April 2008

TECHNICAL BRIEF

DRINKING WATER

The WRC has produced a guidebook offering detailed information on small water treatment systems to serve as a decision-making aid in the identification and selection of appropriate water treatment technologies for the supply of potable water to small communities.

Selecting Suitable Small Water Treatment Systems

Background

Small water treatment plants are defined as **those that have to be installed in areas (usually rural or peri-urban) which are not adequately serviced**. They include chlorination plants for water supplies from boreholes and springs, as well as small treatment systems for rural communities, small municipalities and establishments such as rural hospitals, schools, clinics and forestry stations, among others. Most of these applications require small plants with capacities of less than 2,5 Mℓ/day.

Planners of schemes to provide potable water to small communities are faced with a large number of local and international system designs from which to make a selection. Especially in the case of novel and emerging systems, very little may be known about operating costs, efficiency and applicability. Supplier information may be sketchy, while promising new technologies may not yet have been adequately evaluated under South African conditions.

Also frequently lacking is crucial socio-economic information that should be taken into account to ensure that the selection of a specific small water treatment system matches the needs of the community.

The compilation of a comprehensive Guidebook for the selection of small water treatment systems in a project funded by the WRC overcomes this common lack of information and ensures adequate support for the process of identification and selection of an appropriate water treatment system, from among the many (established or emerging) systems being marketed for the supply of potable water to small communities in South Africa.

Research project

The Guidebook is the principal outcome of a recent research project, the main objectives of which were to:

- Update an existing database of South African small water treatment plants and their performance criteria;
- Identify and evaluate emerging technologies which may be of benefit for the cost-efficient provision of water to small communities;
- Compile a database of technical and economic information on small treatment plants that have potential for use in South Africa;
- Provide socio-economic guidelines needed to assist with treatment plant selection for small communities; and
- Provide a means of making the correct choice of small treatment system from among the technologies available, based on the integration of relevant technical, economic and social information.

The Guidebook and its use

The Guidebook serves as a decision-making aid in the identification and selection of appropriate water treatment technologies for the supply of potable water to small communities.

Treatment configurations and technologies selected for incorporation into the Guidebook were evaluated by first finding out where in South Africa these treatment systems exist and then visiting at least one of these sites to obtain performance, operational and maintenance information pertaining to such systems. If necessary, the designers and/or suppliers of the treatment systems were also contacted for more detailed information. Where the available performance proved to be inadequate, actual measurements of the relevant water quality parameters (turbidity, colour, faecal coliforms etc) were made before and after application of the main unit processes or technologies.

The user of the Guidebook is guided though a number of decision-making steps, starting with the critical step of establishing how raw water quality deviates from South African water quality standards and ending with the identification of one or more appropriate water treatment options.

Each of these options is described in great detail in the database of existing and emerging water treatment technologies being marketed in South Africa.

The database (included as an Annexure in the Guidebook) provides information on the applicability, efficiency, operational use and cost of the entire range of treatment technologies. This enables the Guidebook user to compare options on technical and economic grounds.

In addition, socio-economic guidelines, based on researched community experience with specific or similar water treatment technologies, are provided to assist the Guidebook user in determining the appropriateness of identified technologies for specific small community use.

Target audience

The Guidebook is aimed at individuals or groups concerned with the planning, installation, evaluation or selection of small water treatment systems or technologies for a specific application. These include water service providers, water supply authorities, community-based decision-makers, funding organisations, and consulting engineers.

The Guidebook (both hard copy and the accompanying electronic version) have been prepared for use at management, engineering and technical levels. **It is assumed, however, that the user already has at least some basic knowledge and experience of water treatment and an understanding of its underlying principles.**

Database of water treatment plants

The updated database of small water treatment plants in South Africa has also been made available to the Department of Water Affairs & Forestry as a standalone product. This update includes basic and specific information on the water source, plant size, plant type, processes employed and contact details of either the plant owner or the relevant water services provider. Information pertaining to almost 1 100 water treatment plants has been captured in the final version of the database.

Safety and sustainability – further considerations

Evaluation of current technology applications:

Use of the Guidebook is not limited to the selection of treatment technologies for new treatment plants; it can also assist in assessing the appropriateness of current technology applications for achieving compliance with drinking water quality standards under the site-specific circumstances encountered by an existing plant.

Cost-efficiency – lifecycle costing:

When comparing costs of alternative technologies, the focus should be on cost-efficiency (i.e. the cost to achieve certain treatment goals, which has a bearing on sustainability) rather than on the absolute cost of the technology. Lifecycle costing provides the most effective tool for comparing the cost-efficiency of alternative treatment technologies.

Disinfection:

The selection and application of suitable disinfection technology is crucial in ensuring safe water for small communities on a sustainable basis. Storage of treated water requires the presence of a disinfection residual in all circumstances.

Operation and maintenance:

The selection of an appropriate water treatment system is but the first step towards achieving a sustainable supply of potable water to small communities. Ensuring that correct operation and maintenance procedures are in place is of even greater importance for sustainability. Inadequacy of guidelines provided by suppliers to clients in this regard often contributes to sub-optimal reliability and performance of installed systems.

Treatment plant management – socio-economic issues:

The sustainability of small treatment plants is further dependent on aspects of management (the so-called 'soft issues'). While the Guidebook provides guidelines on important socio-economic issues to consider when selecting treatment technologies for application in small and rural communities, more applied research is needed on similar issues related to plant management (e.g. community involvement and gender considerations).

If not addressed, this may result in poor performance of treatment plants, and, ultimately, non-compliance with recognised local and international norms and standards.

More information:

To obtain the WRC Report, *The Selection of Small Water Treatment Systems for Potable Water Supply to Small Communities* (**Report No: 1443/1/07**); or the accompanying *Socio-Economic Study* (**Report No: 1443/2/07**) contact Publications at Tel: (012) 330-0340 or E-mail: orders@wrc.org.za; Web: www.wrc.org.za