

## Case Study of Scientist-Community Partnerships: Untreated Wastewater for Crops

**Introduction:** Globally, the practice of using wastewater (treated *and* untreated) for edible crop irrigation has been increasing steadily. If managed properly, the re-use of *treated* wastewater can mitigate water shortages from drought, shrinking aquifers, pollution or simply not enough water to go around. Conversely, the irrigation of food crops with raw sewage will enable crop production, and yet there are serious consequences to natural resources (water, soil) and have great public health risks.

There persists today many misconceptions regarding the use of raw sewage for crops, such as where this is occurring, to what magnitude, and the fate of crops raised in these polluted conditions. The world leaders, by far, in using both treated and untreated wastewater are China and Mexico, rather than the '*developing countries*' we hear about. In fact, Mexico alone accounts for nearly half the hectares irrigated this way in Latin America. Crops harvested under these conditions present a two-tier risk element to the community, from the nearby farmers and their families to the consumers elsewhere that are unaware of the contamination. We have seen here in the US the effects of exposure to raw sewage, which can cause outbreaks of illness ranging from mildly inconvenient to deadly. A final misconception is that use of raw sewage comes from having no sanitation or infrastructure for sewage management available at all. In actuality, it can be a prevalent practice in developed areas, whereby the existing municipal infrastructure cannot handle the burden of its population's wastewater, so it continues to simply flow.

**Purpose/Expectations:** Four years ago, an environmental scientist and environmental engineer living in Mexico attended a cook-out on a lake in San Miguel de Allende. Asked to assess the general health of the lake, we returned another day to begin a systematic examination of the local waters as we were trained. Within a few moments of the first trip, we came upon a structure dubbed 'the diversion box', where it has been calculated that approximately 50-70% of San Miguel's municipal wastewater is *diverted* prior to entering the wastewater treatment plant. A portion of this diverted sewage enters the local stream directly via pipe, while the majority flows through a network of dedicated channels to irrigate the fields within an entire indigenous community. Ironically, San Miguel's treatment plant is literally surrounded by crops that are irrigated with the sewage it diverts.

Chaac Water Group is an accidental nonprofit, formed to allow us to more easily interact with the local stakeholders, to enable us to share our results on a professional level to assist them. **Our purpose** remains that of characterizing the extent of the problem (the sewage inputs) and sharing this information with the local stakeholders to promote food safety and reduce public health risks. Our expectations were admittedly a little lofty, as we thought once all the information was revealed and solutions were offered, there would be nothing left for us to do. We also did not anticipate the level of growth and commitment these citizens have shown.

**Implementation:** Four years ago, members of the *Amigos de la Presa* (a program of **Sociedad Audubon de Mexico**) were the original requesters of our research. Through them, the Chaac Water Group was introduced to other nonprofits, researchers from other countries, and local stakeholders that all contributed in making this a committed, ongoing project. Whether it was funding for travel, sampling supplies, housing, food or transportation, the opportunity to make progress was never ignored. It has been a relatively low cost enterprise financially due to the efforts of so many, but the return for this investment

has been tremendous. It started the conversation for this community in regards to its environmental resources, municipal sewage infrastructure, the public health risks associated, and a burden carried by a group of people with no alternatives for crop irrigation. Previously, only a few people understood the actual situation, but with an increased awareness among stakeholders, it is gaining momentum. The stakeholders interact with the local government and federal authorities, as we continue to assess data gathered from our evaluations and their monitoring.

**Outcomes and Impacts:** San Miguel de Allende now has a growing stakeholder group that is dedicated to understanding the 'health' of their waters and what must be done as an informed community:

- Formed a *citizen's water monitoring group* to take monthly samples
- Created a *citizen's stream observation group* that performs bi-monthly evaluation of impacts in stream segments, searching for impairments
- Created a *database* to document these observations, and to share with elected officials
- Actively *sought a working relationship* with stakeholders not involved previously
- Began *meeting* with the water utility, municipal authorities, and federal regulators to discuss evaluations and solution-based documentation
- Obtained the services of an Engineer Without Borders (EWB) volunteer to assist in the project

#### **Barriers/Challenges:**

- Language:** It's a tough reality when working in another country, so be honest and get reliable translators when needed. This is also true for any written documentation you are creating.
- Cultural:** Some community groups are rather reclusive, and it takes a bit of work to create a bridge toward communicating with them. Make sure to seek out the ones that can facilitate this inclusion.
- Documentation:** Conduct all your research/assessments to the best level attainable as dictated in your field. In return, evaluate all facts, documentation and information with the same candor!

#### **Lessons learned:**

**Research the unfamiliar:** After the fact, we realized that a serious immersion into this subject should have been an earlier priority. Careless health risks were taken that could have been avoided. In addition, wander everywhere and talk to lots of people to get a true picture of the community.

**Leave the politics to the locals:** Stick to collecting information, talking and educating with your stakeholders, but save yourself a headache regarding politics. It is not something understood easily, and you will always be an informed "outsider". Our stakeholders have grown quite adept at interacting with their government members, and this is what makes progress sustainable.

**You aren't in Kansas anymore:** It takes a true effort to evaluate situations with a standard that is accepted in general, such as pathogens in sewage, yet remember water resource management and enforcement differ everywhere. In other words, the same laws don't apply everywhere.

**An image paints a thousand words:** Only when we took people to literally show them what was happening, did we make progress. We discovered that written words made the least impact in general, but if imagery, such as graphs, photos or film were used, there was more comprehension.

#### **Future directions:**

**International Stakeholder:** San Miguel de Allende is a designated World Heritage site in the United Nations Educational, Scientific and Cultural Organization (**UNESCO**) as of 2008. As such, there are obligations to maintain municipal infrastructure, water services and natural resources without environmental injustice. There is also an obligation to include representatives of *all* stakeholders in a group for collaboration on the community resources, and yet does not change with elections. For that reason, we have filed a notice of complaint as provided in UNESCO Operational Guidelines.

**Documentary:** Collaborating with **Ponderosa Productions**, a Brooklyn-based documentary team, working on an ongoing project that covers the multiple social and environmental issues that stem from the water crisis in Central Mexico - from the dangerously low levels of the region's aquifers, to the serious health risks associated with the mismanagement of wastewater. The documentary follows a devoted group of activists who are working to enact solutions and pressure authorities into acting.

**New Election:** Already, the stakeholders are asking for meetings in October with the newly elected officials. They've come a long way.

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*This is one of a series of case studies written by scientists and community members responding to a survey in advance of the forum, [Community Connections: Bringing Together Scientists and Local Voices](#), held in Houston, TX on September 26, 2015 by the Center for Science and Democracy at the Union of Concerned Scientists. For more information, visit [ucsusa.org/scientistsandcommunities](http://ucsusa.org/scientistsandcommunities).*