

## REVIEWED PAPER

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**33rd WEDC International Conference, Accra, Ghana, 2008****ACCESS TO SANITATION AND SAFE WATER:  
GLOBAL PARTNERSHIPS AND LOCAL ACTIONS****Approaching community-level greywater management  
in non-sewered settlements in South Africa***K. Carden, K. Winter, A. Spiegel & N. Armitage, South Africa*

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*This study investigates sustainable options for community-level management of greywater in low-income settlements without on-site waterborne sanitation in South Africa. As a consequence of the limited resource base of both the local authorities and the inhabitants of the settlements, these options need to be inexpensive, technologically simple and socially acceptable. A variety of social and technological options are thus being implemented in collaboration with the inhabitants and the local authorities, and their efficacy evaluated. The hypothesis is that involving the inhabitants in the development of solutions is likely to be more effective in the management of greywater in these settlements than the traditional approach where the local authorities provide rudimentary engineered services after minimal consultation. Following an initial scoping study that covered six of the nine provinces of South Africa, four settlements in the Western Cape Province were selected for a second, more detailed study. The study employs the Participatory Action Research (PAR) method which emphasises participation, collaboration and consensual decision-making with the goal of ensuring long term sustainability of social and technological interventions.*

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**Introduction**

South Africa's apartheid system left a legacy of injustice, inequity and poverty manifested in various ways, particularly in the many low-income, non-sewered settlements clustered around major urban centres. The present government has made significant progress in addressing this legacy, particularly in respect of access to water – over 92% of the population (approximately 42 million people) now have access to an improved water source. Yet the pace of delivery of sanitation services remains slow. Recent figures show about 42% of the population (20 million people) are still without access to on-site waterborne sanitation, 16.6 million of them (35% of the total) without access to any form of improved sanitation (UNDG, 2005).

The targets for service provision as set out in the 'Strategic Framework for Water Services' (DWA, 2003) outline the government's commitment to eliminating backlogs and to progressively improving levels of service. In the short term this means providing everyone with access to at least a basic water supply – defined as 25ℓ of potable water per capita per day (ℓ/c-d) within a 200m cartage distance – by 2008, and basic sanitation – defined as on-site dry latrines (VIPs or similar) – by 2010. To meet these goals, connections of low-income settlements to municipal water sources have occurred on a massive scale, frequently without giving adequate attention to greywater management in non-sewered areas. In the absence of suitable conveyance systems, greywater (wastewater from household processes such as washing dishes, laundry and bathing, without input from lavatories) is generally disposed onto the ground outside dwellings. The resulting total pollution load, particularly in densely populated settlements, creates a host of negative impacts, both environmental and health-related. These will likely be exacerbated if the per capita supply of potable water were increased to 50ℓ/c-d in line with the WHO (2003) recommendations for intermediate access to water.

In 2004, the Water Research Commission (WRC) of South Africa (SA) funded a scoping study into the use and disposal of greywater in the non-sewered areas of SA with a view to developing options for improving its management (Carden *et al.*, 2007). In total, 39 settlements in six of the country's nine provinces were visited in an attempt to get a broadly representative sample of behaviour. These were mostly informal settlements in urban/peri-urban areas but also included settlements with dysfunctional sewerage systems (particularly communal toilet facilities), as well as poor households in rural areas with no formal sanitation provision. It was determined that some 490 000m<sup>3</sup> greywater per day was being generated in SA's non-sewered areas

– equivalent to less than 5% of the current urban water demand (Basson *et al.*, 1997). The chemical and microbiological composition of greywater was found to vary considerably although it generally contained high levels of organic matter and nutrients – specifically phosphates and sodium which derive from household cleaning agents – as well as high levels of faecal coliforms. The researchers concluded that there is significant risk involved with the disposal of greywater in SA’s non-sewered areas, particularly in high-density urban settlements where elevated concentrations of pollutants are combined with large concentrations of greywater, and that it needs to be better managed. Some preliminary proposals were thus made for the better management of greywater in non-sewered areas.

The results of the scoping study were then used to construct proposals for a further three-year WRC-funded study aimed at a more detailed understanding of greywater management practices in low-income settlements without water-borne sewerage, coupled with an attempt to introduce and test various interventions in collaboration with both the residents and the local authorities. The new study, entitled “Sustainable options for community-level management of greywater in settlements without on-site waterborne sanitation”, is due to end in March 2009. Its findings thus far are detailed below.

### **Community-level greywater management study**

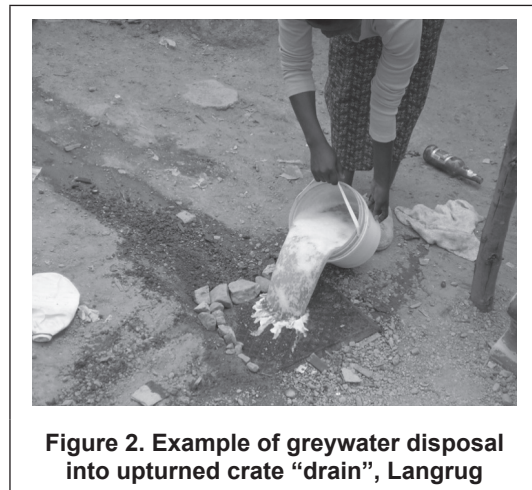
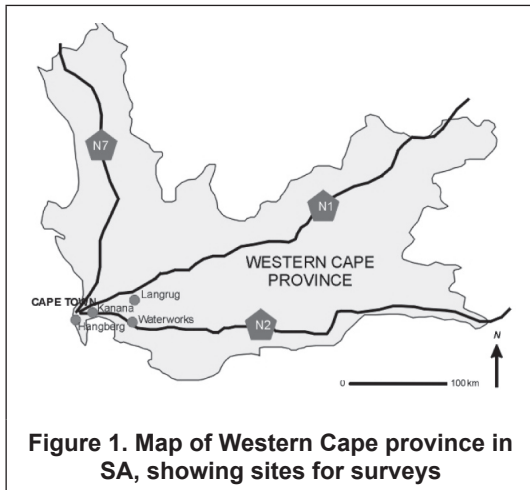
Of late there is growing civil unrest in various parts of SA concerning poor service delivery. In part, this could be attributed to ‘top-down’ policies of the government that often do not appear to the many poor people to be addressing their concerns. It is well established that integrated people-centred approaches are critical to long-term solutions with respect to water and sanitation issues (DFID, 1998). It is for this reason that the project team has adopted a Participatory Action Research (PAR) approach that is pro-poor, participatory and seeks to empower and educate stakeholders with respect to the possibility of implementing appropriate low-cost, local-level, greywater strategies and interventions. In particular, the project aims to establish how and whether engagement with settlement residents might lead to cost-effective interventions that will improve health conditions and minimize the impact of greywater on surrounding biophysical environments. The main objectives are to:

1. Identify the social challenges to effective greywater management in non-sewered areas and the reasons why previous initiatives to implement management systems have not been sustainable in the long term.
2. Identify specific environmental impacts resulting from greywater management practices and ways of mitigating these impacts.
3. Establish links between greywater quality (in respect of detergents used) and the potential for its reuse.
4. Identify ways of overcoming social obstacles in order to create sustainable management options in local communities, and ensure residents are able to use existing management systems or implement new systems.
5. Trial social and environmental interventions in selected settlements in the Western Cape Province of SA.
6. Develop best practices (scientific and sociological) and guidelines for greywater management.

Four settlements in the Western Cape Province of SA were selected for the research (figure 1). The initial choice of settlements was directed by prior knowledge and recommendations by the respective local authorities. Of particular concern was a need to identify an organizing social structure such as a street committee within each settlement that might engage in the participatory method. Two of the study settlements are within metropolitan Cape Town, whilst the other two are in small rural towns nearby. A brief description of the settlements follows:

1. **Hangberg** – a relatively small settlement situated on a mountainside in the southern part of the City of Cape Town comprising a mix of low-income housing, flats, and about 700 informal dwellings (“shacks”) with limited communal rudimentary services. Some 35% of shacks have innovatively – but illegally – connected to the existing water and sometimes even sewage reticulation at the flats, thereby securing services in their homes. Unfortunately some of the water connections have led to local flooding from greywater runoff, resulting in pools of stagnant water on foot paths and pollution of the adjacent marine environment.
2. **Kanana** – over 3 500 people are settled on 24.5 hectares of land at a dwelling density of 162 dwelling units per hectare (du/ha) located on an abandoned municipal dumping site in a buffer zone between a national highway and an established formal township near Cape Town International Airport. There are approximately 328 bucket and pit latrines in the area, the buckets being serviced once or twice weekly. The area is low lying and some of it is inundated with floodwater during the winter rainy season. Open stormwater drains have been constructed in some parts of the settlement to drain water to a nearby wetland and residents frequently dispose their wastewater and faeces into them.

- 3. Langrug** – a medium-sized settlement of approximately 5 000 residents located on a steep hillside on the outskirts of the town of Franschhoek, 85km north-east of Cape Town. All municipal water services are communal with approximately 6 standpipes and 40 toilets serving 850 informal dwellings. Most of these facilities are not functional however, and wastewater is disposed onto streets and pathways resulting in streams of mixed black- and greywater flowing through the settlement. The threat of waterborne disease is a major cause for concern.
- 4. Waterworks** – an area of invaded land with an estimated population of 3 500 on the periphery of the town of Grabouw, 100km east of Cape Town. The number of communal bucket-system toilets, standpipes and washing areas has been limited by the municipality in an attempt to discourage further settlement in the area, and these facilities are not well maintained.



**Progress thus far**

To date, over 100 survey interviews have been carried out with residents in three of the four selected settlements (Kanana, Waterworks and Langrug) in order to establish existing conditions with respect to service provision and the impacts thereof on greywater management. The interviews were also investigating opportunities for partnerships to be formed between researchers, local authorities and identified ‘communities’ within each settlement with a view to empowering the residents to take responsibility for their own greywater management. Key to this is coming to an understanding of behaviour and expectations. The research team is currently attempting to collaborate with a few of the residents in the design and implement of appropriate technologies whilst simultaneously supporting them through education and training. Among the greywater management technologies that have been discussed by researchers and local residents are different types of soakaways, reed beds, and various improvements to the design of the communal washing stands.

Initial trials with soakaways using locally available materials are now underway in two settlements. In Langrug, three trench filters have been installed, thereby generating residents’ interest in greywater management interventions. Figure 2 shows a resident pouring greywater into the opening of one such filter. The filter comprises an upturned plastic crate with multiple openings (usually used to carry bottles) covered with a suitable filter material (in this case a plastic material known locally as “shade-cloth”) to prevent the ingress of gross solids, in particular foodstuffs. It is linked to a 2-3m long sub-surface trench filled with vertical layers of sand and stones. This filter trench appears to have successfully eliminated the earlier rivulet flowing between the shacks. In Waterworks, three filters of a slightly different design have been installed, in this case comprising a large plastic bin (of the kind normally used for household refuse) filled with stones of different sizes and sand, and capped with a perforated lid over which plastic mesh has been stretched in order to prevent the ingress of gross solids. Greywater is temporarily stored in the bin before gradually seeping into the ground through an opening in the bottom.

An important next step in this participatory research process is to document settlement residents’ behavioural and verbal responses to these interventions. Thus far responses have been fairly positive in Langrug and somewhat mixed in Waterworks. The difference appears to relate mostly to communal involvement and the extent of communication between street committee members and residents.

### Findings

It is too early for the project team to make any definitive conclusions, but it has become evident that there are a number of key findings emanating from the research to date, specifically relating to the:

1. Generally high levels of health and environment risk, as shown by water sampling.
2. Uncertainty about tenure / ownership undermining willingness of inhabitants to do anything themselves.
3. General unwillingness amongst local residents to take responsibility for service delivery as they believe this is the municipality's responsibility.
4. Break-down in communication between local authorities and residents, and the residents' mistrust of elected municipal councillors.
5. Community-level greywater management being achievable and sustainable only where the local authority shows consistent commitment in the provision and maintenance of basic water and sanitation services.
6. Participation with residents being key – collaboration at grass-roots as well as government-official and political level is critical to the success of any community-led initiative regarding greywater management.

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### Keywords

greywater management, greywater quality, community-level management, participatory action research, environmental sanitation

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