CURRENT USE OF URINE DIVERSION TOILETS
IN
SOUTH AFRICA WITH SPECIAL REFERENCE IN KGALAGADI DM SITE VISITS BY DWAF BEST PRACTICE TEAM
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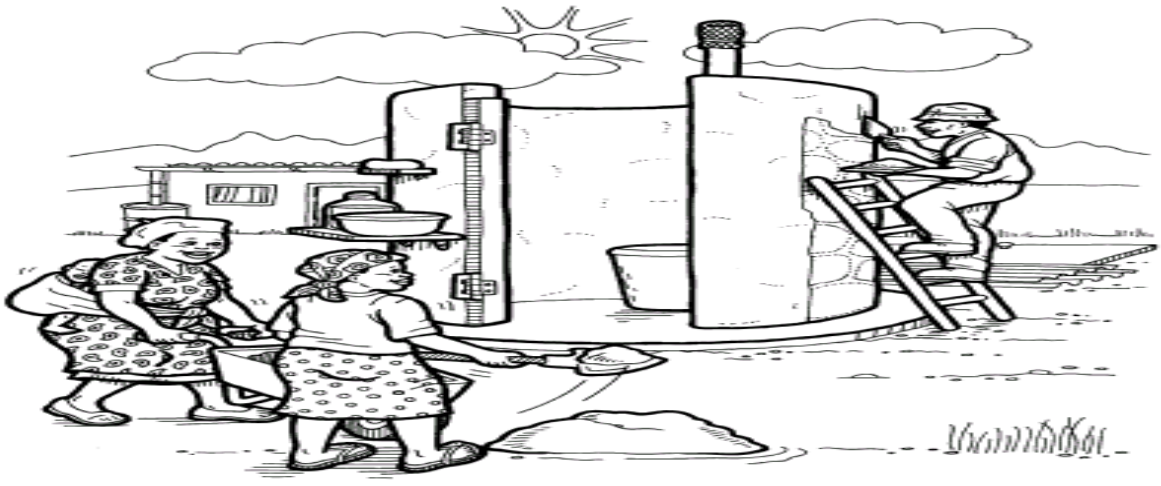

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KEYWORDS

Desiccation, Sanitation Systems, facilities and services; Technological Options, local Government powers and functions in water services; Best Practice; human excreta, waste management, Eco-San; Urine-diversion, Kgalagadi District Municipality; homeowner, householder, dry mass, water scarce, applied research studies, rural settlements.

ABBREVIATIONS

DLGA	Developmental LocalGovernment Agenda
DM	District Municipality
DoL	Department of Labour
DPLG	Department of Provincial & Local Government
DWAF	Department of Water Affairs and Forestry
EPWP	Expanded Public Works Programme
ES	Equitable Share
E&T	Education and Training
GEAR	Growth, Employment And Distribution
HLOS	Higher Levels Of Services
HRD	Human Resource Development
KAP	Knowledge-Attitude- Practice (Theory or Framework)
LG	Local Government
MIG	Municipal Infrastructure Grant
MIT3	Municipal Infrastructure Technical Task Team
NWAC	National Water Advisory Council Sanitation Task Team
O&M	Operation and Maintenance
PIA	Project/Programme Implementation Agency
PHAST	Participative Hygiene & Sanitation Transformation
PLA	Participatory Learning Action
PSC	Project Steering Committee
SMMEs	Small Micro Medium Enterprises
NSTT	National Sanitation Task Team
PSTTs	Provincial Sanitation Task Teams
RSA	Republic of South Africa
SALGA	South African Local Government Association
SAQA	South African Qualifications Authority
SETA	Sector Education and Training Authority
UDS	Urine Diversion
VIP	Ventilated Improved Pit
WSSLG	Water Services Sector Leadership Group (Network Group)
WRC	Water Research Commission
WSA	Water Services Authority
WSP	Water Services Provider

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1. INTRODUCTION AND BACKGROUND

The sanitation policy of the South African government [within a context of developmental local government agenda (DLGA)[1] and greater *milieu* of community participation in the implementation of adequate sanitation] stresses that sanitation is not simply a matter of providing toilets, but rather an integrated approach that encompasses financial, technical, environmental, social, economic, educational, institutional and organisational frameworks considerations developed by DPLG and other sector Departments and/or partners in the local government sector. The National White Paper on Basic Household Sanitation (DWAF 2001), Water Services Framework (DWAF 2003) and National Comprehensive Sanitation strategy (forthcoming) are based on a set of principles where sanitation is about a human right and about environment and health. Following these strategies, sanitation improvement must be demand responsive and supported by an intensive Health and Hygiene Programme, community participation, integrated planning and development, co-operative governance between spheres of government whilst at the same time promoting acceleration of delivery at local government level.

In the light of the above principles within the context of developmental local government agenda (DLGA), "sanitation[2]" may refer to the principles and practices relating to the collection, removal or disposal of human excreta, household waste water and refuse as they impact upon people and the environment (DWAF 2002). In other words, sanitation includes systems to manage wastewater, storm water, solid waste and household refuse. It also includes ensuring that people have safe drinking water and enough water for washing (DWAF 2002).

In government sanitation programmes the main focus has been on the provision of waterborne sanitation or Ventilated Improved Pit (VIP) toilets. However, a

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[1] The Honourable President of the Republic of South Africa (Mr. Thabo Mbeki) set strong theoretical premises for a LGDA in South Africa, when he argued that: "South Africa's social transformation requires, among other things, that we create a truly developmental state system that services the interests of the people, efficient and most cost-effective. Our system of local government must also be built on the basis of these principles. We are convinced that the local government legislation you have approved gives us the possibility to achieve these objectives and thus create a radically new system of local government" *(President of South Africa, Opening Parliamentary Speech, February 2002).*

[2] Access to acceptable sanitation is defined as "a system for disposing of human excreta/disposal, household waste, waste water disposal, storm-water management and treatment and refuse removal/disposal, which is acceptable and affordable to the users, safe, hygienic and easily accessible and which does not have an unacceptable impact on the environment.

significant number of Urine Diversion (UD) toilets, approximately 30,000, have been built to counter the problem of difficult ground conditions (Northern Cape) and maintenance issues (eThekwini Municipality). Based upon literature review, and other qualitative methods used in developing this report, it *is deduced, therefore, that sustainable solutions to the problem lie not only in the ability to supply and use waste and sanitation services to best effect, but aslo in the long-term capacity of WSAs to maintain these services in pursuant with the assumption adopted.*

2 PURPOSE OF THE REPORT

The purpose of this report is to look at the experience to date and determine what needs to be done for urine diversion technology to be adopted in other areas in RSA within the context of learning organisations and/or water services institutions. The basis of this report is a review of both local and international literature using the site visit in March 2004 to projects in the Kgalagadi DM[3], Northern Cape as a verification mechanism.

3. ASSUMPTIONS OR PREMISE OF ARGUMENT

It was assumed that WSAs facing financial constraints are likely to reduce spending on maintenance of sanitation facilities, waste management and treatment. Where sanitation services are high, this significantly increases the risks of pollution of water table under Kgalagadi DM. This effect is cumulative in that as less is spent on O&M as the risks grow. Thus, it was assumed that an appropriate technology in terms of ground water conditions, less on O&M and acceptable to end users has more benefits for financial stressed WSAs similar ground water conditions with Kgalagadi DM.

[3] In many parts of the Kgalagadi municipality, there is only a thin layer of topsoil covering the hard, and rocky material. This makes it difficult and costly to construct any form of pit toilet, and urine diversion is a good solution to the sanitation problem in such areas. In both Mathanthanyaneng and Ellendale rural settlements houses are built along ridges where groundwater is closer to the surface. These villages can then be classified as having groundwater, which is very susceptible to contamination from surface pollution, and thus, VIP toilets were not appropriate technological options.

4: SANITATION CHALLENGES IN SOUTH AFRICA

4.1 Perceptions of technological options

Waterborne sewerage and pit toilets are most commonly used technologies in RSA. This is so despite implications such as high water usage, high operation and maintenance costs, and the advanced technology and institutional capacity required for removal, treatment and disposal of the human excreta. Ventilated improved pit (VIP) toilets have unfortunately also acquired the stigma of being a *"poor man's solution"* to the sanitation backlog, which has tarnished the image of this basically sound technology.

Notwithstanding the above, inadequately maintained sewer-reticulation systems in urban areas have caused adverse environmental impacts, most often as a result of leaking or blocked sewers, but sometimes also as a result of overloaded or inadequately operated or maintained treatment works and failed pumping stations (Stewart Scott 1998).

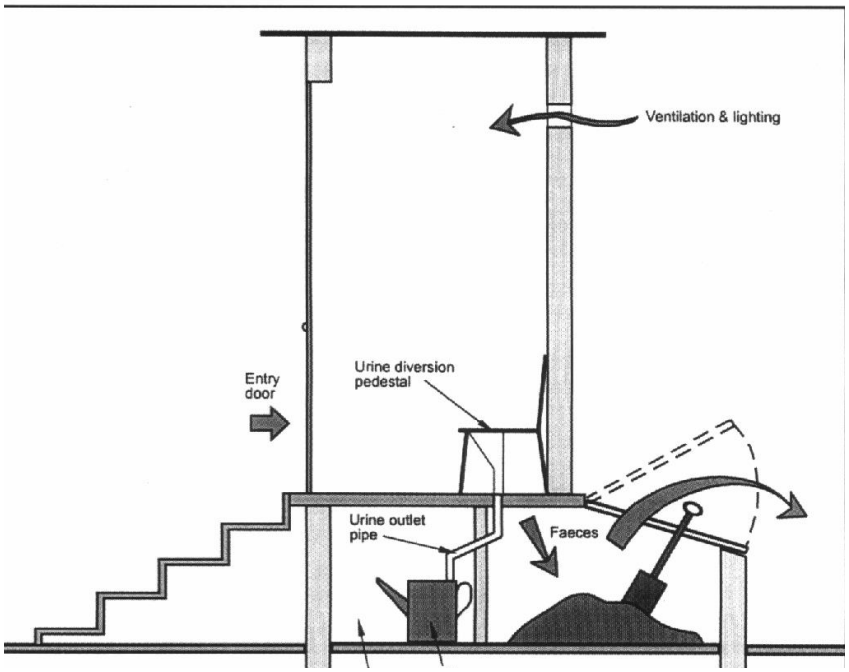
Yet, many community sanitation schemes have been successfully implemented utilising VIP toilets. However, others have been problematic, often due to poor design and construction practices or to social factors such as a lack of community buy-in, or a combination of these. In other words, sufficient attention is not always given to factors such as environmental impact, social issues, water-supply levels, reliability or institutional capacity. Consequently, there is often a legacy of poorly planned and inadequately maintained systems provided by *"well-intentioned but shortsighted authorities and developers"* (Austin and Duncker 2002). Thus, there is a need for new *approaches and technologies that support appropriate sanitation solutions under difficult ground conditions in various settlements in RSA.*

4.2 The Need for appropriate Sanitation Technologies

It is clear in paragraph 4.1. above that sanitation is an extremely complex business without universal *panacea*. It is argued in this report that *"conventional*" sanitation options may be suited to certain situations, but in other circumstances where water or space are scarce, or geological conditions preclude the use of VIPs, there is a

clear need for permanent, inside, emptiable toilets which do not require water. International literature in number of developing countries revealed that UD toilets have lower O&M costs and problems than those associated with VIP toilets, and also produces a free, easily accessible and valuable agricultural resource for those who wish to use it (Austin and van Vuuren 2001) as depicted in Figure 1.

Figure 1 : Example of UD Toilet



In Figure 1 above, it is observable that UD toilet need not be expensive to build because:

- the entire structure can be built above ground; and
- urine is diverted, no water is used for flushing and the volume of the processing vault is fairly small, as it is emptied periodically .

Thus, the Kgalagadi DM in the Northern Cape took the decision[4] to implement UD toilets on a large scale for the *twin reasons* of hard rock and vulnerable underlying aquifers.

[4] Although the Constitution assumes that local authorities and their human resources (both councillors and officials) have the capacity and capability to make reasonable decisions within the *milieu* of greater community participation in the water business cycle on the basis of the Rule of Law on Public Accountability by Executive Council and/or Mayoral Committee (Cloete 1991:17), it is argued that to meet such expectations will require a comprehensive and co-ordinated water services education,

4.3 Operation and Maintenance of UD Toilets

During the site visit, it was observed that UD toilets require a higher level of commitment from users than do other forms of dry sanitation, such as VIP toilets. The reason is that they are more sensitive to, and consequently less tolerant of, abuse. This is supported by literature evidence, Esrey *et al* (1998), that *the most unfamiliar aspect of UD toilets is that they require some handling of human excreta, at household level, of the products*. This technical skill or *"know how"* requires an intensive education and training programme up to mentorship phase of the project which is not often planned for by most WSAs and PIAs under these projects and elsewhere[5]. In other words, it appears from the UDS literature review that municipalities will need more of the "nuts and bolts" type of technical and financial skills to meet the *challenges of 2015 and beyond,* and less of the "warm and fuzzy" kind of education, training and development programmes that tend to dominate current learnerships and modules at the moment provided by various types of training providers and trainers within the water sector.

Notwithstanding the above, socio-cultural factors, population density and the frequency of emptying the bag of dry wastes are factors to be considered when quantifying the operation and maintenance (O&M) costs[6]. High-density areas such as those in informal settlements do not always have the capacity to use the dry wastes as fertilizer or fuel. However, the form of the wastes make them ideally suited for recycling whether on-site or elsewhere (e.g. in a community garden). Therefore, recycling of waste is always feasible.

training and development programme for newly established WSAs and their councillors. This will enhance their knowledge and skills to make reasonable and informed decisions as per the legislative framework as illustrated by Kgalagadi DM.

[5] However, Ethekwini Metropolitan is among the few municipalities in RSA which have a O&M budget which is an indication of good governance and strategic planning.

[6] There are other important aspects of O&M besides emptying of the bag and vault. This is particularly related to the proper use of the facility, the addition of dry matter (soil or ash) if required, the possible dilution and use of the urine in the garden, and ensuring that no water enters the vault through the emptying cover.

4.4. Pathogen destruction

Due to the uncertainty surrounding pathogen destruction in the vault a far more positive approach was taken in the Kgalagadi DM programme, in comparison to the eThekwini programme where double vault toilets are used to gain retention time (Austin & Wickers). It is assumed that destruction does not take place. The addition of dry soil or ash is purely to assist in the *dehydration and control smell*. When the dry matter is removed from the vault it is either burnt or composted. Composting is a well tested method of ensuring pathogen destruction (Scott *et al*) and is extensively used in Johannesburg's treatment plants for rendering sludge safe before it is sold as garden compost. For instance, at individual households composting can be effectively controlled by the householder themselves. Where communal collection occurs, composting needs to occur under controlled conditions.

Yet, as with all dry sanitation systems, it is particularly suited to provide sanitation in dry or extremely water scarce settlements like Kgalagadi District Municipality. UDS toilets perform the same function as other waterless systems and can be acceptable technology for use by households and properly managed institutions. However, the UDS is a component of the sanitation system and must be incorporated into the *generally acceptable approach to sanitation provision to ensure that the social and health benefits of improved sanitation* can be achieved. Although the *UDS does generate a waste that must be handled on-site, the technology is not equivalent to the bucket system and can be recommended for general use*[7].

The team made the following cost-benefit deductions –:

Table 1. Cost-Benefit Analysis

Cost-Benefit Deductions for using Eco-San Waterless Systems –UDS	
Factor	Cost Implications
Typical water consumption	Nil
Typical capital cost	R2 700.00
Monthly	R 5.00 per household (for cleaning and maintenance)

[7] However, the handling of the dry mass is still under investigation by WRC and University of Pretoria

Thus, there are more advantages for using UD toilets in Kgalagadi DM as indicated in Table 1[8]. In order to stress the economic value of UD systems the advantages are further summarised in Table 2 to include:

Table 2: Summary of UDS advantages

Low capital and minimal operating costs
No impact on the environment (ecologically friendly)
System is robust and can be maintained by the household
Can be incorporated into home
Shallow or no pit means it can be installed in all ground conditions

5. CONCLUSION

The sustainability and success of the national sanitation programme strategy is largely dependent on the capacity of WSAs to implement and sustain sanitation interventions which are environmental and technical sound as discussed in this report. This, unfortunately, is primarily related to the financial capacity of WSAs. A poor financial status means that WSAs are not only less likely to address sanitation projects emerging from the National Sanitation Strategy, but also that they are likely to curtail spending on O&M of sanitation facilities and services in accordance with the national norms and standards as well as Millennium Developmental Goals (2015). This will lead to the gradual degradation of the services, and increases in the risks of pollution. The latter is due to *the argument that WSAs facing financial constraints are likely to reduce spending on maintenance of sanitation facilities, waste management and treatment. Where sanitation services are high, this significantly increases the risks of pollution of water table. This effect is cumulative in that as less is spent on O&M as the risks grow.*

It is concluded that WSAs and sanitation practitioners must be aware that where sanitation services are higher, O&M costs are higher, and the opportunities to reduce spending are greater. In addition, once the waste has been collected or mobilised in water *(i.e. flush toilets),* the risks of failures leading to severe water pollution problems are much higher in Kgalagadi DM in terms of the ground water table conditions (refer to paragraph 4.2.). It is further concluded that higher levels

[8] albeit the notion that VIP toilets are more advantageous than UD toilets as VIP toilets perform better than UD toilets or dehydration toilets

of sanitation services (HLOS)[9], therefore, *represent a potentially high return (the waste can be safely disposed of), but high-risk option as opposed to lower levels sanitation facilities and services such as VIP and UDS toilets. Inductively, it is clear from the Kgalagadi DM sanitation projects that sustainable solutions to the problem lie not only in the ability to supply and use waste and sanitation services to best effect, but aslo in the long-term capacity of WSAs to maintain these services. T*his is likely to be the biggest stumbling block to sustainable management of waste management or human excreta or pollution of ground water. Consequently, the sanitation strategies at micro-, meso- and macro- levels must take a broader view of both Kgalagadi DM capacity, in this case, and the socio-economic and political dynamics of the community in order to arrest this *"downward spiral".*

Notwithstanding the above conclusions, the team further observed that the UDS toilets are suited to virtually any province and are acceptable to various cultures and incomes groups, albeit there is a need for an intensive education of households on quality assurance, maintenance of human excreta and disposal of human waste. It was clear that the UDS toilets in high water table and hard rocky circumstances is not only ecological friendly but also most cost effective technological option. Additionally, although not a pre-condition for the implementation of these UD systems, re-use of the human excreta resource is an additional benefit for people in their agricultural activities (Esrey *et al* 1998; Dudley 1996).

Yet, it is necessary to investigate how communal collection services can be put in place, for urine diversion toilets to become a sustainable sanitation solution, in higher density settlements, some form of institutional support from WSAs' Waste Management Division for faeces disposal is likely to be necessary, *as it cannot realistically be expected that the household, or even the majority of households, will be prepared to "re-use their faeces on site".* In view of the aforegoing argument, it is concluded that this service will need to be regarded as an integral facet of the municipal cleansing department's studies, and be chargeable like other

[9] *One needs to understand the current debate in RSA that sanitation decision-makers and practitioners should not refer to water borne as a higher level of service, but rather as a different type of service. This argument rejects the assumption that water borne represents higher or best type of service. Yet, in a water scarce country such as RSA (Turton 2001), water borne*

municipal services such as water, electricity or solid waste disposal. The feasibility of establishing neighbourhood composting stations or entire into agreement with Agricultural Associations for re-use of faeces, as a means of encouraging safe disposal also be examined by all parties involved in the sanitation programme delivery.

However, regarding UDS toilets, it was also concluded that a user education and maintenance issues when introducing the technology must be followed by a mentorship programme for handling of the mass and maintenance of the system as a whole. This will, *inter alia*, indicate that the UDS toilets like other VIP toilets are not entirely "maintenance free"[10] *and will thus still require some form of institutional support and O&M plan from WSAs*.

6. RECOMMENDATIONS

A number of recommendations can be drawn from the analysis of this report. These include, *though not limited to:*

- Although the system has minimum operation and maintenance costs, the relevant municipalities and/or users must be aware that the system is unfamiliar to most households and until it is better known its introduction needs to be accompanied by a long-term user education and mentoring programme; and
- Its suitability in high-density areas has not yet been tested due to the need for a collection system. It is recommended that a pilot be run in high density informal settlements, such as those found in Cape Town (Khayalitsha), to test the suitability of the system for this environment.

system is an inappropriate type of service in most cases, settlements, and communities. Thus, this argument challenges sanitation practitioners to talk appropriate service options as opposed to lower to higher levels of service.

[10] Guidelines and models to implement Free Basic Sanitation in RSA are being developed. Whether the notion of "Free Basic Sanitation" can be applied in water stressed municipalities like Kgalagadi DM including other rural based municipalities is beyond the scope of this report.

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