Computers aid resource management

Computer-based decision-support systems are being used increasingly by land-use planners to assess the potential effects of alternative management strategies. The sophisticated programs aid the development of policies least likely to harm the environment.

One common way of minimising pollution is to capture water-borne chemical and sediment wastes and retain them in artificial lakes. Nitrates and phosphates can be broken down over time by aquatic plants, and sediments can be trapped in deep ponds for dredging.

Dr Bob Anderssen and Dr John Mooney of the CSIRO Division of Mathematics and Statistics have developed a tool to help planners design new artificial lakes, and show how an existing lake's performance can be improved. NESSIE (see 'Designing lakes to control pollution', *Ecos* 69) allows planners to make decisions by comparing design alternatives.

A BUILD module 'constructs' the lake on screen, using information on shape, inflow and outflow points, islands and areas of deep or shallow water. A SOLVE module then calculates water flow patterns, illustrating them in a DISPLAY module that shows the lake's performance and its potential problems such as the risk of lake bed erosion.

An AMEND module then allows planners to discover what will happen if, say, an island is reduced, enlarged or moved, or to determine the optimum size, depth and siting of shallow areas.

Local government authorities have already used NESSIE to check designs being proposed by a third party or, through a consultant, to assess the variety of options being considered and to compare alternatives.

Contact: *Dr Bob Anderssen, Division of Mathematics and Statistics, GPO Box 1965, Canberra, ACT 2601, (06) 281 8560, fax (06) 281 8555.*

Catchment management

Another decision-support system, developed by the Division of Water Resources, helps catchment managers set land use policies and develop strategies for nutrient management.

The Catchment Management Support System (CMSS) is based on practical experience with several catchments. It can be applied to any catchment and does not require a high level of computing expertise.

CMSS has several databases. These contain information on a catchment's natural resources, the rates of nutrient production under different land uses and data on potential management practices.

The program can calculate the expected nutrient loads before policies are applied. These base loads can be compared with results measured in the field, and the system tuned to more accurately reflect the real situation. The changes in nutrient loads resulting from proposed policies are then calculated.

CMSS costs $1300 including a three-day training workshop and manuals. ***Contact:*** *Trevor Farley, CSIRO Division of Water Resources, GPO Box 1666, Canberra ACT, (06) 246 5704, fax (06) 246 5800.*

Recovering waste-water

A mercury recovery process that avoids the problems of existing ion-exchange methods has been developed by Dr Rob Eldridge and Norman Becker of CSIRO's Division of Chemicals and Polymers. Their work builds on the division's water purification success with magnetic particles and ion exchange resins (see 'Metals, muck and magnets, *Ecos* 67).

The toxicity of mercury has led authorities to limit its discharge in industrial waste waters. To achieve these limits (50 micrograms a litre or less) it is necessary to 'scrub' mercury from waste-water on site. Dissolved mercury compounds are usually removed through precipitation.

However, precipitation with sulfides produces sludge and toxic hydrogen sulfide gas, which is a toxic hazard. Thiol ion exchange resins are far more efficient than precipitation, but even these have disadvantages. It is so difficult to recover the mercury trapped by them that it has become common practice to discard mercury-laden exchangers after use. This is because regeneration requires expensive construction materials and large amounts of concentrated hydrochloric acid.

Eldridge and Becker have overcome those problems with a chelating resin exchanger similar to the one described in 'Metals, muck and magnets.' This offers adsorption and regeneration techniques that remove mercury from waste-water and enable industry to recover the trapped mercury cations (positive ions) cheaply and efficiently.

This accomplishment was not without its own problems. The chelating resin exchanger doesn't work if the waste-water contains chloride, which most waste waters do. The researchers tried to regenerate mercury-laden resins with sulfuric, nitric and hydrochloric acids, but recovery and regeneration rates were still low.

Their solution was to use an anion (negative ion) exchanger that employed sodium sulfite as a regenerating agent. This encouraged the mercury attached to the resin to form a complex anion that was not readily readsorbed on the resin. The mercury complex then slowly crystallises in a pure form that can be treated further to yield mercury metal or calomel — keeping the mercury out of the environment, and providing a contaminant-free resin that can be recycled easily.

Contact: *Dr Rob Eldridge, CSIRO Division of Chemicals and Polymers, Private Bag 10, Clayton, Vic. 3168, (03) 542 2419, fax (03) 542 2415.*

Carson Creagh

Keeping watch over industrial discharge

Sewer Sentinel, a remote waste-water monitoring system developed by CSIRO, can instantly detect events such as hazardous waste discharge or oil spillages.

The sensors in the Sewer Sentinel cover temperature, conductivity, turbidity, pH and dissolved oxygen while its integral Hydromace 2000 datalogger system, stores and plots the data. The monitor has been tested and modified by the Division of Materials Science and Technology and Melbourne Water.

Sewer Sentinel can be used for trade-waste discharge monitoring in sewers; detection of out-of-hours discharge in sewers; front-end monitoring of treatment plants; effluent monitoring at discharge points of treatment plants; storm water and polluted river monitoring and sewer-catchment management.

It can be interrogated by telephone and operated in conjunction with a personal computer. In the event of an illegal discharge, an alarm can be raised, a preset telephone number called with a synthesized voice message, or an external event (such as valve closure) can be triggered.

The system is marketed by Mace Instruments, 16 Bridge Street, Rydalmere, NSW 2116, (02) 638 5166, fax (02) 638 5914.