurants and farms, the trails with their times and difficulty ratings, lookouts, elevations, and local places of significance.
- Create a visitor center near the dock to welcome people and offer guiding services and information.
- Implement Tzununa Give Back days to involve community engagement.



Alongside the trails, we will incorporate **Ecobricks and Pavers** to showcase a solution to the immediate problems posed by plastic. The public walkway will be built out of recycled materials to remove waste in the community land-fill. These are powerful tools for cleaning up local areas, educating schools and communities, and creating structures that stand the test of time.

Each of these steps involved in creating this project will allow for more **job opportunities** because this will be led by local Guatemalan staff who will maintain the trails and tourism programs. We will hire native people to create economic opportunities and provide a more authentic and informative experience for travelers visiting the trails. They will be led by people who live on the land.



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**THANK YOU**

**AND WE LOOK  
FORWARD TO  
WORKING  
WITH YOU.**

**AGUA SANA  
ATITLÁN**

We seek partial or complete investors to fund our pilot project #1. Donations in the form of equity, cash, check, and credit are all accepted. All donations towards the project will be filtered through WellKind USA and distributed to the teams according to the appropriate budget allocations. All donations are tax-deductible in the United States of America as well as Guatemala.