WaTER Center Research - PASSIVE TREATMENT

Passive treatment technologies, i.e., those that rely on natural biogeochemical and microbiological processes to ameliorate polluted water problems, may provide a viable treatment alternative to costly and laborious active technologies for treating contaminated water. Passive systems require less operational and maintenance labor and have lower initial costs but require larger land areas than traditional active chemical treatment systems. Thus, they have great potential in developing regions with a relative abundance of land and labor, but minimal financial capital. Passive treatment systems are an application of the principles of ecological engineering, defined as "the design of sustainable ecosystems that integrate human society with its natural environment for the benefit of both" (from a standard text by Mitsch and Jorgensen 2004). As such, the overall goals of ecological engineering projects are the restoration of disturbed ecosystems and development of new sustainable ecosystems having both human and ecological value. These low-maintenance and relatively inexpensive natural systems are often the only viable option for abandoned mine drainage treatment.

The indigenous communities of the Rio Juckucha watershed (near Potosi, Bolivia) have been adversely impacted by mining pollution for over a century. The residents of these communities are predominately indigenous subsistence farmers, whose regional water resources are severely degraded due to mining pollution from acid mine drainage (the water that flows out of active or abandoned mines) and discharges from ore processing facilities. Acid mine drainage has led to severe degradation of local water quality, rendering crucial water resources in this high (11,500 to >16,000 ft elevation) desert unusable for human and animal consumption and agricultural use. This situation has led to increasing conflict between local farmers and miners due to acid mine drainage ruining irrigation water resources, thus decreasing crop yields and endangering families by exposure to water containing elevate levels of lead, arsenic, cadmium and other ecotoxic metals.

Building on design and installation of successful passive treatment systems for metals-contaminated mine waters in the United States, a recent focus has been on implementation of similar technologies in this impacted watershed. In cooperation with Universidad de Autonoma Tomas Frias, Engineers in Action, Rotary International, St. Francis University and OU's Sooners Without Borders, limestone channels, anoxic limestone drains and aerobic ponds/wetlands have been installed to treat waters from abandoned mining operations. "Previous attempts by the Bolivian citizens to clean the water have failed because they are one of the poorest places in the world," said Christopher Breazile, civil engineering junior. "We have studied their water, and we believe this will work." Success of this project, to be determined through a long-term monitoring effort, will provide irrigation water of appropriate quality for approximately 8,500 indigenous campesinos.

See following links for additional information:

http://engineersinaction.org/projects/ongoing-projects/potosi/

http://www.francis.edu/riojuckuchaproject.htm

http://ouccoe100.blogspot.com/2010_03_01_archive.html