No room for complacency — water-pollution control in Zimbabwe

by Sibekile Mtetwa

Water pollution was recognized as a problem by the Romans, and has increased steadily as man strives for progress by exploiting natural resources. Zimbabwe's problems are small compared to countries in the North — and the Government is determined to keep it that way.

ZIMBABWE IS FORTUNATE: the problem of water pollution has not reached the serious levels we see in industrialized nations. Also, Zimbabwe's problems are localized. Nevertheless, events in other countries bear ample testimony to how quickly a situation can get out of control, and require the expenditure of vast sums of money to correct it.

Pollution occurs when people's activities cause a decline in the quality of natural waters. In general, it is a man-caused deterioration of water quality that is sufficiently severe to decrease substantially the usefulness of the resource, either to humans, or to some other beneficial life-form.

Pollution in Zimbabwe

The major causes of water pollution in Zimbabwe are mining and industry. Ordinary farming is also causing pollution through runoff and the seepage of water containing not only fertilizers, but insecticides, herbicides, and other toxic substances. Agricultural-product processing is also a key polluter.

The twentieth century, especially its second half, has witnessed high rates of urbanization, and the rapid growth of industrial and agricultural output. As a result, both water usage, and the quantity of wastewater, have increased rapidly. At the same time, however, the construction of treatment plants has lagged behind this huge leap in demand.

By its timely introduction of suitable control measures at what is still an early stage in the country's development, Zimbabwe's government can exercise effective control of water pollution before a serious — possibly irreversible — situation develops. Until the 1960s, water pollution in Zimbabwe did not pose any substantial problems, and it was not even dealt with in the original Water Act of 1927; legislation relating to water pollution was scattered through other Acts.

As a result of industrialization and urbanization, the country's rivers and reservoirs started to deteriorate; the need for serious action was highlighted by the periodic blooms of blue-green algae which began appearing in lakes in 1960. These blooms were caused by eutrophication (nutrient enrichment) arising from the discharge of nitrogen and phosphorus-rich sewage effluent into the lakes. This caused the excessive growth of algae, which decomposed on dying and depleted dissolved-oxygen levels, thus affecting aquatic life, and also making the water difficult and expensive to treat.

Legislation

Various water-pollution control provisions have been passed since then, and are now incorporated into the current 1976 Water Act.

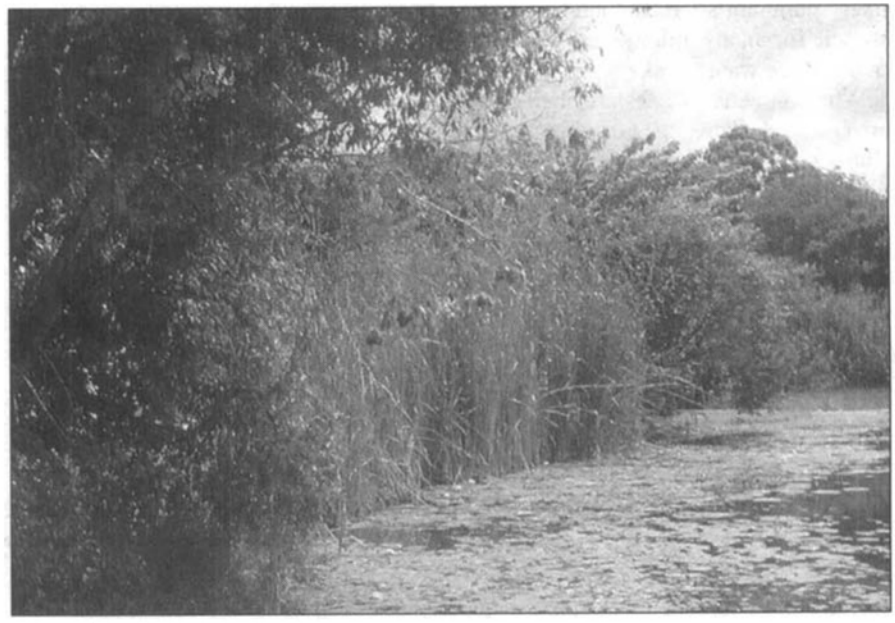
Under the Act, 'the treatment and disposal of effluent from any industrial process or undertaking is regarded as an integral part of that process in regard of the economic and purely mechanical aspects and the implications of the undertaking on the environment.' In other words, the principle that 'the polluter pays' is applied. New industries are expected to comply immediately with the regulations, with little likelihood of exemption. There is no provision to stop a new plant from being built, however, even if the pollution problem is not addressed seriously.

In order to achieve the dual objectives of preventing and controlling the pollution of our water resources, and conserving this valuable resource, it was considered essential that the quality of the effluent discharged directly or indirectly into any water should be strictly controlled. As a result, new regulations prescribing a comparatively high standard of purity for any effluent discharged into the water, and which encourage the optimum re-use of the wastewater, were introduced.

Enforcement

The Act is administered by the Water-Pollution Control Section of the Department of Water Development (DWD). The Section locates and investigates pollution throughout the country; collects water-quality data from surface and groundwaters; and prepares and issues exemption permits. Civil servants also advise on and implement Zimbabwe's national water-pollution control policy.

The best law is no better than the weakest enforcement and this, in part, is dependent on the funding of the programme. In Zimbabwe, prosecution is



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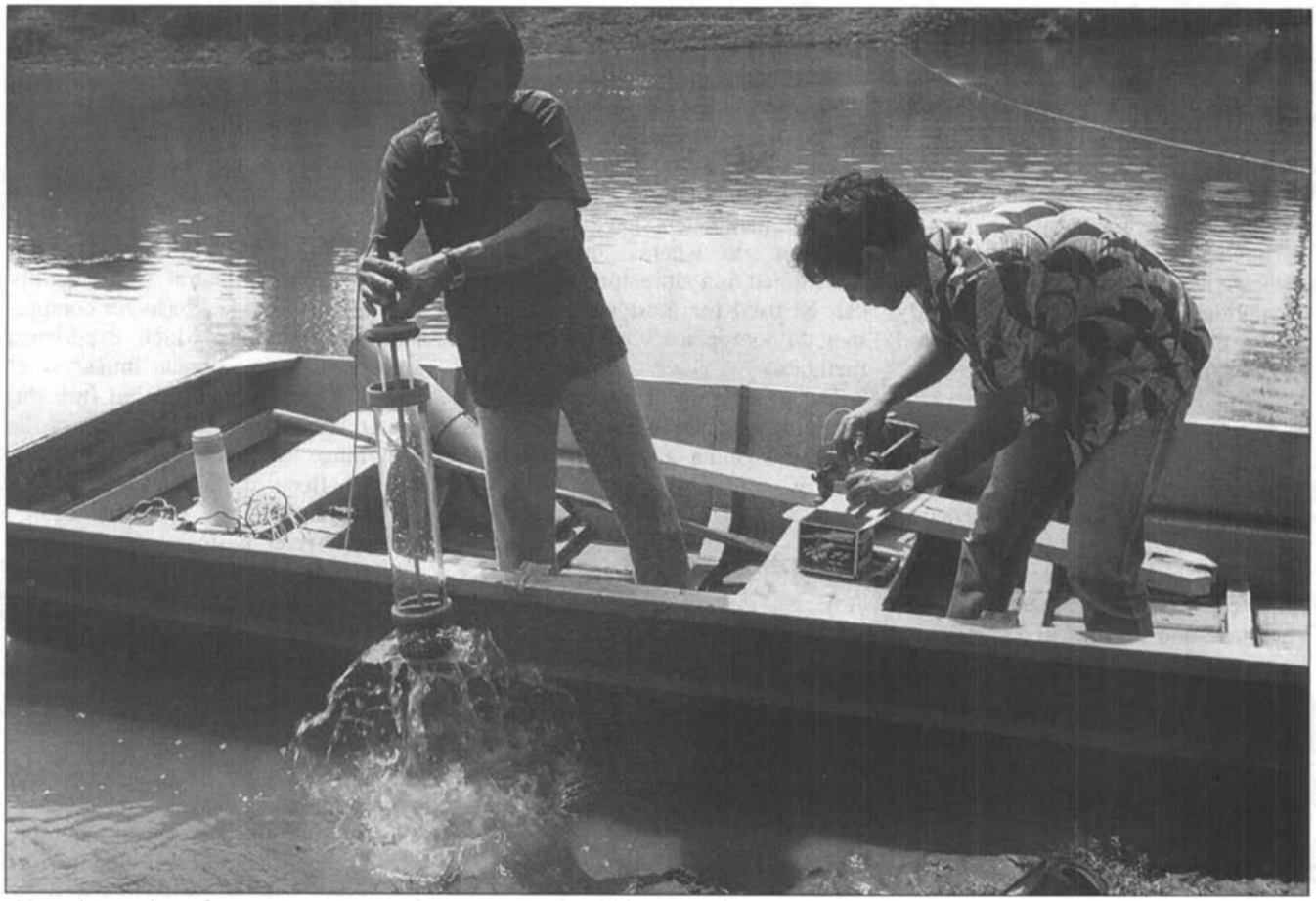
Eutrophication of surface water — damages aquatic life and is expensive to treat.



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How the quality of water is maintained — samples should be taken frequently from respresentative water bodies.

rare; 'best practical means' is complied with after discussions between the pollution agencies and the industrialists.

In the 19 years since the 1976 Act came into force, its shortcomings have become apparent: the fines are now too low, and the pollution-control officers do not have enough power to enforce the law. As a result, the Water Act is now being reviewed, and proposals on enforcing the Water Act effectively have been made to the Water Act Review Board. The Act is being reviewed to:

- remove the specific fines laid down for polluting public or private water, so that the Water-Pollution Advisory Board can review these sums from time to time to allow for inflation;
- relate fines to the type of pollutant being discharged, and link them to the average profits made by the offender in the process of polluting;
- give the pollution control officers powers to issue tickets to offenders, especially for less serious/uncomplicated types of pollution, such as discharges of oil from both registered and unregistered garages;
- make it a legal requirement for polluters to pay for cleaning up the environmental degradation resulting from their activities. The cleaning of the environment should be demanded in addition to a fine; and
- stipulate that anyone discharging effluent into a water course must keep a record of the quality of both the effluent, and the receiving water.

Water Pollution Advisory Board

This group of experts from various relevant organizations was set up in March 1971 'to advise the Ministry of

Guidelines for safe sampling

1. Take care when sampling from:
   - fast-flowing rivers
   - deep lakes
   - contaminated water

2. Avoid direct skin contact with the water:
   - wear a plastic gauntlet which covers the hand and lower arm
   - wear long plastic boots
   - wipe outside of bottle or sampler with cloth soaked in disinfectant.

3. When sampling simultaneously for microbiological and chemical analyses, the microbiological sample should be taken first as this will reduce the risk of contamination being introduced at the sampling point.

4. Hold sampling bottle by the lower part and submerge it to about 30cm or to mid-depth.
   - In streams, stand facing upstream with bottle in front of you. Never sample close to the bank.
   - When sampling from a bridge, attach a weight to the bottle and lower it with a string.

5. Proper labelling of samples is essential; labels should be waterproof and include:
   - time, date, and location; sampler's name; any preservative added; and type of analysis required.

Water Development on matters concerning water pollution'. The Board meets once every three months, and is chaired by the DWD's Senior Water-Pollution Control Officer. The members advise the Secretary of Water Resources and Development on pollution prevention and the establishment of quality standards for waste and effluent waters, and applications for exemption permits; and they regularly review the legislation and recommend new amendments.

Water-quality monitoring

A monitoring programme has been designed and implemented so that a pollution-control programme can be carried out in Zimbabwe. Samples are collected frequently, then analysed. Physical and chemical monitoring forms the basis of any water-quality monitoring programme, so different guideline values for the three main areas of water-use — human consumption, effluent disposal, and agricultural use — have been put together.

Zimbabwe's water-quality monitoring programme aims to gather enough data on the quality of water in her rivers, lakes, canals, and underground water to:

- establish the natural quality of these waters; detect chemical and biological changes in these waters; and
- to assist in the continual determination of realistic standards of quality, for waste and effluent waters discharged into natural waters.

Some parameters have to be measured *in situ*, whereas others can be determined in a laboratory. On-site kits can be used for most parameters, but they do not replace standard laboratory methods.

The programme includes: setting up sampling points and routine sampling; and establishing a database on water quality.

Sampling points

Any analysis of the environment is only as good as the sampling which precedes it, so following proper collection and handling procedures to avoid contamination, and paying attention to detail and accuracy, are vital. Taking care when sampling is also essential, to ensure the safety of the sampler. The box on page 13 contains a summary of the guidelines now distributed to all relevant field-staff in Zimbabwe.

The selection of sampling points is crucial to the monitoring programme. The sites must be representative of the water body, and provide accurate information about changes in water quality.

There are several types of sampling point that are used in natural water-quality monitoring programmes: baseline stations are typically located in the headwater of lakes or undisturbed, upstream-river stretches. Baseline stations establish natural water-quality conditions; provide a basis for comparison with stations which experience significant, direct human impact (represented by trend and global flux stations); and test for the influence of the long-range transport of contaminants and the effects of climatic change.

Trend stations are typically located in major river basins, large lakes, or major aquifers. They test for long-term changes in water quality, and provide a basis for statistical identification of the possible causes of measured conditions or identical trends.

An example of the approach adopted in Zimbabwe is shown in Figure 1 which represents the Manyame river system in the regions around Harare.

In addition to the types of sampling points identified above, global river flux stations are sometimes used. These are located at the mouths of major rivers. They determine integrated fluxes of critical pollutants from river basins to oceans or regional seas.

Pollution-control monitoring is essential for the protection of both the environment, and people's health. It is part of a wider environmental-health process designed to control factors in our physical environment that may damage our physical, mental, and social well-being. Water-quality monitoring and pollution control are undertaken in Zimbabwe to check whether the quality of the water meets regulations with respect to human health and the environment at large.

In general, the pollution is detected by either a complaint from the water-user, or during normal routine monitoring. Although considerable work remains to be done, and sustained effort is required to control water pollution, and to prevent further deterioration, the majority of Zimbabwe's main sources of water pollution have been brought to book and, in most of these cases, control and abatement measures have been taken, or are now being implemented.

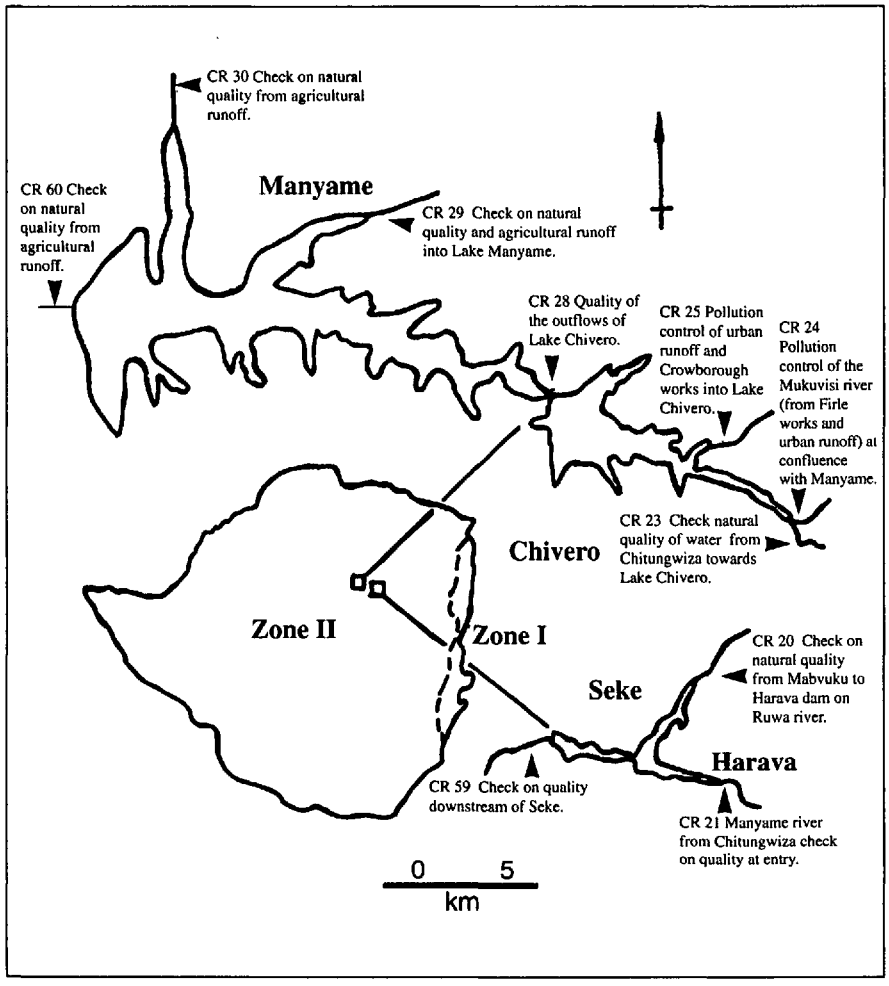

Figure 1. Sampling points in the Manyame river system around Harare.

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