Framework for Developing a Sustainable Watershed Management Plan for San Cristóbal de Las Casas, Chiapas, Mexico

Problem Statement
The colonial city of San Cristóbal de Las Casas, in the central highlands of Chiapas, is a cultural and economic center for the indigenous Mayan population of southern Mexico. The city experiences a water supply deficit for human consumption due to a lack of management and adequate infrastructure. The rapid population growth of the last two decades has deteriorated the surface water quality and increased pressure on the tenuous local water supply.

Primary Concerns
- Water quality
- Water quantity
- Access to water
- Sanitation

Deliverables
1) Water Quality Monitoring Plan
A surface water monitoring program was designed for the watershed in order to provide a better understanding of the sources, amounts, movement, and fluxes of contaminants in the region.

2) Watershed Model
Modeling the watershed allowed for the integration of available data into a unified framework for understanding water flow and transport of pollutants within the watershed. The model will be augmented and utilized by our partners to evaluate various management scenarios.

3) Best Management Practices
Twenty-five BMPs were evaluated based on effectiveness (towards meeting a primary goal and alternative benefits) and feasibility (cost, physical requirements and local considerations). The following BMPs were recommended for a pilot project consideration:
- Contour water retention trenches
- Buffer zones and bioswales
- Rainwater harvesting
- Composting latrines
- Retention basins
- Educational campaigns.

Recommendations
- Implement the water quality monitoring plan.
- Establish pilot projects of selected BMP to determine local effectiveness and costs.
- Use preliminary design considerations to further explore advanced treatment plants to treat the city’s wastewater.

Stakeholders
- Citizens on the urban periphery only have community water taps and no municipal sanitation services.
- Citizens in the city center have a reliable supply of water who can also afford to buy drinking water.
- Smaller communities dispersed throughout the watershed are generally not connected to the municipal water system.
- Communities on the urban periphery who have piped water and basic sanitation services.
- Communities outside the watershed who receive downstream contaminated water and use it for agricultural purposes.

Private Industry:
- SAPAM - Municipal water utility responsible for supplying potable water and sanitation services
- CNA - Federal agency responsible for setting and enforcing water quality standards

Government Agencies:
- SAPAM - Municipal water utility responsible for supplying potable water and sanitation services
- CNA - Federal agency responsible for setting and enforcing water quality standards

4) Wastewater treatment options
In order to meet national water quality standards, treatment of the municipal wastewater load is required. A variety of treatment systems were evaluated based on preliminary design criteria needed to effectively treat the current load, as well as the load under two likely population growth scenarios.

Land Area Required for Treatment Options

SAPAM - San Cristóbal municipal water and sewage system utility

SYJAC - Non-governmental organization primarily concerned with community development projects in San Cristóbal

ECOSUR - Research university with a campus in San Cristóbal

Water bottlers and suppliers
- Contour water retention trenches
- Buffer zones and bioswales
- Rainwater harvesting
- Composting latrines
- Retention basins
- Educational campaigns.

For more information visit: http://fiesta.bren.ucsb.edu/~chiapas/ Or contact: Chiapas@bren.ucsb.edu