

## **The Conservation and Development of the Ayuquila River in the Sierra de Manantlan Biosphere Reserve**

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The Sierra de Manantlan Biosphere Reserve has initiated an integrated project for the management of the river that includes diagnosis and monitoring as well as local social and political organization. In this presentation, we describe our experiences with the process of local organization and the difficulties in balancing the interests in the sustainable management of the watershed.

Deep divisions occur in the Ayuquila watershed, geographically, socioeconomically, and in relation to pollution of the river. The lower basin of the river can be divided into two main sections—an upper relatively flat valley, and a lower, steeper, more mountainous section. Communities in these areas differ socioeconomically, and in their relation to the river and its resources.

The historical and archeological record shows that even from the prehispanic period, the lower basin of the Ayuquila river was characterized by a clear differentiation among its provinces. The province of Milpa, in the upstream areas, was dependent on highly productive and intensive agriculture that permitted the presence of urban centers with high population density. In contrast, the province of Amula, downstream, was situated in a mountainous region, whose climate and landscape limited agricultural activities to seasonal cultivation. The level of development was thus poor (Laitner and Benz 1994).

Through time, this differentiation has been maintained and even intensified. In the present-day Valley of Autlán-El Grullo (corresponding to the province of Milpa), an intensive, technical, irrigated export agriculture based on the cultivation of sugar cane and vegetables (melón, watermelon, tomato and chilo) is currently practiced. In contrast, downstream municipalities (corresponding to the province of Amula) are characterized by a seasonal agriculture based on the production of maize for subsistence use, extensive cattle raising, and artisanal fishing.

These differences in production are reflected in the distribution, dynamics and structure of the population. Today, the population of the entire region is about 93,000. Seventy-nine percent are concentrated in the municipalities of the Autlán-El Grullo Valley, while 21% are in the downstream municipalities.

The development of the irrigation system of the valley and later the installation of the sugar cane mill, or Ingenio, in the 1960's has converted El Grullo and Autlán into poles of attraction for manual labor, sustaining urban development and a constant increase in population. In contrast, the population of the municipalities of Tuxcacuesco, Tolimán and Zapotitlán de Vadillo have increased at a lower rate during the same period. These differences are reflected in labor statistics. In Autlán and El Grullo, more than 70% of the workforce is in commerce and industry, while in the predominantly rural municipalities, more than 60% is in agriculture.

The social welfare between these areas also differs. Levels of education in the downstream municipalities lag behind the urban, upstream areas as well as the state in general. The proportion of the population older than 15 years without schooling and the proportion of the population that is illiterate are both over 20% while the state average is 5% and 8% respectively.

In downstream municipalities, 62% of the dwellings have potable water sewers, compared to 83% in the state overall, and only 30% have sewers, compared to 80% in Jalisco. Electrical service exists in only 57% of the households in Zapotitlán de Vadillo, 74% in Tolimán, and 79% in Tuxcacuesco, whereas the state average is 91%. Within these municipalities, towns located along the Ayuquila are the poorest and most marginalized. The towns of Zenzontla, Ventana, La Cañita and El Camichín among others, lack electricity, sewers, and potable water entirely. Medical attention is sporadic, education is deficient, and a high level of illiteracy persists. The adult illiteracy rate is 33.5% only 61% of children attend school.

Thus, the area is divided socioeconomically. It is also divided in the effects of pollution. The upstream towns located along the river nearest the discharges from the Ingenio and the cities are the most affected by the problem of pollution. In the towns situated along the channel, like El Tempisque, El Palo Blanco and El Aguacate, the impact is greatest because in this area, the only

flows in the river arise from municipal sewage discharge, discharge from the Ingenio, and return flows from the valley irrigation system.

The downstream towns along the river, like Ventana, Zenzontla, La Cañita and Agua Mala are located below the confluence with the Arroyo Manantlan, which is an important contributor of clean water. While the water quality here is better, during the dry season, short periods occur when water quality is extremely bad due to massive discharges from the oxidation ponds of the Ingenio, or from chemicals used in the washing of the mills. Although the most evident impact occurs during these short periods, there is a continual process of damage to the river and its resources that directly affects the family economy, which depends in good measure on fishery resources. In addition, these are the same populations in the regions with the greatest deficiencies in health services, education, potable water and electricity.

Because there is no potable water supplied to the towns, the people are forced to dig filtration wells in the bed of the river to supply drinking water. River water is purified only by being filtered through the coarse sediments of the channel, with direct repercussions on health.

The differences in the impact of pollution on the municipalities also extends to their perspective and political response to the contamination.

El Grullo is at the same time an important generator of pollution, while it is also affected by pollution in its riparian areas. The nearness of the Ingenio to the municipal seat has also generated bad feelings among the inhabitants because of the fetid odors arising from the oxidation ponds.

As a result, El Grullo has taken an active position in the search for solutions to the problem, and environmental pollution in general, and has even entered into a direct confrontation with the Ingenio, establishing formal complaints all the way up to the presidency, requesting orders that the company improve the quality of its waste water.

On the other hand, the municipality of Autlán, since its population is not directly affected and because it has formal economic relations with the Ingenio through the collection of taxes, has taken a more distant and conservative position on the pollution problem.

The sugar industry plays a fundamental role in the economy of the region. It is an important source of direct employment as well as an indirect source through employment associated businesses and services principally concentrated in El Grullo.

Since the start of operation, the Ingenio has dumped its wastes without any treatment directly into the river, while systematically denying its responsibility for pollution. This denial has only increased the anger of the affected populations. It is also important to note that until 1995, the Ingenio was state owned, which enormously complicated the ability of the riverine populations to obtain a suitable response from government authorities to their demands for wastewater treatment.

There are great differences among the growers of the region. Nevertheless, for our analysis, we can divide them into two large groups that differ in the way their activities contribute to degradation of the river, and their relations with the other actors.

The Union of Cane Producers are a group tightly linked to the future of the Ingenio. They are mostly residents of the municipal seats of El Grullo, El Limón and Autlán. The producers play a complicated role. As citizens, they bear a responsibility for generating urban waste. As producers of cane, they also take part in the industrial pollution. However, as suppliers of only raw material, they do not consider themselves responsible for the contamination resulting from the industrial process. Nevertheless, in their words and deeds, they defend the interests of the Ingenio, which in the final analysis is their own interest. Interestingly, in their productive practices, this group is not identified by others as part of the problem, even though the burning of the cane fields, the use of chemical pesticides and fertilizers, and the degradation of agricultural soils represent significant environmental degradation.

The second group of producers farm on marginal lands on slopes, and are among the population most affected by the pollution of the river. This group includes ranchers as well as poor farmers and the impact of pollution on the family economy and welfare has different dimensions for each of them. Nevertheless, their productive activities also contribute to the degradation of the river

since their cultivation practices, manner of grazing, forestry and fishing have an impact on the vegetative cover, soil erosion, forest fires and fish and crustaceans.

With the increase in population of Autlán and El Grullo and the consequent increase in water diversion and sewage, there has been a continuous decline in water quality and of the well-being of the affected population. As a result, they have recently adopted a more radical stance, threatening to seize installations of the Ingenio and public officials and set fire to the cane fields. As a result of the complaints by the towns affected by pollution, many of which are located in the Sierra de Manantlan Biosphere Reserve, the reserve has taken a leading role in seeking alternatives for environmental management of the Ayuquila.

In 1987, the Sierra de Manantlan Biosphere Reserve was decreed, and in 1988, the Manantlan Institute for Ecology and Conservation of Biodiversity (IMECBIO) of the University of Guadalajara was established in the municipality of El Grullo. Both of these events strengthened the downstream towns in combating the Ingenio. The Biosphere Reserve created a legal instrument that strengthened the position of the towns affected by the pollution of the river, while the IMECBIO became a body dedicated to the conservation and management of the reserve, concerned with the environmental problems and development of the region.

In 1990, the riparian communities and the city council of El Grullo asked IMECBIO to undertake an evaluation of the impact of contamination of the Ayuquila. With the pressure of the riparian inhabitants of El Grullo, in 1991, the city council began a discrete complaint against the Ingenio. The IMECBIO drafted a report that documented the complaints of the local population, and analyzed the causes of pollution in the river, including the water discharge from the Ingenio. For the first time there was a technical document that supported the assertion of the local peasants.

With a change in the municipal government in 1992, the new city government took more blunt measures, and joined forces with the planning committee for Municipal Development, openly denouncing the discharge of wastewater from the Ingenio before federal and state officials. They did not obtain a favorable response.

In 1994, animated by the armed uprising in Chiapas, and the lack of institutional response to their demands, the inhabitants of the riparian towns took a more radical position, and threatened to burn cane fields, block access to the Ingenio, or undertake sabotage.

Given the complexity and the intensification of the problem, in 1994 the Reserve promoted the formation in the riparian towns of local committees for the protection and restoration of Ayuquila River, or "River Defense Committees". The goal was to channel the dissatisfaction into institutional paths as well as promote community organization for restoring and managing the river. Ten committees were constituted, one in each riparian town, which met to define a common strategy against the problem. Each committee presented to the environmental protection institutions and governmental authorities a formal complaint against the Ingenio. At the same time, the Reserve promoted the creation of space for dialogue together with the municipal governments and the state government for finding coordinated solutions to the problem.

In 1994, the State Government convened a general meeting of the city councils, the Ingenio, the involved state and federal agencies, the River Defense Committees, producer associations, and the University of Guadalajara, to discuss and find solutions to the problem. While this meeting was a great advance, the representatives of the Ingenio did not show the least inclination to resolve the problem, polarizing the differing positions, and blocking any agreement for concrete action. Unfortunately, the political articulation was not the most well planned, since we found ourselves in the middle of the state and federal electoral process, which, in the final analysis, cut the initiative short. However the need for continuing the dialogue and establishing a permanent forum for coordination to discuss alternatives was demonstrated.

At the beginning of 1995, with the change in the federal government, the office of Environment, Natural Resources and Fisheries was created, responsibilities previously dispersed in three departments. In addition, the opposition party (Partido Acción Nacional) won the governorship of Jalisco and the most important municipal governments in the area. Finally, during

this same period, the Ingenio became a private company. These three changes created a new institutional and political climate allowing a more favorable perspective for the resolution of the problem of pollution and management of the Ayuquila basin.

In 1995, the River Defense Committees placed increased pressure on the environmental regulatory authorities, who in turn established administrative sanctions against the Ingenio for not complying with existing regulations concerning wastewater discharge. Granted financial incentives by the federal government, the Ingenio promised to phase in a complete system of wastewater treatment over three years.

While this was a great advance, the problem of degradation of the river persists and the riverine inhabitants do not perceive a real improvements, since the Ingenio will continue to discharge its wastewater without the required treatment over the next 1 to 2 years while it completes the treatment installations. In addition the rest of the factors causing degradation of the river, like municipal wastewater, inadequate management of garbage, contaminated agricultural runoff, forest clearing and fires will still continue.

The Reserve is continuing to integrate the work of the local inhabitants in the management and conservation of the lower basin of the Ayuquila River. It has initiated a planning process that will develop a governing plan for the management of Ayuquila River.

The proposed process involves a series of planning meetings among the involved communities and institutions. It is hoped that this will be a space for dialogue about the solution of the conflicts and coordination of actions to slow as rapidly as possible the alarming deterioration of the river and lead to its rehabilitation.

tons of molasses

Editor's note: Since this article was written, the federal government created in 1997 the "Comision of the Ayuquila-Armeria River." However, although active in defining major problems at the general watershed level it did not act promptly to resolve local pollution problems. It created local frustration. The Ingenio did not honor its commitment to eliminate the discharge of contaminated water, so a major public opinion drive was organized by the IMECBIO and the local population, using newspapers, radio and television at local, state and national levels. Members of the IMECBIO were threatened by those that perceived this as an attack on the economic activity that maintained their livelihoods. Relations in the valley became acrimonious with regards to sugar production and river pollution. In 1998 a molasses tank in the Ingenio suffered an accident and thousands of tons of molasses spilled into the river producing massive fish kill for over 30 kilometers downstream affecting not only the Jalisco portion of the river but also the portion in the state of Colima. On going environmental monitoring of water quality and aquatic organisms by the IMECBIO allowed authorities to completely document the environmental impact of the molasses spill on water quality and the biota. This environmental crisis generated a citizen protests in both states, about 150 peasants marched to close the Ingenio, and local, state and regional political leaders were forced into action. An agreement was generated and the Ingenio was fined for pollution. The Directorship of the Sierra de Manantlán Biosphere Reserve, brought specialists from Cuba, who analyzed the Ingenio pollution problem, devised various mechanisms for resolving it inexpensively, and in their presentation of results convinced local municipal governments, the Union of Cane Producers and other local actors that implementing water treatment alternatives would not affect the economic viability of the Ingenio. So these local actors joined the IMECBIO, the DRBSM and the downstream peasant populations in demanding a halt in water pollution by the Ingenio. The Ingenio was forced to change its water treatment mechanisms and recycle its water. Water quality has now improved and new fish species have colonized the areas that were devoid of fish life. Surveys show that the local population recognize and are satisfied with the changes in water quality. The Ingenio has changed its confrontational approach and now collaborates with the biosphere reserve and with the IMECBIO in river conservation programs. A new process has been initiated to create a local intermunicipal committee for the management of the lower Ayuquila Watershed that

adequately addresses the local needs. Seven municipal presidents from the area traveled to Ontario, Canada and Wisconsin, U.S.A. for 10 days accompanied by personnel from the reserve and the IMECBIO in order to explore solid waste recycling programs, water treatment mechanisms of different scales, local citizen participation mechanisms, intermunicipal and interinstitutional linkages in watershed management, and the value of natural protected areas in promoting public use and ecotourism in rivers. The municipal presidents are exploring how some of these components can be incorporated in the region, and how they can be more effective and reduce costs by working together. A fiduciary fund managed by the local municipalities is being created to implement the solid waste and water management workshops that will set the stage for diagnosing the problems and developing work plans for resolving them. This new initiative combines various issues into an integrated watershed management proposal: strengthening local government in environmental management, promoting democratic local citizen participation, creating linkages among academic institutions and local government for environmental-problem solving and linking water quality and biodiversity conservation with tourism and public-use.