

# WATER REUSE

## Guidelines pave the way for safe use of greywater

*Today, it is widely acknowledged that demand for water will grow, while the resources we have left to draw it from are dwindling. In places where water scarcity is common, new water resources are urgently being investigated. One that's being eyed as of potential significant value, is the water that we have already used. Greywater is being thrown into the mix as a viable source of water, and an important, available tool in the arsenal to increase water security, particularly during drought. Petro Kotzé reports.*



Greywater is untreated household wastewater from domestic processes like taking a bath and shower, washing your hands, doing the dishes and the laundry. It excludes water from the toilet.

In South Africa, a person's experience with greywater is vastly different, depending on where they live. In serviced areas, where homes have taps and sewerage systems, water enters the house to be used, and it is washed away again after it has been dirtied. In some serviced suburbs impacted by drought, like parts of Cape Town, residents recently started making use of greywater extensively. Instead of washing the water away, residents are catching it in a bucket, and diverting it to other needs, such as flushing the toilet. This is often the case in severe droughts, when there are no other alternatives.

People living in informal settlements where there are generally no municipal sewerage and water services supplied to homes already use greywater extensively, both in times of drought and when water is plenty. Water collected from a tap could be used multiple times – first to bathe, maybe for more than one person, and then perhaps to do laundry and wash the floor, before being discarded outside.

Still, in South Africa, though direction is provided by municipal guidelines, there is no national legislation to govern its safe use. A recent Water Research Commission study has laid the foundations for the way forward. **Guidelines for greywater use and management in South Africa (Report no. TT 746/17)**, has been written by researchers from the Future Water Research Institute at the University of Cape Town (UCT), and the Division of Community Health at Stellenbosch University.

The aim of the document is to provide a South African context for the inclusion of greywater as a viable, alternative, non-potable resource. The guidelines are based on existing knowledge and expert opinion, and are intended as background information to national and local government policy-makers for the drafting of appropriate legislation and local-level guidelines.

### **The risk of using greywater in South Africa**

Project team leader, Dr Kirsty Carden, senior research officer at Future Water, explains that the current drought has sharpened people's minds to alternative water resources such as greywater. But in South Africa, the management and risk of greywater is different than in many other countries where it is commonly used, because we generally do not make use of greywater treatment systems.

Here, most greywater is collected by hand with a bucket from the shower or bath, or some people might have a small system installed to divert the water from their house to the garden, for example.

"The quality of this water can be very poor, and certainly not without health concerns," she says.

As the routine testing of the quality of greywater produced in a household is not feasible, it is commonly classified according to where the water is generated. This is divided into light (class 1 and class 2) and dark (class 3) greywater, as follows:

- Class 1a: Bathroom greywater – greywater sourced from showers
- Class 1b: Bathroom greywater – greywater sourced from basins and baths
- Class 2: Laundry greywater – greywater sourced from laundry basins and washing machines
- Class 3: Kitchen greywater – greywater sourced from kitchen sinks and dishwashing machine.

The study excluded class 3 as a potential resource because it can be highly alkaline and contains high concentrations of organic material, fats and oils. Still, around 50% to 75% of water used in a household can potentially be reused instead of being washed down the sewer. According to the project report, household potable water use in South Africa could be reduced by up to 50% should greywater be used for toilet flushing and garden irrigation.

The quality of greywater is highly variable and depends to a large extent on the household in which it is generated – particularly the number of people living in the house, their lifestyles and ages. Households with babies, small children and pets produce greywater that contain higher counts of faeces and urine. Households with inhabitants suffering from acute diseases, such as gastroenteritis, eye / ear infections or jaundice can produce greywater with considerable loads of bacteria. Even if the kitchen sink water is excluded, soaps and detergents, fabric softener, medicines, disinfectant, food particles, pesticides, cosmetics and fibers can make their way into greywater. Saliva, sweat, body oils, hair, blood and some urine and faeces matter are all part of the potential mix of greywater content. As such, the use of greywater poses significant potential risks to both human health and the environment.

Pathogens in greywater can potentially cause disease when people come in direct contact with the water, or when irrigated produce is eaten. The high sodium content from soaps, shampoo, body wash and other substances can result in soil degradation, potentially causing long-term problems. Zinc from some hard soaps can also accumulate in the soil, and leaching can lead to groundwater contamination. Interestingly, studies have not found clear indications that so-called eco-friendly products are more suitable for greywater irrigation systems than conventional cleaning products. In addition, there is potential for the sewerage system to become blocked due to reduced flows and higher solids content in the sewage.

Children, people with compromised immune systems, the malnourished, elderly and pregnant women are all more likely to become ill from consumption of contaminated water and from exposure via recreational activities. In South Africa, this collection of people is a sizable portion of the population.

*"Around 50% to 75% of water used in a household can potentially be reused instead of being washed down the sewer."*



Photo supplied

*In informal settlements water may be used multiple times before being discarded.*



*Greywater is untreated wastewater from domestic processes, such as taking a bath and a shower.*

The study concludes that "not enough is currently known about the long-term effects of greywater use on human health and the environment to make definitive decisions about this practice." The ranges of contaminants and their potential health impacts under South African conditions is an area of research that needs further attention. Even then, the use of greywater could always pose some health risk and therefore, a well-planned greywater policy should include a decision on what frequency of contamination incidents and/or water-related diseases constitute a sufficient level to sound the alarm for reassessment of the continued use of greywater in a community.

## A summary of guidelines for the use of greywater in South Africa

The report states that greywater is most appropriate for activities such as watering the garden (untreated greywater) and flushing the toilet (treated and disinfected greywater). It should be noted that the long-term impacts on the environment of irrigating with greywater have not yet been determined.

As a rule, untreated greywater should never be used where it can easily come into contact with susceptible individuals and/or ingested. It should never be used for:

- Drinking or cooking
- Irrigating of any food eaten raw or minimally processed (leafy vegetables and root vegetables)
- Washing of pavements, especially when water drains into the stormwater systems
- Irrigating gardens during or immediately after rainfall
- Irrigating areas in gardens where children play, like lawns.

When greywater is used, the following rules should always be adhered to:

- Avoid human contact with greywater, or soil irrigated with greywater. Children and pets should be kept away from areas that are irrigated with greywater.
- Water that comes into contact with a toilet, urinal or a toilet fixture such as a bidet should never be used as greywater.
- Water that has been used to wash nappies or other clothing soiled by faeces and/or urine should not be used;
- Water generated by cleaning in the laundry or bathroom, or when using hair dyes or other chemicals should not be used.
- Water from the kitchen sink or used in the kitchen to wash dishes or food should not be used.
- Greywater generated by washing clothes / brushes used for painting or for maintaining machinery and vehicles should not be used.
- Greywater should not be used if anybody living in the premises is suffering from diarrhoea, ear or skin infections.
- Water used to wash animals, such as domestic pets, should not be used.
- 'Low risk' greywater, such as warm-up water from hot taps, rinse water, bath or shower water is preferable.
- Untreated greywater should not be stored for longer than 24 hours (otherwise it should be treated)
- Use signs to indicate greywater reuse, and label all pipes
- Ensure that hands are properly washed after contact with any form of greywater and reuse system.

## Potential uses for greywater in South Africa

The study found that, if managed correctly, greywater reuse can potentially still be a promising alternative water resource, particularly in low-density, high-income areas where health concerns are less pronounced and more greywater is generated.

Greywater is most suitable for activities such as toilet flushing and irrigating sections of the garden where there is limited contact with people. However, there is potential for health risks when toilets are flushed, as water droplets may be aerosolised and could land on nearby surfaces, or dispersed into the air and transferred through hand to mouth contact if proper hygiene practices are not followed.

Greywater can also be used for small-scale irrigation, as long as appropriate barriers to risk are in place. Installing such a system is complex, however. This can prevent large-scale adoption in urban catchments.

Greywater use is not recommended in un-serviced settlements in South Africa. As it is already reused many times before it is disposed of in areas where there is commonly no form of drainage, it often merges with toilet water and other effluent flows, creating a toxic mix of contaminated water that poses a danger to human health and the environment. As a result, the quality of greywater emanating from non-sewered settlements often resembles black water (sewage), and is hazardous from a pathogenic and chemical perspective.

"There's no further use for greywater in informal settlements," says Dr Carden. The paradox here is that greywater offers great

potential for improvement in household nutritional status and social functioning in poor rural settlements, and in urban and peri-urban settlements around the major metropoles of South Africa. The challenge lies in identifying conditions and limitations under which greywater could be used beneficially.

In South Africa, the most promising domain for institutionalising greywater reuse at this stage appears to be in large buildings such as office blocks, public buildings and hostels as it can be collected and treated under proper supervision.

### **Moving forward to a future with greywater**

How greywater should and could be used very much depends on the context, says Dr Carden. The key message is that peoples' health and the environment should be protected first.

In informal settlements, our first priority should be providing proper services. In serviced areas, people should be able to use greywater as they see fit, but under certain conditions. In large buildings, properly run systems capable of disinfecting water should be put in place.

Dr Carden says that following the study, she would not promote greywater as a viable, safe alternative source of water in South Africa under current circumstances. However, she adds that the report was written before they were in the throes of the current drought. "In that context we were pretty conservative." As the drought continued, she says it became clear that people were already using their greywater, regardless of the lack of guidance.

There is a sense that greywater use will happen no matter what, notes Dr Carden. The aim is to provide enough information to management authorities, in order for them to provide the best

guidance to residents on how to do this. Still, if the country is to seriously start thinking of greywater as part of the resource mix, research on the long-term impacts on people, the environment and policy must continue.

"There are gaps in our knowledge of what could happen, particularly in lower income communities that don't have access to good services and often use greywater. In general we don't have a good understanding of the impact of greywater – not only on human health, but also on the environment in the long term."

Yet, the inclusion of greywater as an alternative resource as part of the water supply mix is one of the basic premises of creating more resilient cities in the future. Traditionally, water is pumped into a city, used and dirtied, and then pumped away again to be disposed of. "We should think about this differently," says Dr Carden. Instead, the quality of water already within a city should be matched with an appropriate use (called fit-for-purpose water). In South Africa, it is common to use freshwater of a drinkable standard for everything from washing clothes and cars, to flushing the toilet, watering the lawn and drinking. But it's not necessary to use water of the same quality for all of these functions. Yet, potable water is mostly the only option currently supplied.

As we are becoming ever more aware that we have to plan for uncertainty, and build resilience into systems that have emerged as being vulnerable to crises such as drought, the development of guidelines on the safe use of greywater is an essential step in the right direction.



*The study recommends that management of greywater in informal settlements in South Africa should be geared towards safe disposal, rather than further productive use.*