47. Improving pond water

Wherever possible, a community should avoid the health risks which result from using contaminated pond water, by using an alternative, good-quality source. (Groundwater or rainwater sources will usually produce water of much better quality.) If a pond is the only source of water, the implementation of some of the ideas in this Technical Brief should improve the quality of the water. It is not easy to find a sustainable way to produce good-quality potable water from ponds, but any improvement in the quality of pond water is worth the effort. This Brief concentrates on the removal of suspended matter and pathogenic organisms. It does not address the removal of chemical contaminants because of the complexities involved.

Health risks

The consumption of untreated pond water is a health risk. Like all surface water sources, it is likely to contain one or more of the following contaminants:

- **Pathogens** (disease-causing organisms, many of which come from faeces) such as bacteria, viruses, protozoa, and guinea-worm larvae. If *schistosomiasis cercariae* are present, they can penetrate the skin of anyone entering the water-causing bilharzia.

- **Harmful chemicals**
  - **Agricultural** — pesticides, herbicides, fertilizers
  - **Industrial** — heavy metals (e.g. chromium)

- **Other contaminants**
  These affect the appearance and taste of the water and make filtration difficult:
  - **Algae** may release poisonous toxins when they die. Their growth is promoted by the presence of fertilizer or other sources of phosphates or nitrates in the water.
  - **Suspended solids** — fine particles of soil, particularly clays, to which bacteria and viruses often become attached. If these particles can be removed (e.g. by settlement), so can many of the pathogens.

Reducing contamination

Contaminants come from many sources (Figure 1). It is easier to prevent them entering the pond than to remove them from the water. To be successful, the following methods of reducing contamination need wide support from the community, plus participatory health education:

- **Restricting activities around the pond**
  Whenever possible, fence off the catchment area draining into the pond and prevent polluting activities from taking place within the catchment area.

- **Restricting activities in the pond**
  Faecal pathogens enter the water:
  - when faeces are deposited in the water;
  - when people wash themselves or their clothes; and
  - on the feet of people and animals.
  Keeping people and animals out of the pond will improve the water quality. It will also prevent the spread of guinea-worm disease.
  Some communities may be able to devote one pond to bathing and watering livestock, and leave another pond protected from these activities so that the water quality is maintained.
Improving pond water

Collecting water without entering the pond
People can only be discouraged from entering the pond if alternative methods for collecting water are provided:

Platforms, steps or ramps (Figure 2) can be used to bring people close enough to the water for them to bend down and fill a bucket, but contamination deposited on these structures can enter the pond, especially when it rains. If the pond level varies considerably, platforms will need to have floating sections to keep the access close to the water. Alternatively, people can draw water by bucket and rope. Bank-mounted devices (Figure 3) which keep people well away from the water are ideal, but if a handpump is to be used it must be sustainable. Spilt water should not be allowed to flow back directly into the pond, and is best disposed of into a soakaway.

Drawing strained or filtered water
The water near the surface of a pond, and away from its edges, usually contains less suspended solids than anywhere else in the pond. There are some advantages, therefore, in using a floating intake pipe (Method 1). A coarse strainer (such as a perforated pipe) will keep out amphibians and plants. A floating strainer box has a larger surface area which may permit the use of a finer strainer (such as woven mesh) to exclude the smaller water creatures. Both types will need to be cleaned periodically, although the strainer box is, to some extent, self-cleaning, since debris is likely to fall off the mesh when water is not flowing into the box (especially if the surface water is disturbed by wind).

Instead of drawing water straight from the pond, it is much better to collect it after it has passed through existing sandy soil (Method 2), or through sand filters constructed in/on the bed or bank of the pond (Method 3). Over a period of time, filters in/on the bed are likely to become blocked due to the accumulation of settled suspended solids in and on the filter. Bed filters can only be renovated if the pond is drained to allow their partial or complete reconstruction. It is possible to construct a sloping sand filter down the side of the bank to the pond (Figure 4), but this is rare. With such a filter, some of the filter media can be cleaned or replaced when the water level in the pond drops substantially at some stage.

Man-made filters on the banks (such as horizontal roughing filters and slow sand filters) or at home (Methods 4 and 5) can be used to improve the quality of the pond water considerably, and good, well-maintained designs can remove all faecal bacteria, and most viruses. Such filters can be drained down to allow for the regular cleaning of the sand or gravel, or for it to be replaced. A well-trained, dedicated caretaker is needed to supervise the proper running and cleaning of such filters.
Methods 1 and 2: STRAINING AND NATURAL FILTRATION

Method 1. Floating strainer
1a. Perforated pipe
1b. Strainer box

Method 2. Filtration by existing strata
2a. Permeable banks
2b. Permeable bed

General arrangement
Flexible pipe (or rigid pipe with flexible joint at A)

Methods 3, 4 and 5: FILTRATION THROUGH MAN-MADE FILTERS

Method 3. Filter in bed or bank
Original situation
3a. Filter in bank
Impermeable soil replaced over sand

3b. Filter in bed
Pipe gravitates to well reservoir
(see Figure 2b) or is connected to suction pump
Excavation containing perforated pipe
surrounded with sand and gravel

Method 4. Filter on bank
Suction pump
Compartments filled with increasingly smaller stones
Ideally to slow sand filter
Example of horizontal roughing filter
used to remove suspended solids

Method 5. Filter at home
5a. Three-tank design
Tank 1: Reservoir and constant-flow device
Tank 2: Sand filter
Tank 3: Clear water reservoir
5b. One-tank design
Sand

If flow rate is low, more storage can be provided below end of pipe.
**Improving pond water**

Figure 5. Pond-water filter used in India

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Other methods of water purification

Other small-scale water purification methods include **settlement and/or storage** for at least 48 hours (see ‘three-pot system’ on page 102), **boiling**, **chlorination** and **solar disinfection**.

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**Further reading**

AIHHP (1993), Proceedings of the Workshop on Sanitary Protection and Upgradation of Traditional Surface Water Sources for Domestic Consumption, All India Institute of Hygiene and Public Health, Calcutta.
