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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

TECHNICAL BRIEF

Greywater re-use

Towards sustainable re-use of greywater for small-scale agriculture

A new WRC publication provides guidance towards the sustainable use of greywater in small-scale agriculture and gardens in South Africa.

Greywater: An under-utilised resource

Limited supplies of freshwater are a concern worldwide and especially in South Africa, where annual rainfall falls well below the world average. Reuse of greywater offers one means of relieving pressure on freshwater supplies. It is established practice in a significant minority of households, especially in low income settlements where water is difficult to obtain and families are under financial pressure to minimise use of all resources. Active promotion of greywater use for irrigation in gardens and small-scale agriculture would have the potential not only to maximise use of limited water supplies, but also to improve food security in low income settlements.

However, before such use of greywater can be promoted through government structures and local authorities, it would be necessary to:

- ***Clarify the legal status of greywater use for irrigation.*** Although the status of greywater use for small-scale irrigation is not addressed specifically in the National Water Act of 1998 and is, therefore, in need of clarification, such use would appear to be within the spirit of the law. The Department of Water Affairs currently supports single household use of greywater for irrigation as a water-saving measure, provided this poses no pollution or health hazards. The legal position of greywater also needs to be clarified in terms of the National Building Regulations and Building Standards Act of 1977, in as far as this Act applies to the storage and use of greywater within the boundaries of a property.
- ***Formulate guidance for the use of greywater for small-scale irrigation.*** This would allow such irrigation to be performed in a way that is safe for humans, plants and the environment.

The latter of these two needs has, in fact, been addressed in a study which resulted in the production of the first comprehensive Guidance Report on the sustainable use of greywater in small-scale agriculture and gardens in rural villages, peri-urban and urban areas of South Africa.

Principles underlying the Guidance Report

A set of underlying principles was formulated to serve as a departure point for the development of the Guidance Report.

In terms of these principles, the **intended users** of the report were identified as:

- Municipalities or NGOs who wish to initiate greywater irrigation applications or wish to support water users in developing and monitoring greywater irrigation applications.
- Informed members of the public who wish to plan for irrigation use of greywater on their properties or in their settlements, and need guidance in doing so.

Furthermore, the **focus** of the Guidance Report was defined as:

- Minimisation of risks of illness in handlers of greywater and greywater-irrigated produce, or consumers of greywater-irrigated produce.
- Minimisation of risks of reduction in growth or yield of plants/crops irrigated with greywater.
- Minimisation of risks of environmental degradation, especially reduction in the ability of soil irrigated with greywater to support plant growth.

Finally, **boundary conditions** were set within which the use of the Guidance Report would be applicable, namely:

- Irrigation use of greywater is limited to the beneficial use of greywater to support plant growth within the boundaries of the irrigated property only. Movement of greywater beyond the boundaries of the property is explicitly excluded, since this would amount to uncontrolled disposal of greywater to the environment, with all the associated disadvantages and risks.
- The guidance provided applies only to irrigation use of greywater and is not intended to address the issue of greywater disposal. The focus, therefore, is not on maximising the volume of greywater which can be applied to land, but on minimising risks and on maximising benefits associated specifically with the use of greywater for irrigation.

- The guidance provided is intended to be used within the context of existing knowledge and best practice relating to irrigation, including crop or plant selection, installation and maintenance of irrigation equipment, and adaptation of irrigation schedules to local agroclimatic conditions. The guidelines focus not on providing a catch-all manual for small-scale irrigation applications, but on managing the additional risks and challenges arising out of the use of greywater in such applications.

Structure of the Guidance Report

The structure of the Guidance Report ensures that users are suitably orientated by first addressing the questions

- What is greywater?
- Why use greywater for irrigation?

before proceeding to discuss the following main concerns associated with the use of greywater for irrigation, namely

- Health considerations
- Plant growth and yield
- Ability of soil to support plant growth.

In the stated purpose of the Guidance Report which follows, intended users are identified and the Guide's primary focus is announced, this being the minimisation of risks to the health of humans and crops, the growth and yield of plants and crops and the ability of the soil environment to support gardening or agriculture. Major sources of information used in compiling the Guidance Report are identified.

The legislative context of greywater use is then considered, highlighting the need for clarification of the legal status of greywater usage for irrigation.

Given the prevalence and nature of greywater usage in informal settlements, a section of the Guidance Report focuses on special considerations relating to greywater usage within this context.

Following the above-mentioned introductory sections, the core section of the Guidance Report, titled *Guidance for Greywater Use in Small-Scale Irrigation in South Africa,* is presented. This section comprises the following topics:

- Guide to managing risks and uncertainty
- Greywater quality: Guide to greywater constituents
- Greywater quality: Mitigation of greywater quality
- Greywater quantity: Guide to irrigation volumes.

Guidance for greywater use in small-scale irrigation in SA

In the sub-section providing *guidance for managing risks and uncertainty associated with greywater irrigation*, three categories of greywater use are identified, based on the extent to which the greywater to be used has been characterised. Restrictions on permissible use are identified for each category. The most stringent restrictions apply to greywater that has not been characterised. In the case where greywater has been subjected to minimum analysis (pH, electrical conductivity, sodium adsorption ratio and *E. coli*) and characteristics are in compliance with quality limits, less stringent restrictions apply. Restrictions are least stringent when the greywater being used has undergone full analysis (minimum analysis plus boron, chemical oxygen demand, oil and grease, suspended solids, total inorganic nitrogen and total phosphorus).

The quality limits in each category are specified in the sub-section titled *Greywater Quality: Guide to Greywater Constituents*. The section titled *Greywater Quality: Mitigation of Greywater Quality* provides guidance on adjusting to or improving greywater quality. Two approaches are presented for consideration: firstly, agricultural practices to mitigate the effect of, predominantly, chemical constituents such as sodium; and secondly, treatment to improve mainly the organic and microbiological quality of greywater. The final subsection, *Greywater Quantity: Guide to Irrigation Volumes* guides users in selecting the volume of greywater to be applied, and in adjusting this for site-specific conditions.

Conclusion

A simple flow diagram is presented that both summarises and clarifies the use of the different sections of the Guidance Report in practice. Application of the approach depicted in the diagram should lead to the integrated implementation of greywater irrigation in a manner that addresses greywater quality, risk management strategies, greywater treatment (if desired), and appropriate greywater application planning.

Further reading:
To obtain the report, *Sustainable use of greywater in small-scale agriculture and gardens in South Africa Technical Report* **(Report No: 1639/1/10)** or the *Guidance Report* **(Report No: TT 460/10)** contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; E-mail: orders@wrc.org.za; or Visit: www.wrc.org.za