



reaching
further

year in review
2019



our mission

creating access
to clean water
with communities
at risk





letter from the director



Dear friends of Caminos de Agua,

This was not a good year for water globally, and especially in our region – making our work more important than ever. The state of Guanajuato, in central México where we work, was named one of the most hydraulically stressed regions on the entire planet. Compounding the issue, we continue seeing increasing levels of contamination in regional water supplies with arsenic levels reaching as much as 22 times the World Health Organization recommendations. To effectively address this growing crisis, we’ve continued to build on and create new partnerships at all levels – working with community collaborations, NGOs, and local (pg. 7), state, and even federal government (pg. 9) to substantially increase our reach.

This year, we continued to build rainwater harvesting systems to deliver more clean drinking water locally. We completed a large-scale project in the communities of Pozo Hondo and La Vaciada where we built 27 large-scale rainwater harvesting systems – impacting 80 families as well as an additional 80 children at the local elementary school. In 2019, we invested heavily in taking our rainwater solutions further than we ever have before. Working closely with our community partners, we developed a massive project that will allow us to build hundreds of rainwater systems in dozens of new communities over the next three years (pg. 7). Also, through partnerships in the communities of Doña Juana, Palo Colorado (pg. 7), El Salitrillo, San Miguel Viejo, and Agustín González (pg. 6), we were able to work closely with students and other NGOs this year to bring rainwater solutions to hundreds more.

This was a year of celebration for our “Tech Team,” who helped us win the prestigious Innovation Showcase Award from the American Society of Mechanical Engineers (ASME) for our pioneering water filter – Aguadapt (pg. 9). We are now positioning Aguadapt to reach well beyond the bounds of our watershed to make an impact in emergency situations and household water supplies throughout Mexico and beyond (pg. 9). By the end of the year, we installed the second of our second Groundwater Treatment Systems (pg. 9), which will provide clean drinking water for an entire community when it goes live in 2020. It is not only an important solution for our region, but – through our open sharing of information – we hope to position this system to make an impact for the upwards of 300 million people suffering from similar water contamination issues around the globe.

We are grateful to our network of individual supporters, which grew exponentially this year – allowing us to expand our work to meet the rapidly increasing needs. We are also very thankful to one of our most important and consistent supporters – the Natural Health Research Foundation and Dr. Joe Mercola and Steve Rye – who continue to be crucial to the development of our solutions.

We would like to specially thank Aaron, Chantal, and Billy; who all concluded their time with Caminos this year. They were paramount in developing our tech team, educational program, and water quality monitoring program respectively. We also thank Muriel Logan who stepped down from our Board of Directors after three years of service. Caminos is grateful to all of you for your passion and tireless dedication over the years; we will not be the same without you.

So, on behalf of the entire Caminos de Agua team, our volunteers, and our greater network of advisors and partners, we sincerely would like to thank all of those who helped make 2019 a better year for so many; we couldn’t have done it without you.

Saludos,

Dylan Terrell
Executive Director of Caminos de Agua

defining the crisis

70 %

of the aquifers in
Guanajuato are
overexploited

60 %

of extracted
groundwater in
México comes from
overexploited
aquifers

25 %

of the global
population currently
faces extreme
hydraulic stress

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The Alto Río Laja Watershed stretches across seven municipalities in the northern part of the state of Guanajuato in central México. Almost all of the water consumed in this region comes from a large underground reservoir known as the Alto Río Laja Aquifer, which serves several thousand distinct communities and more than 680,000 residents. This finite water resource is declining at an alarming rate, from 2-4 meters per year. The underground water that remains is contaminated with arsenic and fluoride - exceeding World Health Organization recommendations by 22 and 12 times the limits respectively. These contaminants are closely linked to dental and crippling skeletal fluorosis, developmental disabilities in children, chronic kidney disease, and various cancers. In addition to these significant health risks, there are substantially damaging economic and social impacts as well.

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The World Resources Institute (WRI) labels México as a whole as a “high water stress” nation. It is estimated that upwards of 60% of all the groundwater in the country comes from overexploited aquifers - meaning that finite water tables are dropping throughout the country. Because water often needs to be pumped from long distances to meet demand - in some cases across hundreds of kilometers and literally over mountains - it is assumed that 40% of groundwater is lost through leaks in the system. Additionally, roughly 13 million people only have access to contaminated water and an additional 9 million people have no water services at all.

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Globally, water resources are becoming more contaminated, whether it be inorganic contaminants like arsenic and fluoride from over-extracted aquifers or organic chemicals plaguing surface water supplies due to agricultural or industrial runoff. Fresh water supplies are also dwindling rapidly. A quarter of the global population - or roughly 2 billion people - face “extremely high water stress,” according to WRI. This means the possibility of water supplies completely drying up - as has already happened in South Africa and India, affecting millions of people - will be the reality for so many more in the years to come.

All of these increasingly complex water issues disproportionately affect low-income communities around the globe. If we want to live in a world where everyone has access to safe, healthy water, we must create actionable solutions that impact those with the fewest resources.



our watershed

Agustín González

Local students organize to change the future of water in their community

For at least 15 years, the people living in the community of Agustín González have been subjected to the highest levels of fluoride that have been registered in San Miguel. Much of the younger population has suffered adverse health effects from this contamination, as seen by the many severe dental fluorosis cases at the local high school. Because of their long term exposure, these students are also at risk for chronic kidney disease, cognitive development issues, and cancer.

A few years ago, Caminos de Agua completed a study in the community and found out that there was a 20% increase in fluoride levels. Instead of dwelling on the negatives, it became an opportunity for lasting change - 10 students from the high school reached out to Caminos de Agua and El Maíz Más Pequeño to learn about local water issues and understand the solutions available. Together, we ultimately built a rainwater harvesting system at their school in an effort to make sure that future generations do not have to

endure the suffering that they have been through. This project was only the start. In 2020, we will be building 10-20 more rainwater harvesting systems in community homes with students at the Agustín González high school. This new project is a collaboration between the students, Caminos de Agua, and the Department of Environment and Sustainability at the municipal government of San Miguel as well as a local business who is helping to provide the funding.

“Water contamination is a pressing issue today. Working on this problem is a way that we as students can contribute to creating a better world for the future. We need to raise awareness in order to change the direction of our collective future. We made simple changes, but impactful ones.”-Emmanuel, a local high school student, who was a key participant in this project.

Working Together With Our Partners to Have More Impact.

In 2019, Caminos de Agua spearheaded a new coalition of 14 area NGOs to promote a coordinated and unified voice in the battle for safe, healthy water. The Agua Vida Coalition (Coalition) signed an agreement with the current municipal government – with the state government acting as witness – in March to create a plan for the future of water in San Miguel de Allende. Coalition members worked closely with the Department of Environment and Sustainability throughout the year to implement several individual pilot projects, including watershed restoration with El Maíz Más Pequeño and rainwater harvesting systems with Caminos de Agua. In fact, Caminos de Agua is set to build 11 large-scale rainwater harvesting systems in the community of Agustín González, with funding provided by a local real estate developer through a partnership with the municipal government. Agustín González suffers from the highest levels of fluoride in the entire municipality (see the story on pg. 6).

The Coalition has gained a sympathetic ear in the municipal government, and, moving forward, hopes to succeed in making San Miguel the first municipality in all of México to require rainwater harvesting systems be

installed in all future housing developments to help mitigate the ever-depleting groundwater resources.

This year we also partnered with local organizations, like El Maíz Más Pequeño, Casita Linda, and Feed the Hungry, to install rainwater harvesting systems in schools and community homes. We worked very closely with our community collaborators to lead the development of a massive rainwater harvesting proposal with the Río Arronte Foundation, which was “pre-approved” at the end of the year. This project will allow us to expand our reach substantially – building more than 330 large-scale rainwater harvesting systems, 60 composting toilets, and install nearly 700 water filters in 30 rural communities over the next three years.

Education is Key.

Lastly, our Community Outreach & Education Team has spent the year developing a new 7-module water education program, which is currently being implemented in community schools in San Miguel de Allende. This program is the future of Caminos’ community work. Education is the cornerstone of long-term impact in our projects, and we found the current materials to be inadequate to address the complex water issues found in our region.

500,000
liters of
groundwater
treated



150
water samples
analyzed for
arsenic and
fluoride



1
community
is ready
to pilot the
groundwater
treatment



GROUNDWATER
TREATMENT SYSTEM
BY THE NUMBERS

Our Groundwater Treatment System

The need for safe, healthy drinking water continues to grow rapidly, and we simply cannot reach all those impacted through rainwater harvesting alone. That is why we have spent years developing our Groundwater Treatment System (GTS) as a major internal development project. GTS is a community-scale, low-cost treatment plant that can remove arsenic, fluoride, organic chemicals, and biological pathogens. Our Research and Development (R&D) Team implemented our first GTS pilot system at the beginning of the year to remove arsenic. To date, the system has treated more than 550,000 liters of water. Moving into 2020, the R&D Team is hard at work to put our second GTS pilot online, which will be removing both arsenic and fluoride – providing drinking water for an entire community.





México

Chiapas

Finding real solutions in marginalized regions

At Caminos de Agua, when we are developing new solutions to bring clean drinking water to communities, our learning in the field is just as important as what we do in our lab. Over time, we have developed close working relationships with grassroots organizations, community organizers, and NGOs who are directly working in communities in need. They are able to provide critical feedback on how our solutions work in real life and, consequently, how to make changes that improve performance and use. Through these pivotal relationships, we are able to better align our technologies to users' actual needs.

So, when we were looking to pilot Aguadapt, our innovative new water filter, we immediately thought of our partner, Bruno Morales – Concern America's representative in Chiapas.

In Chiapas, one of the most marginalized regions in all of Mexico, water is a chronic issue, especially among indigenous communities where waterborne diseases – caused by pathogens in the water supply – are common. Worse yet, many of

these communities are far from health centers or hospitals. Our ceramic filter – the precursor to Aguadapt – removes 99.9999% of pathogens and bacteria and has been used for years by Bruno and Concern America with hundreds of families in Chiapas, making it the ideal pilot testing environment for Aguadapt.

“We [Concern America] focus our work on mainly ethnic Tzotzil, Tzeltal, and Tojolabales communities, historically marginalized, internally displaced by conflicts, and which have always been the main target of oppression and exploitation.”

– Bruno Morales, Concern America

It was Bruno's use of our ceramic filter, and his design of the filter system that works for communities in southern Mexico, that ultimately helped lead us to design Aguadapt. Our experience with Concern America is a great example of how feedback from our partners results in the creation of better solutions for all the communities we are working with.

Striving for Socially Impactful Technological Innovation.

We are very excited to announce that Caminos de Agua won the prestigious Innovation Showcase Award, hosted by the American Society of Mechanical Engineering (ASME), in Washington D.C. in June of 2019 for Aguadapt – our new modular water filter. This is an amazing achievement in a major international competition, which is accompanied by an initial cash prize.

In addition, Caminos has access to free consulting services with Catapult Design – a design firm that works with socially-driven organizations to build accessible, market-based products and services that give low-income and under-served people reliable tools to improve their quality of life. In October, ASME invited Caminos to additional events in New York City. There, we had an opportunity to compete for more funding and to present Aguadapt to industry water experts who can help take production to scale. By the end of the year, we found out ASME will be providing us with more financial support and consulting services into 2020.

Aguadapt is already making an impact in Mexico. We completed our first round of production in July. By August, we shipped nearly 700 Aguadapts to

our partners, Concern America, in Chiapas – Mexico’s southernmost state, where the filters are being piloted in community homes (see the story on pg. 8). Our ceramic filters – the precursor to Aguadapt – made a big impact in projects in the states of Puebla and Queretaro as well, where we provided filters for more than 200 families throughout the year.

Working Towards National Policy Changes.

In addition to working on local policy initiatives (see pg. 7), Caminos also works to affect water policy change on the national stage. In 2019, Caminos was invited to participate as one of the very few NGO voting members on the national Consejo Consultivo del Agua (Consulting Council on Water). This independent body is made up of organizations and individuals from social, academic, and economic institutions, as well as ex-government officials in Mexico – all experts in water – to consult on federal level water policies and initiatives. Caminos also joined Red ATL, which is driven by Oxfam, and seeks accountability, free access to information, transparency, and free participation on national water issues.

1,000
Aguadapt
systems
produced
locally



660 +
Aguadapt
systems
shipped to
Chiapas



200
families
using filters
in Puebla &
Queretaro



FILTERS BY
THE NUMBERS

What is Aguadapt?

Low-cost water filters are limited in scope and unable to adjust to modern, and often unique, drinking water problems many communities face today. For less than \$30 USD, Aguadapt lasts for over four years, removes 99.9999% of all pathogens, attaches to universal plumbing, and is easily installed in all common containers – making it ideal for disaster relief and emergency response. Most importantly, Aguadapt is a platform that can be adapted to treat regionally-specific chemical contaminants – like arsenic, lead, fluoride, and pesticides – which disproportionately affect low-income communities around the globe.





our world

North Carolina State University

Multiplying our impact through collaboration

Dr. Josh Kearns of North Carolina State University (NCSU) and our director, Dylan Terrell, first met at a water conference in Thailand in early 2016. At the time, Josh had spent years developing low-cost biochar treatment systems to remove organic chemicals in water supplies throughout Southeast Asia.

Sharing similar philosophies on how to employ affordable technologies in real-world settings, the two formed a partnership and began focusing on the research and development of low-cost methods to remove the regionally-specific arsenic and fluoride contaminating water supplies in the Alto Río Laja watershed where Caminos de Agua works. Today, Josh continues teaching at NCSU but is also the Chief Technical Advisor for Caminos and assists our technical team with data analysis, experiment formulations, and strategic planning for community employment of new technologies.

“The current, well-known model of innovation is within the context of an ideal environment at a university and laboratory setting; however in the development field, the result does not produce a technology that is readily deployable and that can function in different scenarios. Caminos de Agua is at the cutting edge of innovation in the sense that they involve the people living within that context and allow them to shape and guide the processes. This, in turn, greatly increases the potential for long-term success.” - Dr. Josh Kearns

The work between Dr. Kearns and Caminos illustrates how academia and civil society can work together to take experiments from the lab to create real solutions that work for real people.

Using International Expertise

In 2019, Caminos works at bridging international expertise with local communities, contexts, and experiences here in central México. The goal is to both improve problems in our region while also transforming the international academic community to take less theoretical, more practical, approaches to their work. Through these collaborations, we seek to create applicable solutions to globally-distributed water issues that are taken out of the lab to make a difference in the lives of real people. We continued to work with Engineers Without Borders - UK, SAFAD, and university partners like North Carolina State (NCSU), Cranfield, Wageningen, Texas A&M, and University College of London. These partnerships help us on projects as diverse as the development of our Groundwater Treatment System, research studies on arsenic quantification, Aguadapt development, and field monitoring and evaluation of our rainwater harvesting systems.

One international collaborations this year stemmed from identifying a major problem in global water quality monitoring. Globally, 150 million people are exposed to arsenic in their drinking water; however, testing for arsenic is difficult, usually requiring

expensive equipment and specialized training. Because of these limitations, communities have relied heavily on low-cost field kits to understand local arsenic levels. This year, working closely with NCSU, we called into question the accuracy and reliability of these field kits. After a long-term study, we published an article that evaluates the effectiveness of arsenic field kits. We found that the arsenic kits continuously underestimate real arsenic levels in the drinking water in our region, and, for our purposes, they are useless for accurately understanding regional arsenic concentrations. After using unreliable kits for years, we had to switch to use certified labs and university partners for testing arsenic. This is a costly and time-consuming process, which greatly reduces our ability to act. To address this, we have continued to work with NCSU to develop a low-cost field testing method for arsenic - based on existing technology. Into 2020, we aim to pilot this in the field and prove the method, with the goal of creating an incredibly affordable - and accurate - arsenic testing method that could be used by communities around the globe. This would not only be a huge help for our own projects, but it could be a major contribution to the international Water, Sanitation, and Hygiene (WASH) community.



Field School for Social Impact

However, our global impact goes well beyond these partnerships. Caminos de Agua has long acted as a “field school” for aspiring, socially-responsible engineers, interns, and early first hires. This year alone, our young engineers worked on developing technical solutions while also negotiating with the State Health Secretary and working closely with our community team to understand the social implications of implementing new solutions. Karina Bautista, a recent UNAM graduate (pictured on the right), joined our team with the financial support of the Unitarian Universalist Fellowship of San Miguel de Allende. Her work on promoting rainwater harvesting systems and disseminating information on the water situation throughout the watershed was instrumental this year.



2019 financial highlights

50%

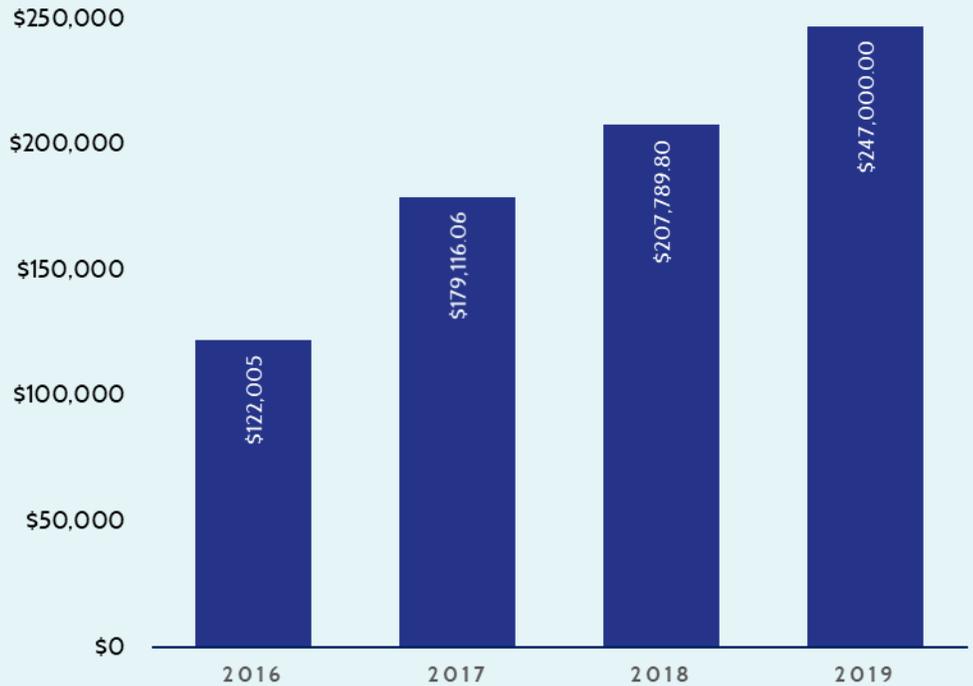
increase in annual income since the founding of Caminos de Agua

USD \$123,500

from generous individual donors

USD \$46,000

invested in research and development projects



- Individual Donors 50%
- Institutional Support 34%
- Water Filter Sales 13%
- Water Testing Services 3%



- Research & Development 24%
- Education 20%
- Rainwater Harvesting 16%
- Water Filters 17%
- Water quality monitoring 11%
- General operating expenses 12%



* Income and expenses peak at different times of the year. Due to the recent successful 4th quarter of fundraising in 2019 put us in a strong financial position going into 2020.

our team

S T A F F

Dylan Terrell

Executive Director

Paco Guajardo

Associate Director

Casilda Barajas

Education Coordinator

Melissa Landman

Development Coordinator

Alexandra Reiling

Director of Technology

Matthieu Carrière

Research & Development Coordinator

Saúl Juárez

Community Projects Coordinator

Ismael Rodríguez

Water Filter Production

Filiberto Baltazar

Water Filter Production

Nico Vargas

Water Filter Production

Billy Thurston

Water Quality Monitoring Coordinator

Dennis Paquette

Bookkeeper

Aaron Krupp

Director of Technology (2017-2019)

Chantal Kronenburg

Communications Coordinator (2017-2019)

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Dr. Dennis Taylor

Dr. Josh Kearns

Dr. Larry Dworsky

Dr. Matthew Polizzotto

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Miguel Álvarez

Water Testing Services

Nancy Grimwood

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Mathilde Poulle, Pilar Cabrera*

EWB Technical Fellows

Miguel Fingerut

Wageningen Universtiy Fellows

Martijn Eikenboomer, Nina Ommerborn

Caminos de Agua Fellows

Caleb Davis, Calum Stewart,

Karina Bautista, Stephan Calvet

Translation

Anel J. Vaca

To Our Partners in 2019

¡GRACIAS!

INSTITUTIONAL



MEDIO AMBIENTE Y SUSTENTABILIDAD



The Jonathan D. Krist Foundation



UK ENGINEERS WITHOUT BORDERS



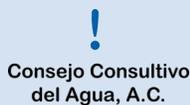
ACADEMIC



NGOS & OTHERS



Unitarian Universalist Fellowship of San Miguel de Allende



ECOBASE



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year in review
2019

