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WATER, ENVIRONMENT AND MANAGEMENT

Choosing an appropriate sanitation system

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INTRODUCTION

Before an appropriate sanitation system can be identified for a low income community 8 system "abilities" or criteria should be addressed and where possible satisfied. These criteria should be applied to all available sanitation systems to establish the most appropriate one.

SANITATION SYSTEMS

Below is a brief list of various sanitation systems generally available in South Africa (DDA, 1988).

Pit Latrine - Unventilated (Pit "Privy" or "Long Drop")
- Ventilated, improved (VIP)
- Ventilated, improved double (VIDP)

Latrine - Ventilated vault (VV)
- Continuous composting (CC)
- Biogas

Aqua Privy
Reed odourless earth closet (ROEC)
Bucket system
Anaerobic digester -
dry or wet : - Drain to soakaway or
- Drain to small-bore system

Chemical toilet
Biological or electrical toilet
Water closet (WC)
with : - Conservancy tank or
- Septic tank and soakaway or
- Waterborne reticulation

The problem now is how do we choose the most appropriate sanitation system for the particular community we are interested in with due consideration for their unique sets of needs and circumstances? I believe we need to look at 8 "abilities" (DDA, GUIDELINES) of each system before the choice can be made for the most appropriate one.

SYSTEM ABILITIES

1. Affordability - Of the system by the community
2. Acceptability - Of the system to the community
3. Constructability - Of the system by a Contractor, the supply or local authority or community
4. Usability - Of the system by the community
5. Reliability - Of the system
6. Durability - Of the system relative to the community
7. Maintainability - Of the system by the supply or local authority or the community
8. Upgradability - Of the system by the supply or local authority or the community

Let's take a more detailed look at each of these criteria.

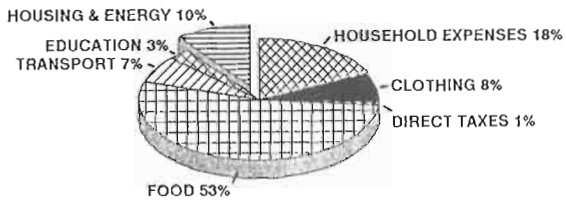
1. Affordability

The various costs related to most sanitation systems are :

Initial cost : Capital cost of system

Running costs : Interest and redemption on capital loan
Operating costs
Maintenance costs
Sewage disposal/treatment costs
Local authority's overheads
Water consumption charges etc.

The question then is : Who pays for what? In South Africa the tendency nowadays is towards the "user pays" approach with normally the capital outlay being heavily subsidised and the end users covering most of the running costs. To find out whether a system is affordable we need to establish the monthly costs of the system to be borne by the end user and compare those with that portion of a household's monthly income normally set aside for these expenses. Below is the spending pattern of a household in the lower income level, of below £65 ($115 US) per household per month, in Natal/Kwazulu (DBSA, 1991) :



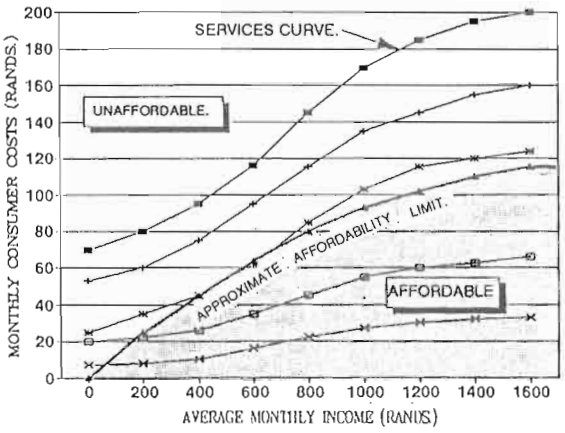
SPENDING PATTERN OF HOUSEHOLD OF LOWER INCOME LEVEL IN NATAL/KWAZULU

SPENDING PATTERN OF HOUSEHOLD OF LOWER INCOME LEVEL IN NATAL/KWAZULU

The HOUSING AND ENERGY portion of 10% varies for different income levels and generally covers the monthly service charges for sanitation, water, telephone, electricity, refuse removal, road levy, bond repayments, rates etc. This portion of household spending must then be compared with the estimated monthly (running) costs

of all services to be used by the community to assess affordability. Household spending patterns and income levels vary considerably but the above procedure can give an indication as to whether a service or all services are affordable or not. These running or consumer costs, and not just the initial capital costs, must be borne in mind right at the planning stage of a project.

With combinations of various levels of sanitation and other services and various household income levels a series of curves can be plotted (HOLLIDAY, 1990) indicating affordable and unaffordable services as shown:



AFFORDABLE AND UNAFFORDABLE SERVICES

2. Acceptability

This criterion generally conflicts very strongly with Affordability. What is acceptable to a community is normally unaffordable and vice versa. This criterion is also relatively new in South Africa because in the past most supply authorities have tended to be somewhat prescriptive as to the type and level of service for a community with very little if any communication with the benefitting community. "Community participation" (WITS, 1990) is one of the new buzz-words in the "new" or "real" South Africa.

The causes of rent boycotts are often less politically inspired and more as a result of little or no community involvement in the choice of the type and level of service. Very few communities are prepared to pay the running costs of services for which they had no say. Nor are they prepared to pay for existing services which are run down to the point of being totally unreliable due essentially to no provision being made for the instituting and financing of an on-going maintenance programme.

For the successful implementation of a project the community must be involved as far as possible in the decision making process from the start. Some of the questions that need to be asked via surveys, public meetings, questionnaires etc are as follows :

The Community :

What is their level of education and literacy and how well do they understand the project?

What are their cultural, social and religious backgrounds?

What is the community's attitude or custom in the handling of human waste?

How do they view the benefits of the project? etc.

The System :

What is its level of sophistication - is it technically appropriate?

Will the existing standard of health be maintained or improved?

Is it fly and mosquito free? Is it pollution free?

Can the system be installed indoors or outdoors?

Are squat pads or toilet seats acceptable? etc.

3. Constructability

Who will supply and install the proposed sanitation system? Will it be the supply authority, the local authority, a contractor, local sub-contractors or the community itself? This will depend on the level of sophistication of the system. Is the construction of the system labour-intensive and if so could local skilled or unskilled labour be used in order to create employment opportunities? Are there any building standards or regulations and/or by laws that need to be adhered to?

Does the system consist of specialised parts or standardised parts which are readily available from local hardware/plumbing merchants? Can any of these parts or materials eg. cement blocks etc. be manufactured by local entrepreneurs? Is the system appropriate for the soil conditions in terms of pollution of underground water, drainage if required, and foundations? Are local materials such as sand, stone, timber etc. available for construction? Is there any water available? Are there any problems of access to the settlement or onto individual stands?

4. Usability

Are there any user education programmes or operating instructions available or do all members of the community understand and know how to properly operate the system? Is the proposed sanitation system safe for all ages of users especially where pit latrines and children are concerned? Is there easy access for children, the aged and the handicapped? Are there any customs or traditions that may affect the way individuals use the system? Is there sufficient light and ventilation in the toilet? What anal clean-

ing materials will be used? What water supply system is available and is this system compatible with the proposed sanitation system? Can the system handle sullage or waste water? Is the system suitable for communal use such as in schools? Can the system be used in high density areas especially if pit latrines are to be used?

5. Reliability

This aspect can generally only be assessed after a number of years of use by the particular community unless a similar system has been used extensively elsewhere and a proven history is available. Does the system perform the task for which it was intended?

6. Durability

There should be as few moving parts as possible but if there are any, are they sufficiently lubricated, simple and robust? Are all the materials corrosion resistant? Are they manufactured to South African Bureau of Standards (SABS) or to any other recognised standards? Is the system capable of withstanding and operating under a normal amount of abuse or misuse? Has the system been designed to withstand varying climatic conditions such as extreme temperature changes, hail, rain, wind etc?

7. Maintainability

Has any maintenance infrastructure been established and are there sufficient funds, trained personnel and spares or materials available? Can maintenance be carried out by the local community? Does the sanitation system consist of standard parts readily available? Is there ease of access for the repair or replacement of parts? Are special tools or is special equipment required? Is the system easily cleanable and is water readily available? Does an infrastructure exist for the desludging of pits by vacuum tanker or the handling, disposal or treatment of human waste? Are any daily or regular tasks required to operate or maintain the system such as the agitation of anaerobic digester tank contents etc?

8. Upgradability

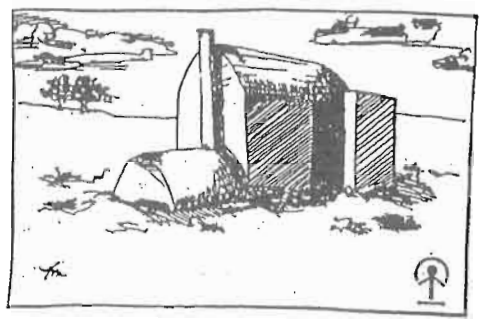
Is the design of the system flexible enough to enable future upgrading from say a VIP to full waterborne reticulation? Can improvements be made to the system and if so what improvements and who could implement this work, the consumer or the local authority? In the case of pit latrines can the superstructures be relocated when the pit is full? Is each stand large enough to allow this? If the system is upgradable is the water supply system adequate or will it also require upgrading?

CONCLUSION

I believe that if all of the above 8 criteria can be satisfied as far as is practicable then the most appropriate sanitation system for the particular circumstances of a particular community could be implemented to the satisfaction of all parties concerned - especially to the end user.

THE PHUNGALUTHO TOILET (South African Patent Nº 92/2558)*

By way of illustrating the above "abilities" let's take a brief look at a sanitation system which I consider goes a very long way to satisfying all 8 criteria and could become a very popular, low-cost and practical sanitation system for any low or even middle or upper income community anywhere. The Phungalutho ("no smell") (CRAWFORD, 1990) is a ventilated pit latrine and has been developed by Don Crawford of the Institute of Natural Resources at the University of Natal in Pietermaritzburg, Natal. It consists of a 2,5 m to 3 m deep pit behind the superstructure with the superstructure being constructed, using a set of steel moulds, from the cement stabilisation of the excavated soil from the pit. The pedestal or seat inside the toilet superstructure has a steep earth chute below it leading into the pit. The pit has a raised arched cover with a vent at the crown to improve pit venting.



THE PHUNGALUTHO TOILET

Lets take a look at the "abilities" or criteria :

Affordability

The initial capital outlay for the construction of a Phungalutho is about £40 ($70 US) for materials and about £60 ($105 US) for labour. So if the end user constructs it himself it should cost about £40. The only additional cost could be a nominal fee for hiring the steel moulds if the user constructs it himself. The only running cost could be a monthly levy of up to £1 ($1,75 US) to cover the desludging of the pit every 5 - 7 years. Maintenance costs would be the costs of patching here and there with cement stabilised soil and some bagwashing and painting if required.

Acceptability

Judging by the enthusiastic response of individuals and communities in Natal/KwaZulu to date the Phungalutho is a popular concept mainly because it is :

- **easy to construct** by unskilled or skilled labour
- **no odours** occur due to the layout and design of the pit and venting system
- **safe** because the pit is behind the superstructure and not beneath it
- **no flies** due to the cool and relatively dark interior and the venting system
- **attractive**. Most Phungaluthos to date have been bagwashed and painted bright, cheerful colours.

Constructability

The Phungalutho can be constructed by unskilled labour after basic tuition and by following a well illustrated construction guide booklet.

An individual toilet takes two people about a week to construct. This time can be reduced to 4 - 5 days per toilet if numerous toilets are constructed on a large scale project.

The excavated soil from the pit is used and cement stabilised for building purposes so the only materials to be purchased are some chicken mesh, some 10 gauge fencing wire, ± 8 pockets of cement, some small pieces of timber and piping and gauze or stocking for the vent.

Usability

The Phungalutho is a very simple and effective toilet which can be safely used by young and old. The structure can be easily adapted for handicapped people and can be extended to include a shower due to its odourlessness. Toilet paper or similar tissue should be used, as in all sanitation systems, in preference to any other paper type.

Reliability

There's very little if anything that can go wrong with this toilet. The only moving part is the toilet seat cover. The short access passage with a wingwall does away with the need for a door.

Durability

The structure is very strong and durable due to its design and cement stabilisation and has in fact been intentionally over designed. The walls are a minimum of 150 mm thick and are reinforced with wire in the corners. The arched pit cover and arched roof are reinforced with wire and chicken mesh. A cement/soil plaster skin is generally applied to these two arches and the walls are bagwashed with a cement/soil mix.

Maintainability

The only maintenance required is the occasional patching with soil/cement if necessary and painting if required. Every 5 - 7 years the pit would probably need desludging. This could be done via the pedestal opening or via a suitable opening in the crown of the pit cover arch.

Upgradability

The simple wooden seat cover to the pedestal could be replaced by a conventional PVC toilet seat and a fibreglass chute could be installed from below the seat into the pit. If the Phungalutho is to be upgraded to waterborne reticulation the earth or fibreglass chute (and the pit if required) could be filled or sealed and a washdown pan and cistern installed.

* PATENT : The design is patented to ensure that no standards are compromised to the end user's detriment.

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