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Workshop on Wastewater Treatment: Alternatives for Small Communities

July 22-August 4, 1993
Eastern Shore of Maryland and Delaware
Southern California



United States Delegation
Middle East Peace Process
Multilateral Working Groups on the Environment
and Water Resources

Cover Photo: Workshop participants learned about the use of salt-tolerant plant species while on a field trip to a constructed wetland site at a U.S. Bureau of Reclamation pilot project near San Jacinto, California.

Summary

How can wastewater, a degrader of freshwater resources and related ecosystems and a menace to public health, be transformed into a resource for the arid Middle East? And what treatment technologies can help small communities bring about this transformation? These were the principal issues addressed by participants of a summer workshop on wastewater treatment sponsored by the United States as part of the Middle East Peace Process.

Held under the joint auspices of the Multilateral Working Groups on the Environment and on Water Resources, this bi-coastal workshop took place from July 22 to August 4, 1993. Fifteen scientists, engineers, and government officials representing research, engineering, and policy disciplines came from the Middle East. They were joined by a delegate from Russia, which is a co-sponsor of the peace process. Their task was to take part in an interactive exchange of information relating to wastewater collection, treatment, and reuse alternatives appropriate for smaller communities in the Middle East. Low-cost and low-maintenance alternatives were emphasized.

Beginning on the East Coast of the United States, the workshop included three days of lectures and site visits to treatment facilities in small towns of Maryland and Delaware. Participants spent the next ten days in Southern California, where they worked with a specially developed computer program on treatment technologies and visited a variety of treatment facilities to view innovative examples of wastewater reuse.

The workshop was organized and supported by the U.S. Agency for International Development, U.S. Environmental Protection Agency, and the Department of State. Additional support was provided by experts from the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the U.S. Fish and Wildlife Service.

Workshop Report

BACKGROUND

Because of a critical shortage of clean water, preventing water pollution becomes a matter of paramount concern for many urban and rural areas in the Middle Eastern region. A major health hazard in water-short areas is the reuse of untreated wastewater, a practice that threatens both farmer and consumer. Although shortages require that water reuse be practiced wherever possible, effective treatment is needed to return wastewater to an acceptable state for certain intended purposes. When treated effectively, wastewater becomes a precious resource, rather than a hazard.

At a distance from the capital cities are hundreds of small urban centers with fewer than 10,000 residents. Each town has its own set of environmental sanitation problems that relate to such factors as population size and density and the nature and scale of commercial production, and also to climate, topography, water resources, and type and distribution of flora and fauna in and around the town. What appears as a particularly pressing problem in one town may represent a very minor difficulty in another. Nations, as well, differ in the problems they face.

Often, smaller towns take an ad hoc approach to sanitation that may incorporate inappropriate methods and result in inadequate coverage. Conventional treatment approaches are costly and often difficult for small towns to sustain. Recognizing this situation in the mid-1970s, A.I.D. published a manual entitled *Appropriate Methods of Treating Water and Wastewater in Developing Countries*. This manual incorporated not only technical considerations but also economic and institutional issues in choosing appropriate methods. However, advances in the state of the art and altered economic and social conditions within the region suggest the need for reevaluation. Also of significance are advances in nontechnical approaches that emphasize pollution prevention through economic and policy means.

PURPOSE

In consideration of these factors, the workshop proposed to review appropriate state-of-the-art processes for collecting, treating, and reusing wastewater. Participants came together to discuss these processes and to exchange information from their own experiences. They also visited a wide range of wastewater treatment and reuse sites on both eastern and western coasts of the United States. American wastewater specialists from universities, various government agencies, and the private sector lent their expertise to this effort.

Given the wide range of potential methods for wastewater treatment, each with a complex set of technical, economic, and institutional conditions to be evaluated, a selection tool was clearly needed. To help participants with their choices, a unique computer program was developed to characterize a range of treatment approaches according to construction elements, cost, energy consumption, chemical use, operator skills required, maintenance demands, and legal requirements. The program allows the user to develop configurations of collection, treatment, and reuse/reclamation technologies (treatment trains) that can provide water and nutrients for locally grown crops or for other beneficial uses. When incorporating current technical, social, and economic data for the region, the program ranks the optimum combination of treatment trains to achieve the desired reuse alternative by estimating costs. It is expected that this program can assist in the selection process and aid the expansion of sanitation coverage into many underserved or poorly served towns in the Middle East.



Laboratory facilities for monitoring treatment effectiveness were reviewed at Easton, Maryland.

ACTIVITIES

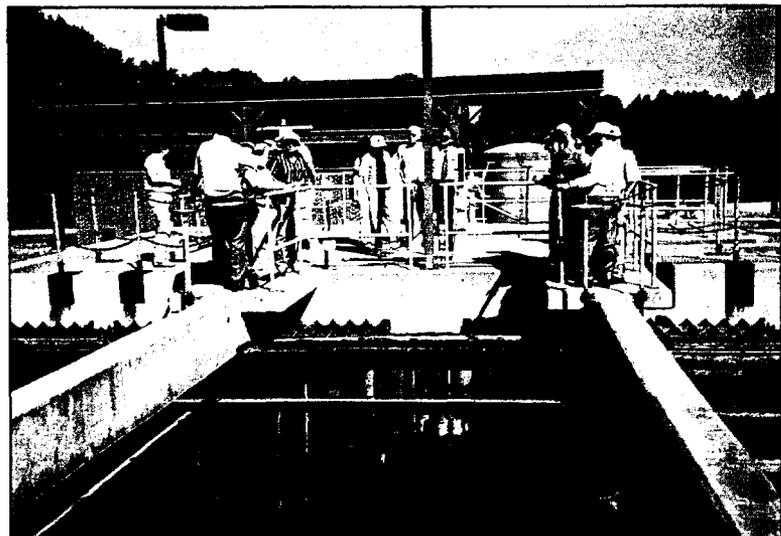
The focal point of the workshop was the critical need for wastewater treatment and reuse. The primary environmental issue in the arid Middle East is water scarcity. Wastewater is a resource that cannot be neglected; thus, wastewater reuse needs to be the driving element in the choice of treatment technologies. A variety of U.S. examples were cited as models of the range of approaches available.

East Coast Site Visits

Participants toured the Easton, Maryland, wastewater treatment facility, a primary facultative lagoon and secondary pond facility feeding an overland flow system that grows grass for local farm use. Their visit was followed by a discussion on the effectiveness of duckweed aquaculture for treating wastewater and on the productive uses of duckweed as a feedstock. Participants visited several other sites on the Eastern Shore, viewing a sludge composting plant and a wastewater installation that combines community septage systems, recycling sand filters, emergent wetland system, peat wetland system, UV disinfection, and odor control. Participants also visited a local Environmental Protection Agency office in Annapolis to discuss small community collection systems.

Traveling to Delaware, the participants visited Henlopen State Park to see a rapid infiltration system, as well as the Lewes wastewater treatment facility. The latter exemplified a total barrier oxidation ditch, fine bubble diffusers, teacup grit separators, sand filtration system, and sludge applications. The day ended with a visit to Long Neck to tour a regional facility using a slow-rate infiltration system, aerated lagoons, and a wastewater irrigation system that is used for growing grasses and soybeans for animal feed.

Participants visited various wastewater treatment facilities while on field trips to the Eastern Shore of Maryland.

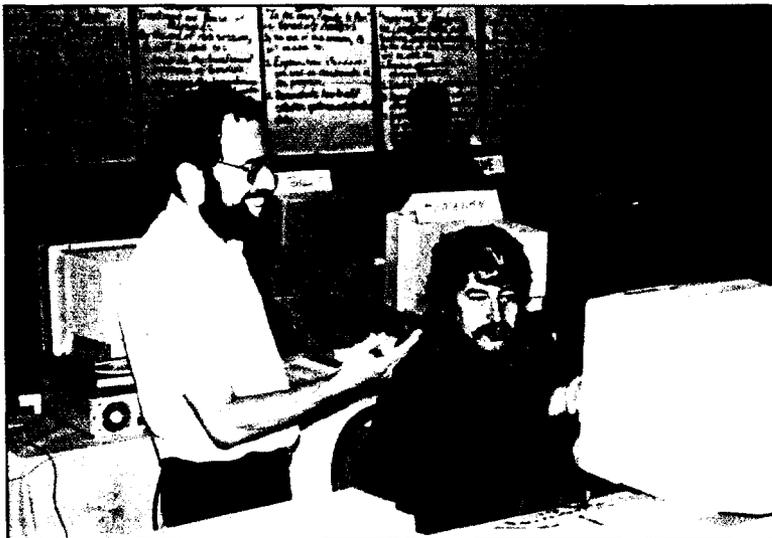




Participants and workshop facilitators visited the Chesapeake Bay in Maryland.

West Coast Segment

On July 25th, the participants flew to Newport Beach, California, to begin the second portion of the workshop. Activities began with a review of lessons learned from the East Coast sessions, followed by a presentation of objectives for upcoming activities. Among the issues discussed were the consequences of poor technology selection and the need for a paradigm shift in choosing appropriate technologies. Participants focused on waste minimization as a necessary first step, then examined reuse and reclamation objectives.



Participants became proficient in the use of a computer model for the prefeasibility level of wastewater treatment approaches for small communities. Participants tested the model on hypothetical case data which they provided.

WAWTTAR Computer Program

A major emphasis of the workshop was the introduction of WAWTTAR (Water and Wastewater Treatment Technologies Appropriate for Reuse), a computer program designed for participants' later use in selecting technologies based on data from their own locales. The program calls for building treatment trains, a series of treatment processes designed to achieve the water or wastewater beneficial-use objective. In familiarizing themselves with the program, participants used hypothetical data to test critical assumptions for technology selection. They also discussed ways to make the program more effective.

California Site Visits and Presentations

Several site visits took place during the West Coast portion of the workshop including one to the State of California Irvine Ranch District, where participants viewed water reuse and reclamation alternatives, and another to the Eastern Municipal Water District, a U.S. Bureau of Reclamation facility in Hemet, California, where they observed collection and treatment facilities, saline water conversion, groundwater recharge, and water conservation approaches plus



At Anaheim, California, participants viewed cactus species irrigated with reclaimed wastewater.



During a field trip to the U.S. Bureau of Reclamation facilities at Hemet, California, participants discussed vegetation types used in wetlands wastewater treatment.

research work on irrigation and wildlife habitats. A visit was made to Water Factory 21 (an advanced wastewater reclamation plant) to review its long history of wastewater reuse, and the group toured the wastewater treatment plant at Anaheim. An afternoon was spent touring the salinity lab at the University of California at Riverside.

Several presentations were made during the conference. One promoted a global vision for wastewater reuse on aquaculture, horticulture, wildlife habitat, and recreation practices. Another provided guidelines and standards for reuse covering public health, plant tolerances, wildlife, and industrial implications. Participants also heard a presentation on the Bouwer process of rapid infiltration and soil mantle treatment, and on constructed wetlands and their application to small community programs. Biosolids were discussed, including treatment processes, plant nutrient value, water holding value, and its management. In addition, participants heard a presentation on California water resources, learning how municipalities meet demand in a densely populated arid zone. The final day of the workshop included a presentation and discussion on sustaining treatment facilities and the benefits they provide.

The conference ended with an evaluation by participants and discussion of potential follow-on activities. Various ideas were put forth, to maintain the momentum and enthusiasm generated at the conference. Among the ideas suggested were further workshops in the Middle East, to bring together program users to share their experience using data from specific locales. Holding workshops to introduce others to the program in the Middle East would also broaden the applicability and experience with the program. A further suggestion was for an exchange of information through a newsletter linking the program users and others involved in the wastewater sector. The concluding discussions revealed a great enthusiasm for continued contact in working together on a common concern. The conference provided a stimulating venue for sector professionals to work together toward new solutions for universal and long-standing issues of water shortage and water reuse.



*Workshop participants and staff at the workshop site,
Newport Beach, California.*