User based perceptions of on-plot sanitation systems in low income urban communities in Africa and Asia

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User Based Perceptions of On-plot Sanitation Systems in Low Income Urban Communities in Africa and Asia

by
DARREN SAYWELL, B.A. (Hons)

A Doctoral Thesis
submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy of Loughborough University

September, 2000

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Abstract

Rates of population growth in developing country cities are straining the capacity of sanitation service providers. In spite of widespread sector recognition of the need to adopt low-cost, people centred approaches, 80 per cent of investments in the water and sanitation sector continue to be allocated to high cost technologies for urban elites. Household level, on-plot sanitation systems potentially offer a solution to the sanitary needs of the urban poor. Nevertheless, commonly held assumptions amongst sector professionals that lower cost, on-plot systems are inappropriate and unacceptable in urban communities impede their wider application. There is little empirical evidence to justify this position. The scope of this work examines the technical appropriateness and user acceptability of on-plot sanitation options. The thesis contributes to an improved understanding of the context in which on-plot systems operate, what factors constrain their application, and what issues need consideration when deciding on sanitary options in low-income communities. The research adopted a mix of methodological techniques to improve the reliability and validity of findings, with both quantitative and qualitative methods applied during fieldwork. Findings from Ghana, Mozambique and India are included in the thesis in order to permit sampling of key latrine types used internationally. The thesis concludes that user based perceptions of the performance and acceptability of on-plot systems varies markedly to those of sector professionals, particularly in relation to plot size, satisfaction levels and reasons for absence of household latrine. Furthermore, user based criteria of performance are developed for consideration practitioners when narrowing decision making on sanitary options. The implications of the study highlight the need for integration of user concerns into strategic planning for sanitation, more effective stimulation and negotiation of demand for sanitation systems and challenges for agencies in adopting a user oriented approach. The recommendations from the thesis include practitioner focused policy changes that affect project planning and support systems for user education. Potential areas of further research interest include ranking user perceptions, an holistic understanding of excreta management processes and institutional constraints affecting user-service provider consultations.

Key words: Urban, on-plot, sanitation, low income, users, latrines, Ghana, India, Mozambique
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Glossary of terms used

Aqua privies
Latrine in which excreta fall directly through a submerged pipe into a watertight settling chamber below the floor, and from which effluent overflows to a soakaway or drain.

Arithmetic mean
A measure of central tendency. The sum of the values of all observations divided by the number of observations.

Asymptotic significance
The significance level based on the asymptotic distribution of a test statistic. Typically, a value of less than 0.05 is considered significant. The asymptotic significance is based on the assumption that the data set is large. If the data set is small or poorly distributed, this may not be a good indication of significance.

BOD
Biochemical oxygen demand: the mass of oxygen consumed by organic matter during aerobic decomposition under standard conditions, usually measured in milligrams per litre during five days; a measure of the concentration of sewage.

Chi-Square
Tests the hypothesis that the row and column variables are independent, without indicating strength or direction of the relationship. The Chi-Square test procedure tabulates a variable into categories and computes a chi-square statistic. This goodness-of-fit test compares the observed and expected frequencies in each category to test either that all categories contain the same proportion of values or that each category contains a user-specified proportion of values.

Compost latrine
In this type of latrine, excreta fall into a watertight tank to which ash or vegetable matter is added.
Crosstabulation
A bivariate table, or a table that displays the joint frequency of two variables.

Dry latrine
A latrine where users defecate into a bucket, basket or other receptacle that is regularly emptied. This type of latrine forms part of the nightsoil system.

Excreta
Faeces and urine.

Goodman and Kruskal's Tau
A measure of association which reflects the proportional reduction in error when values of the independent variable are used to predict values of the dependent variable. Values range from 0 to 1.

Incentives
Factors that can stimulate behaviours required from different stakeholders. Incentives are said to be perverse when they are incompatible with goals of an enterprise or programme, including misdirected subsidies, unrealistic coverage targets, inappropriate career structures, credit restrictions on poor.

Investment efficiency
Success in seeking investment from governments, donors, private finance institutions.

Latrine
Place or building, not normally within a house or other building, for deposition, retention and sometimes decomposition of excreta.

Operational efficiency
Allowing resources to go further and extending sanitation coverage.

Overhung latrine
Latrine sited such that excreta falls directly into the sea or other body of water.
Median
A measure of central tendency. It is the value above which and below which half of the cases fall, the 50th percentile.

Mode
The most frequently occurring value (or values).

Nightsoil
Human excreta, with or without anal cleaning material, which are deposited in a bucket or other receptacle for manual removal (often taking place at night).

Off-set pit
Pit that is partially or wholly displaced from its superstructure.

On-plot sanitation
Sanitation systems which are contained with the plot occupied by the dwelling. On-plot sanitation is associated with household latrines, but also includes facilities shared by several households living together on the same plot.

On-site sanitation
Includes communal facilities which are self-contained within the site, in contrast to sewerage and dry latrines where excreta is removed from the site.

Pathogens
Organism that causes disease.

Percolation rate
The rate at which liquids move through soil.

Pit latrine
Latrine with a pit for accumulation and decomposition of excreta and from which liquid infiltrates into the surrounding soil.
Pour-flush latrine
Latrine where a small quantity of water is poured in to flush excreta through a water seal into a pit.

Sanitation
The means of collecting and disposing of excreta and community liquid waste in a hygienic way so as not to endanger the health of individuals or the community as a whole.

Septic tanks
Watertight chamber for the retention, partial treatment, and discharge for further treatment, of sewage.

Sewage
Wastewater that usually includes excreta and that is, will be, or has been carried in a sewer.

Sewer
Pipe or conduit through which sewage is carried.

Sewerage
System of interconnected sewers.

Soakaway
Soakpit or drainage trench for subsoil dispersion of liquid waste.

Soakpits
Hole dug in the ground serving as a soakaway.

Sullage
Wastewater from bathing, laundry, preparation of food, cooking and other personal and domestic activities that does not contain excreta.
Superstructure
Screen or building of a latrine above the floor that provides privacy and protection for users.

TACH
Total annual cost per household; includes capital (or investment) costs and recurrent costs.

Unbundling
Unbundling is a way of dividing investments into more realistic and manageable components. These separate components can be relatively independent or linked so that performance of one is dependent on that of others. Horizontal unbundling refers to the way in which services in different areas are provided by different organisations and/or in different ways. Vertical unbundling refers to the way in which services at different levels in a hierarchical system are provided by different suppliers.

Vector
A carrier or disease, e.g. rat, fly, mosquito, etc.

Vent pipe
Pipe provided to facilitate the escape of gases from a latrine or septic tank.

VIP latrine
Ventilated improved pit latrine, pit latrine with a screened vent pipe and a partially dark interior to the superstructure.

Water seal
Water held in a U-shaped pipe or hemispherical bowl connecting a pan to a pipe, channel or pit to prevent the escape of gases and insects from the sewer or pit.

Wastewater
Sewage or sullage.
Y-junction
Chamber in which liquid may be directed along either of two pipes or channels.
Abbreviations

AMA  Accra Metropolitan Authority
CMU  Central Management Unit
DFID Department for International Development
ESWG Environmental Sanitation Working Group
GESI Global Environmental Sanitation Initiative
GOM Government of Mozambique
HCES Household Centred Environmental Sanitation
INDER Institute for Rural Development
SIP Slum Improvement Programme
PNSBC National Low Cost Sanitation Programme
UESnet Urban Environmental Sanitation Network
WSSCC Water Supply and Sanitation Collaborative Council
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Introduction

1.1 General

The provision of basic services to low income urban communities has become an important area of research activity, especially since the development agenda has re-focused on the urban milieu. Consequently, there is significant international interest in, and continuing difficulties that exist with, the provision and management of affordable, appropriate and sustainable sanitation systems to low income urban communities in developing countries. The global picture regarding access to sanitation continues to cause concern with almost 2.4 billion rural and urban dwellers lacking safe sanitation. During the course of the 1990's, the number of global urban residents lacking safe sanitation increased by 41 million to 418 million (Commission on Sustainable Development, 2000). In a typical developing country city the proportion of the urban ‘poor’ living in settlements without access to basic services is extremely high (ranging between 30-60 per cent (Black, 1996)), and in some cases is exceptional (Addis Ababa, 79 per cent; Luanda, 70 per cent; Calcutta, 67 per cent). Rapid urbanisation coupled with rapid urban population growth has placed extreme strain on civic administrations in their efforts to provide basic services (such as roads, water supply, drainage, and sanitation). In turn this has led to widespread environmental degradation and raised the incidence of morbidity and mortality amongst poor, vulnerable, urban communities. Adequate management of sanitation is therefore important to health, community development and the sustainability of cities.

1.2 Global focus on water and sanitation

The International Drinking Water Supply and Sanitation Decade (1981-1990) gave unprecedented attention to the issue of safe water and sanitary disposal facilities, and led to a rejection of the idea of ‘business as usual’ as the way forward in the sector. The achievements from the Decade were felt less in the additions made to physical infrastructure (though significant) than in the alteration to thinking and practice that accompanied it. This new thinking was expressed in various international fora during the Decade, and through a special chapter of Agenda 21 in which governments committed
themselves to four major waste related programme areas. Subsequent initiatives (the Water Supply and Sanitation Collaborative Council) and other international conferences (Dublin, 1992; Noordwijk, 1994) called for greater attention to sector development needs and advocated several guiding principles to follow. The slogan which gained currency in the sector at the time ('Water and Sanitation for All') forced policy makers and implementers to rethink conventional approaches to service provision, with an appreciation that in developing countries different technological solutions, operational criteria and new forms of service provision and management would be required (Black, 1996).

Despite these high profile efforts, progress in the sector has been too slow and inconsistent to bring much relief to the poor, and in particular the urban poor. In spite of widespread sector recognition of the need to adopt low cost, people centred approaches, 80 per cent of investments in the water and sanitation sector continued to be allocated to high cost technologies (Black, 1996). Likewise, less than 5 per cent of donor aid is spent on low cost solutions. Sanitation, and its urban component, continues to be neglected on the development agenda, as indicated by the commitment that various international organisations, such as the Global Water Partnership and the WSSCC, have given to prioritising urban environmental sanitation efforts. High profile initiatives such as the Global Environmental Sanitation Initiative (GESI), the Environmental Sanitation Working Group, the Urban Environmental Sanitation Network (UESnet), and the Household Centred Environmental Sanitation Model (HCES) are testament to the resources being applied to promoting urban environmental sanitation issues.

1.3 Urban sanitation in developing countries

Typically, most urban centres in developing countries, including many cities with 1 million plus inhabitants possess no conventional sewerage system at all (Hardoy et al, 1990). In the majority of these cases, alternative channels such as surface water rivers, canals, gullies and ditches serve as the end point for untreated wastes. In those cities where a sewerage system is found, this tends to serve a very small proportion of the urban population, typically the city's social and economic elites. For the remainder of the urban poor, typically found in informal settlements in and on the edges of the city, open
defecation, or insanitary conditions through the use of traditional latrines is likely to be commonplace.

The prospect of an improvement in the living conditions of the urban poor over the medium term is improbable. Rates of urban growth in the developing world will strain existing service provision. By the year 2025, an estimated 54 per cent of the developing world’s population will reside in urban areas (Commission on Sustainable Development, 2000) and by 2015, 21 cities in developing countries will have a population in excess of 10 million (compared to 1 in 1970 and 10 in 1995). Globally, in order to achieve full sanitation coverage by 2025 in urban areas, services would need to be extended to 2.16 billion (which represents 76 per cent of the current global urban population).

The doubling of public spending on health in developing countries between 1960-1995 (as a percentage of GNP) indicates the increase in flow of financial resources to the sector (UNDP, 1999). But the shortfall between current levels of investment and those required to achieve full coverage remains large. Current estimates put national expenditures on water and sanitation in developing countries at between US$10-25 billion, but significantly the majority of this is spent on higher levels of service in urban areas (WSSCC, 1999). Estimates for the levels of investment required in order to achieve full coverage vary between US$100 billion over a 10 year period (Commission on Sustainable Development, 2000) to US$11 billion per year until 2025 (WSSCC, 1999). Neither of these figures disaggregate the requirements for urban sanitation improvement.

1.4 On-plot sanitation
On-plot sanitation generally refers to those sanitation systems that are contained within the plot occupied by the dwelling. Typically associated with household latrines, on-plot systems also include facilities shared by several households living together on the same plot. Although there is a large volume of literature available on the technical issues of urban sanitation, with sanitary designs and specifications for low cost sewerage and on-site or on-plot sanitation being reasonably well researched and understood. There is considerably less work on the relative performance and user acceptability of different
sanitation systems in different operating contexts, or the social, institutional and financial aspects associated with this topic.

Nevertheless, it is commonly held among local authorities and sector professionals alike that whilst sanitation at the household level (on-plot) is appropriate for rural areas, it is generally unsuitable in the urban context (Shahalam, 1984), unless viewed as a (preferably short-term) route to 'better' (higher service) forms of sanitation. These attitudes do not appear to be based on any objective examination of performance or on the perceptions of those using the facilities.

1.5 Sanitation selection models
Attempts to provide guidance to policy makers and implementers regarding the appropriate choice of sanitary technology in urban and rural contexts enjoy a long line of precedents (Shahalam, 1984), but in essence all methods try to overcome a decision problem. Early efforts at selection processes were undertaken by USAID and the World Bank (Kalbermatten et al, 1980; Mara et al, 1980; Feachem et al, 1980, Reid and Coffey, 1978) and tended to stress physical factors, access to water and cost considerations. Reid and Coffey (1978) developed an algorithm that includes socio-economic, socio-technical and health aspects, whilst Shahalam (1984) takes this model further by including a means for comparing overall performance of alternatives, the aspirations of a community and the effects of inequalities in levels of society and technology. More recent versions of the decision making algorithm continue to stress technical factors (Franceys et al, 1992), while Loetscher (1999) reviews SANEX™, an expert system designed for the evaluation of sanitation alternatives in developing countries using 50 technical, socio-cultural and financial criteria in order to assess 80 sanitation systems. One of the unifying features of these respective systems is that the criteria applied are supplied by the sector professional in isolation from the perceptions and perspectives of the users.

1.6 Purpose of the research
This research is designed to help facilitate decision making processes regarding on-plot sanitation provision by intermediaries (NGO’s, government, international organisations) in
low-income urban communities. The central focus of the research is to investigate how appropriate and acceptable on-plot sanitation is for the user in the urban context, to identify what factors affect sustainability, and to develop guidance on technology selection for a range of sector stakeholders (as defined above).

The work encompasses a wide variety of issues including socio-cultural, institutional, financial and technical considerations. However, the most important theme is that it focuses on the perceptions of the users of on-plot sanitation. Frequently, assessments and judgements on the effectiveness of sanitary technologies are made from a technologically biased and purely external perspective. Those who are not likely to themselves be regular users of improved pit latrines are responsible for many technical evaluations. Thus, attention in this work has been directed to establishing what the concerns of the users of on-plot sanitation systems are in urban areas and to reflect these in an analysis that proposes guidelines for their selection.

Sections 3.2 – 3.4 in Chapter 3 detail further the objectives, hypothesis and research questions governing the thesis.

1.7 Structure to the thesis

The thesis is structured in such a way as to present a logical order to the investigation, findings and conclusions. Chapter 1 introduces the subject, scope and context of the thesis. Published and grey literature on urban sanitation provision and on-plot sanitation systems is detailed in chapter 2. Methods for data gathering are established in chapter 3 and the primary analysis of household, postal survey and field-tested data are presented in chapter 4. Chapter 5 discusses the implications from the findings, focuses on sanitation selection models and contrasts mechanistic algorithm approaches with the results from this research. An alternative method of narrowing decision making is presented in this section. Chapter 6 concludes the thesis with a summary of major insights in understanding user-based perceptions of on-plot sanitation, followed by a synthesis of recommendations arising from the research.
Each chapter begins with an outline of contents, and concludes with a short summary of key points. The structure of the chapters included in the thesis is represented below in graphical format:
1.8 Summary

Given the rapid population growth in developing countries, and its focus in urban poor settlements, there is a pressing need for affordable, practical sanitation systems that deal with human wastes in an hygienic, sustainable and environmentally friendly manner. Pit latrines at the household level (on-plot systems) offer one such solution to this problem. The focus of this research is to investigate how appropriate and acceptable on-plot sanitation is in the urban context, to identify what factors affect sustainability, and to develop guidance on its use for policy makers and professional staff of urban governments, development agencies and non-governmental organisations.

The research will advance knowledge about the performance, use, and user acceptability of on-plot sanitation in urban areas. It will provide an informed understanding of the context in which on-plot sanitation systems operate most effectively, what key constraining factors exist in providing on-plot sanitation in these areas and what issues to consider when approaching decision-making regarding choice of technical solutions. By focusing on community based understanding of urban sanitation for the poor, this study provides an innovative and user based perspective on infrastructure provision in developing countries.

Unless a more rigorous review of the appropriateness and acceptability of lower cost sanitation options in low income urban communities is forthcoming, the majority of the urban poor will continue to be deprived access to safe and hygienic means of excreta disposal.
Chapter II: Literature review

2.1 Chapter outline

2.2 Publications reviewed

2.3 Note on terminology

2.4 Urban sanitation provision: the present situation
   2.4.1 Reasons for inadequate urban sanitation provision
   2.4.2 Modes and models of urban sanitation provision

2.5 Technical issues
   2.5.1 Types of pit latrine
   2.5.2 Controlling insect and odour nuisance
      2.5.2.1 Flies
      2.5.2.2 Mosquitoes
      2.5.2.3 Cockroaches
      2.5.2.4 Fly control
      2.5.2.5 Mosquito control
      2.5.2.6 Cockroach control
      2.5.2.7 Odour nuisance
   2.5.3 Pit size, single and double pits
   2.5.4 Solids accumulation and pit emptying
   2.5.5 Groundwater pollution
   2.5.6 Small plots and high density populations

2.6 Health and social issues
   2.6.1 Introduction
   2.6.2 Latrine use
   2.6.3 Children and latrines
2.7 Management issues

2.7.1 Management and bureaucracy

2.7.2 Costs

2.7.3 Payment by householders, willingness to pay and cost recovery

2.7.4 Public and community latrines

2.8 Sanitation selection models

2.9 Summary
On-plot sanitation in urban areas

2.1 Chapter outline
This chapter considers the literature, both published and grey, which focuses on low cost sanitation provision in urban areas. Description and analysis of the literature is organised around three key sections (see 2.2 below) and the chapter concludes with an appreciation of similarities, controversies and areas of theoretical and empirical weakness identified from the review.

2.2 Publications reviewed
The literature review was wide in scope, covering all aspects of low cost sanitation so that what was relevant purely for urban areas could be abstracted. More than 250 documents were examined and material relevant to on-plot urban sanitation has been summarised in sections dealing with technical, health and social, and management matters. Alternative technologies are critically reviewed, with special attention given to the relative advantages and disadvantages of each option. Many social and management factors that have influenced the success of projects and programmes have been noted.

2.3 Note on terminology
There are several classification methods applied to excreta disposal. Typically, distinctions may be drawn between wet and dry systems, with wet systems relying on water to flush faeces from the place where it was deposited. A further division may be made between on-site and off-site sanitation. The former includes communal facilities that are self-contained within the site; with the latter excreta is removed from the site, as with sewerage and some dry latrine systems. On-plot sanitation refers to types of sanitation that are contained within the plot occupied by a dwelling. Commonly, on-plot sanitation equates to a ‘household latrine’, but may also include facilities shared by several households living together on the same plot - a common occurrence in many developing countries. A more useful classification of these systems is offered by Pickford (1995: 36):
Table 1: Classification of excreta disposal method (after Pickford, 1995)

<table>
<thead>
<tr>
<th>Classification</th>
<th>Excreta disposal method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decomposition</td>
<td>• Compost latrines</td>
</tr>
<tr>
<td></td>
<td>• Algae tanks</td>
</tr>
<tr>
<td>Decomposition and infiltration</td>
<td>• <strong>PIT LATRINES</strong></td>
</tr>
<tr>
<td></td>
<td>• Simple pits</td>
</tr>
<tr>
<td></td>
<td>• Pits with lids</td>
</tr>
<tr>
<td></td>
<td>• VIP latrines</td>
</tr>
<tr>
<td></td>
<td>• Pour flush latrines</td>
</tr>
<tr>
<td></td>
<td>• Twin pits</td>
</tr>
<tr>
<td></td>
<td>• Miscellaneous variations</td>
</tr>
<tr>
<td></td>
<td>• Aqua privies and soakaways</td>
</tr>
<tr>
<td>Removal, decomposition and infiltration</td>
<td><strong>SEPTIC TANKS</strong></td>
</tr>
<tr>
<td>Removal</td>
<td><strong>PIPE SYSTEMS</strong></td>
</tr>
<tr>
<td></td>
<td>• Conventional sewerage</td>
</tr>
<tr>
<td></td>
<td>• Non-conventional sewerage</td>
</tr>
<tr>
<td></td>
<td>• Vacuum systems</td>
</tr>
<tr>
<td></td>
<td>• Container systems</td>
</tr>
<tr>
<td></td>
<td>• Vaults</td>
</tr>
<tr>
<td></td>
<td>• Chemical toilets</td>
</tr>
<tr>
<td></td>
<td>• Overhung latrines</td>
</tr>
</tbody>
</table>

2.4 Urban sanitation provision: the present situation

The ability of local and municipal governments to meet the needs of urban sanitation provision is an increasingly difficult task in densely settled and rapidly urbanising developing countries. Much progress has been made in sanitation coverage over recent decades; in 1975 only 23 per cent of the urban population had access to sanitary facilities, by 1995 this figure had grown to 42 per cent (Schübeler, 1996). In the same period, the World Bank (1994) reports that in middle income countries, the proportion of urban population served with sanitation increased from 44 to 68 per cent. The same source however, indicates that there were approximately 453 million urban people, or 33 per cent of the urban population in developing countries still without adequate sanitation in 1990. With urban populations in developing countries rising steeply (from an estimated 1.5 to 4 billion by the year 2025), the figure for the urban unserved will inevitably increase, given that in excess of 50 per cent of urban growth in many cities occurs in ‘informal’ settlements, typically lacking basic service provision (Black, 1996).
Much of the growth in urban areas is taking place in large cities. In 2000, there will be 18 cities in the developing world with populations greater than 10 million. However, the problem is not just one for metropolis'. More than half the urban population worldwide lives in cities of less than 500,000 and between 40-45 per cent live in towns and cities of less than 100,000 people.

The consequences of inadequate urban sanitation on morbidity and mortality rates (especially for children and infants) have been well documented (see Box below and refer to Mara, 1996; Black, 1996; Hardoy et al, 1990; Hogrewe et al, 1993 amongst others). In combination with impacts on health, poor urban sanitation implies daily hardship and stress, degrades the urban ecology of many cities and diminishes the human potential of large numbers of the urban poor.

<table>
<thead>
<tr>
<th>Impact of poor sanitation in urban environments (Hardoy et al, 1990)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Porto Alegre, Brazil</strong></td>
</tr>
<tr>
<td>One fifth of the urban population lives in shantytowns with poor infrastructure services. Infant mortality rates among residents of these areas are three times as high as among residents of other parts of the city.</td>
</tr>
<tr>
<td><strong>Urban Guatemala</strong></td>
</tr>
<tr>
<td>Infant mortality rates for different population groups vary from 113 per 1000 for the children of households in the lowest income group to 33 per 1000 in the highest income group.</td>
</tr>
</tbody>
</table>

### 2.4.1 Reasons for inadequate urban sanitation provision

Many commentators question the reasons why progress has been so slow in urban sanitation provision. The review highlighted a wide diversity of opinion on the subject and the following section aims to indicate the diversity, not cite all references. The WSSCC Sanitation Promotion Kit (1997) provides a valuable, if brief overview, focusing on a range of problems, including:

- Lack of political will;
- Poor policy at all levels;
- Neglect of consumer preferences;
- Low prestige and recognition of sanitation's role;
- Inappropriate approaches;
- 'Women and children' last;
- Ineffective sanitation promotion strategies and poor public awareness;
- Poor institutional frameworks.

Wright (1997) advocates a rethinking of urban sanitation interventions in developing countries and argues that misjudgements of consumer demand in previous supply driven approaches led to inadequate sanitation system design and performance. Tayler (1999) highlights limited access to sanitation by particular urban groups (citing the ‘thika’ tenancies in Calcutta as an example) as a factor constraining wider sanitation provision. Schübeler, (1996) categorises into four groups the factors that lead to inadequate sanitation provision:

- **Resource mobilisation**: governments do not possess the level of resources needed to expand existing systems to sustain future demand. New means by which sanitation services can be financed and delivered need to be validated.
- **Operating capacity**: the ineffectiveness and low operating efficiencies of existing sanitation systems and facilities results inevitably in poor sanitation.
- **Economic and ecological sustainability**: the rationale and logic of a system which pipes water from great distances, treats and distributes this water to cities, only to be used as a means for conveying waste which is retreated and returned to the environment, is increasingly under scrutiny. The long term economic and ecological sustainability is questionable.
- **Choice of objectives and priorities**: if planners fail to respect a logical hierarchy of policy objectives in sanitation development programmes, this can lead to perverse decision making, whereby public health objectives are subordinated by system ‘hardware’ objectives.

Other commentators place greater emphasis on specific issues. Kalbermatten et al (1999) identifies two key concerns central to current failings in environmental sanitation: poor planning and the neglect of user perceptions of needs. Poor planning manifests itself in cases where services are planned without considering all their potential impacts. Neglect of user perceptions of needs is commonly illustrated when decisions regarding interventions are taken at a political or administrative level far removed from those who are served by the intervention.
2.4.2 Modes and models of urban sanitation provision

In order to understand the role that on-plot systems play in urban sanitation, a conceptual overview of how sanitation is organised in many developing countries is required. Schübeler (1996) offers a basic analysis of current modes of provision. Three modes of urban sanitation are identified, comprising conventional, informal and low cost. In practice, these modes are complementary, operating in different locations in the same city at the same time.

The *conventional* mode is characterised by long term sectoral master plans, with phased implementation of complex infrastructure to accepted standards and design norms. The approach aims to enable the engineer to plan a technically coherent system for the entire urban milieu (e.g., Master Plan for Chittagong, Bangladesh). The *informal* mode results from the failure of public and private sectors to meet the needs of low-income communities. Informal housing production is not restricted to the physical dwelling unit, but involves provision of sanitary facilities (amongst other infrastructure) through the efforts of individual residents, community based organizations (CBO's) and informal private sector actors (e.g., Orangi Pilot Project, Karachi, Pakistan). This mode of delivery is highly dependent on locally based artisans and small-scale entrepreneurs for material, credit, labour and technical skills. Frequently the solutions that are arrived at through this method are far from satisfactory. Being improvised and ad hoc solutions, which are isolated from municipal service networks, informal sanitary provision is rarely a sustainable alternative.

Recognising the valuable contribution that low-income residents made to housing and service provision in the 1970's has led to the slow adoption of *low cost* modes of sanitation provision. This is characterised by development projects that implement technically adapted, low-cost solutions that rely on self-help opportunities. Examples might include site and services schemes or slum upgrading programmes in existing low-income settlements (e.g., Self-help Toilet Scheme, Yogyakarta, Indonesia).

The relative advantages and disadvantages of each mode have been well-documented (Schübeler, 1996; Pickford 1995; Mara, 1996; Wright, 1997; Tayler, 1999). Supply driven master plans of the conventional mode type typically produce under utilised trunk facilities.
that ignore the need to provide local level facilities. By contrast, large numbers of small, isolated, demand driven but disconnected activities comparable to the low cost mode, implemented without reference to any overall plan, may fail to have any significant city wide effect on poor sanitation (Tayler, 1999). In an attempt to reconcile this basic dilemma new models of sanitation provision have been proposed. Wright (1997) introduces a conceptual planning framework referred to as the ‘Strategic Sanitation Approach’ (SSA). The central goal of SSA is to achieve the sustainable expansion of sanitation coverage in urban areas. The approach differs from the existing supply driven agenda in two underlying ways: it is demand based, and incentive driven.

A demand-based approach relies on agencies conducting effective demand assessment exercises, and on thorough stakeholder participation. A key challenge for governments and agencies is to motivate and build capacity of different actors to participate in appropriate and productive ways. The second underlying principle is that incentives can stimulate specific behaviours required from key actors to achieve sustainable expansion of sanitation coverage. The right incentives package (with appropriate rules, referees and rewards) can assist governments or municipal agencies achieve their primary goal.

The approach involves:

- Wider choices concerning technologies and service levels
- Step by step actions
- Economic replication
- Responsive institutional arrangements

In conceptual terms, the approach seeks to integrate social, technical, institutional and economic factors that have an impact on the sustainability of service provision. SSA is built on the key assumption that the provision of sustainable sanitation to urban areas is only possible by a demand oriented service delivery system, which implies a system that has the flexibility to offer alternative technological options and corresponding institutional arrangements for service delivery. The approach also encourages a wide view of sanitation services to the city as whole, rather than stand-alone projects for target communities or for a specific service. The importance of financial policies, at community
and agency level, and emphasis on incentives to perform for various actors in all stages of the process of service provision, including construction, financing and maintenance, are stressed.

SSA is designed to be flexible enough to adjust to different regions and contexts, and to learn and apply lessons from new experiences. It has already been put to use in planning sanitation interventions in several countries, including Ouagadougou, Burkina Faso; Conakry, Guinea; and a pilot project that covers 10 per cent of the city of Kumasi in Ghana. However, until recently there was little practical guidance on the application of SSA principles to the planning of sanitation in urban centres. GHK et al (2000) helps to fill this gap through a guide to strategic planning for municipal sanitation based on practical experience from a pilot exercise in Bharatpur municipality, Rajasthan, India. Critical lessons emerging from this work are that strategic plans or processes must:

- Be grounded in the existing situation;
- Respond to informed demand;
- Involve all the stakeholders;
- Match action with available resources;
- Take a wide view of sanitation.

Another possible conceptual framework for understanding urban sanitation is suggested through SSA's emphasis on unbundling. In circumstances where there is an absence of a strong central management capacity, it is logical to separate sanitation systems into smaller managed units that allow a greater degree of independence, user involvement and control. This principle is reflected in the Household Centred Environmental Sanitation (HCES) model (Kalbermatten et al, 1999)), which views urban centres as a series of zones radiating outwards in concentric circles from the household level through local communities and larger settlements to the town or city as a whole. HCES' key principles can be summarised in four points:

- Stakeholders are members of a zone;
- Decisions are reached through consultation with all stakeholders;
- Problems should be solved as close to their source as possible;
Decisions, and the responsibility for implementing them, flow from the household to the community to the city and finally to the central government.

Attempts to apply HCES principles as a tool for analysis of sanitation projects has met with mixed reactions, particularly in response to on-plot sanitation systems (Saywell and Cotton, 1999). In relation to a well-documented national sanitation programme (PNSBC in Mozambique), it was observed that (theoretically) HCES might have impacted positively on the programme in terms of fostering stronger demand orientation, and in improving inter and intra sectoral institutional co-ordination. However, several intrinsic limitations were noted, particularly HCES’ assumption of a system of local government to guide implementation (not always applicable or relevant to on-plot systems). Additionally, many low-income urban communities lack social cohesion beyond one’s immediate neighbours, family or social group, hence the concept of thinking and arranging sanitation by zones (one step up from neighbourhoods) is of limited relevance.

More recent concepts regarding approaches to sanitation provision have move beyond organisational and institutional approaches to improving sanitation provision and increasingly focus on understanding the demand for a product (latrine), and developing appropriate marketing strategies that focus on influencing adoption rates. Although ‘social marketing’ as a concept has a long history in the commercial marketing industry, it is an approach increasingly gaining currency in the water and sanitation sector. Berry (1993), Jenkins (1999), and Curtis (1997) are all recent authors on the approach, and a major new study commissioned by the Department for International Development will examine its applicability for (household level) urban sanitation (DFID, 2000)

2.5 Technical issues

Early sections of the review have addressed urban sanitation from a broad perspective. Since the thesis focuses on experience with on-plot sanitation systems, the following sections deal specifically in relation to detailed technical, health, social and management issues.
2.5.1 Types of pit latrine

The principle underlying all types of pit latrines is that excreta, sullage, (sometimes refuse) and anal cleansing materials can be deposited in a hole in the ground. Its basic components, as seen in Figure 2, are a superstructure to provide user privacy, a hole or seat set into a slab which covers the pit, and a pit beneath the slab into which excreta is deposited.

Pit latrines receive only a small amount of water. Since the pit is not sealed, this liquid is allowed to seep from the pit into the surrounding ground. Excreta in the pit undergoes complex chemical and biological reactions which lead eventually to decomposition to innocuous, humus-like solids, water and gases. The remaining water and gases dissipate into the ground or air, leaving a solid residue in the pit. During decomposition, disease-causing pathogens are rendered harmless, a process which may take up to two years.
The residual material left in the pit is compressed and compacted until such time as the pit becomes full.

The size of pits varies markedly from place to place. Pickford (1995) reports that pit sizes of approximately one metre in diameter and three metres deep are typical dimensions in developing countries. Reed (1999) generally concurs with this estimation, clarifying dimensions to include pits of 2.5 – 4m deep and 1 – 1.5m wide. More extreme examples of pit sizes have been well documented. In Uganda, pits are frequently over 8m deep, 2m long, but only 0.6m wide. For the contractors who dig the pits, this shape is preferred as it enables them to climb in and out without using a ladder. Foot holes are cut in the side of the walls alternately on opposite side of the pits (Reed, 1999). The strongest design for pits is circular in plan, as this minimises the risk of pit collapse, the quantity of pit lining required and material used in a cover slab.

The cover slab provides a safe place for the user to excrete. Given that the slab is the part of the latrine structure that the user is in direct contact with, it is important that he/she feel comfortable with the overall design. The slab is placed directly on top of the pit lining at about 15 cm above ground level as a means to prevent surface water entering the pit. Most modern slab designs are made of concrete, and typically feature a squatting hole, foot rests and cover (to prevent children falling in, and to reduce odour/insect nuisance). The pit is normally beneath the latrine shelter, as shown in Figure 2 above. Beyond the simple pit latrine, typical variations in design include pour flush, offset, twin pit and VIP latrines.

Pour-flush latrines

Latrines with water seals (or pour-flush) are suitable where water is used for anal cleaning (this practice is widespread in south Asia). After defecation a small quantity of water is thrown down the pan, causing the excreta to pass to the pit, hence 'pour-flush latrines'. With a well-designed smooth-surface pan only a litre or two of water is required for cleaning, compared with nine litres or more commonly used in a cistern flushed WC. A pan with a water seal can be incorporated in a slab that acts as both a cover to the pit and as a floor of the latrine, with the pit immediately beneath the latrine shelter. More
often the pit is offset, normally outside the latrine building. Floor and pan are supported on firm ground. The pan is connected to the pit by a short length of pipe or channel. Examples of a direct (a) and offset (b) pour-flush latrine are shown in Figure 3 below.

Figure 3: Pour flush latrine with pit beneath shelter

Latrines with tight fitting lids
In Maputo, Mozambique, Brandberg (1985) promoted a low-cost pit latrine that required only two-thirds of a bag of cement and no steel reinforcement. The thin circular dome shaped slab has a removable lid cast in the squat hole to ensure a tight fit. Odour and insects cannot escape from the pit when the lid is placed over the squat hole. Although being used in a densely populated urban area, plot sizes in Mozambique were sufficient to allow for separate pits to be constructed elsewhere on the plot when full. To reduce
costs further many latrines were constructed without any superstructure, except for a privacy screen made from local materials. This popular 'open-air' approach further reduced odour nuisance.

A simpler version of this approach, already promoted in urban Malawi and Kenya, uses a flat, un-reinforced slab 600mm square and 50mm thick, again with a tight fitting lid. The slab rests on local materials of poles or scrap iron sealed with earth. The small slab reduces costs further but ensures a secure, washable and sealable slab. As for the domed slab, a superstructure is not required as part of the design.

Both these approaches are unsuitable for public, communal or institutional latrines as the handle becomes dirty (Brandberg, 1991b). An un-reinforced domed slab is illustrated in Figure 4.

Lids are claimed to have been very successful in controlling flies in Mozambique, where 230,646 latrines with un-reinforced domed slabs and concrete lids were built between 1985 - 1998 (Saywell and Hunt, 2000). However, experience elsewhere has been mixed, with Wagner and Lanoix (1958) commenting on the problem of poor operation and maintenance of these types of latrines.

**Ventilated latrines**

The escape of odours and flies through a squat hole may be greatly reduced by providing a vertical vent from the pit (hence, Ventilated Improved Pit Latrine). Vents may be made from PVC, asbestos, cement, mud and split bamboo or built into the latrine superstructure. For maximum effect, flyproof netting should be fixed across the top of the vent and it should extend approximately 500 mm above flat or sloping roofs or to the apex of conical roofs to benefit from a draught passing across the pipe (Ryan and Mara, 1983). A VIP latrine is illustrated in Figure 5.
Odour control is maintained in a VIP latrine by wind blowing across the top of the ventilation pipe, causing air in the pipe to rise. Replacement air is drawn into the pit through the superstructure and down the squatting hole. This keeps the structure free from odours. Fieldwork in Botswana and Zimbabwe indicated that wind blowing across
the top of the vent and into the latrine shelter was of critical importance to its effective functioning. This contrasted with previous ideas that the pipe should be on the sunny side of the building and painted black, if not naturally black (pipe heating causes the air to rise and allows odours to escape).

Insects are controlled by the presence of a fly screen at the top of the ventilation pipe, which prevents flies entering or exiting via the pipe. The superstructure must be kept dark at all times, and the ventilation pipes needs to be straight to permit light from the pipe shining in the pit (this in turn attracts flies towards the light). Flies that hatch in the pit try to reach a source of light. If the superstructure is sufficiently dark the flies move towards the vent top (Curtis and Hawkins, 1982), are trapped by the flyproof netting and eventually die. The effectiveness of VIP latrines was demonstrated in Zimbabwe, where four pit latrines, two with vent pipes, two without were used equally for six months. 13,953 flies were trapped in the un-vented pits, but only 146 in the vented ones during the subsequent two and a half month period (Morgan, 1977).

However, little consideration has been given to the urban context of latrines in which other buildings allow neither wind nor sunshine to reach the vent pipe. In particular, the effectiveness of ventilation pipes which do not protrude well above roof level in densely populated areas where local wind speed and direction is governed by the height and location of neighbouring buildings is unknown.

**Dry latrines**

With 'dry latrines', users defecate into a bucket, basket or other receptacle that is regularly emptied (manually). Although the collection and disposal of nightsoil is a centuries' old practice (Rybczynski, 1980) poor operation or spasmodic and infrequent collection makes dry latrines malodorous and causes an insect and odour nuisance. Additionally, nightsoil collection exposes those collecting the waste (sweeper or 'scavenger' in Asia) to fresh excreta and its attendant health hazards (Muller, 1998). Although widely condemned by users and authorities alike, millions of dry latrines still exist. In urban India for example, recent surveys by Bijlani & Rao (1990) indicate that 33 per cent use buckets or dry latrines. Paradoxically, in Ghana, two-thirds of household bucket latrine users expressed
satisfaction with them, as they provided reasonable privacy and convenience (Whittington et al, 1992).

**Compost latrines**
Compost latrines allow for the recycling of a natural resource. The theory supporting composting latrines is that the rate of decomposition of faecal matter can be increased by the addition of other waste materials, such as straw or vegetable matter so that the ratio of carbon-nitrogen in the waste is optimised. The majority of composting latrines in developing countries follow the double pit VIP model. The Vietnamese double vault system, for instance, is designed to keep urine and faeces separate on the assumption that this accelerates decomposition and minimises smell.

When properly operated, compost latrines can provide material useful as a fertiliser. Unfortunately, many users have mixed perceptions as to their ease of operation (Saywell, 1999). Compost latrine use is typically restricted to those nations where the practice is customary and the discipline of operation is observed (Hunt, 1986). The lack of adequate composting period leading to high levels of worm infection, and the requirement for users to add organic material regularly are key constraints that makes compost latrines only rarely suitable for urban areas.

**Overhung latrines**
Overhung latrines are built over water into which faeces fall. Only when the water has sufficient flow to carry excreta away and is not used by downstream people is the health hazard low enough for the latrines to be considered as satisfactory.

**Septic tanks**
Septic tanks are designed to be watertight. Solids settle in the tank while liquid effluent is allowed to percolate into the ground from a soakaway or drainfield. Solids stored in the tank digest anaerobically over time, reducing in volume during this process. Conventional septic tanks are designed to take both WC and sullage wastes (Tayler, 1999) and as such offer the same benefits to householders as sewerage and the same disadvantages, high cost and the need for piped water (Pickford, 1980). The discharge of effluent to a soakaway adds to the cost and requires lower-density housing to operate effectively. An
Figure 6: Continuous composting latrine

Perspective view

Cross section

Vent pipe
Toilet seat
Refuse chute
Access for removing compost
N shaped ventilation channels
Partition wall

Fly-screened air vents

Vent pipe
Toilet
Refuse chute
Partition wall
Fly-screened air vents

Loosely packed waste
N shaped ventilation channels
Consolidated and decomposed waste collects at the bottom and slowly slides to the end compartment for removal
Removal hatch
alternative is to discharge effluent to storm drains, but as septic tank effluent is highly charged with potentially pathogenic organisms, this practice involves obvious health risks. Key limitations with septic tanks in the urban context include their cost and space requirements.
Aqua privies

Aqua-privies are watertight tanks located beneath latrines so that faeces fall into the tank. Effluent is discharged to soakpits. They have a reputation for poor operation and are seldom constructed today, except as communal latrines. The need for large quantities of water for cleaning the drop pipe has been given as another disadvantage of aqua-privies.

At their best, when simple pit latrines are well designed, built and maintained they provide sanitary benefits as good as more sophisticated options. Their low cost, simple construction technology, ability to be upgraded by householders and acceptance of different anal cleansing materials make pit latrines a practical and widely used form of sanitation for many urban people. At their worst, however, pit latrines provide levels of sanitary hygiene little above open defecation.

2.5.2 Controlling insect and odour nuisance

The literature review revealed that pit latrine use is not free from operational difficulty. Complaints about pit latrines most frequently mention insect and odours nuisance. In general, there are few specific references to overcoming these nuisances in urban areas, and more specifically the literature on odour nuisance is extremely limited.

The main vectors of concern with regard to low-cost sanitation are arthropods, which include insects, arachnids and centipedes/millipedes (Lacairn and Reed, 1999). Within this grouping, Class Insecta are of the greatest relevance since it includes (amongst others) mosquitoes and flies (Order Diptera), and cockroaches (Order Dictyoptera).

2.5.2.1 Flies

Although the literature is not conclusive, there is indicative evidence that flies can be a transmission route for diarrhoeal diseases (under certain circumstances) and for trachoma (Chavasse, 1997). However, the importance of flies in disease transmission is highly context-specific, depending critically on species composition, fly density and local sanitation practices.

Houseflies (M. domestica) are the fly species of greatest concern because they feed on human faeces, are domestic in their habitat and commonly settle on children. However,
the extent to which they present a latrine-oriented nuisance is debatable. Their preferred breeding grounds in urban areas tend to be rotting vegetable matter (found in household rubbish), or animal dung. Houseflies only occasionally breed in human faeces, and if so, in the ambient environment, not in latrines since the presence of other vectors (soldier fly and blowfly larvae) renders the latrine unsuitable for species breeding. *M. sorbens*, a relative of the housefly, is common in the tropics and are found in high densities where there is little or no sanitation coverage. Although the species breeds easily in scattered human faeces, they do not breed in latrines. Blowflies (*Chrysoma putoria* and *C. magecephela*) prefer to breed in latrines and will increase rapidly as a result of a latrine programme. With high densities, blowflies are linked to diarrhoea causing pathogens, and are unpleasant for users, possibly reducing latrine usage.

2.5.2.2 Mosquitoes

Whether a pit is dry or wet makes no difference to fly breeding, but for mosquitoes wet pits are essential, as the larvae need water to swim in and have a free liquid surface for the breathing siphon (Curtis and Hawkins, 1982). Maxwell and Curtis (1990) report that before a campaign to control mosquitoes was introduced in Zanzibar, Tanzania, it was estimated that each person in the town of Makunduchi received about twenty five thousand bites per year. Most of the mosquitoes bred in wet pit latrines. Half the population was infected with filariasis. Certain types of mosquitoes (the *Culex quinquefasciatus* variety) are a significant urban nuisance mosquito because they breed in polluted water and are a vector of filariasis. In situations where latrines have a free water surface because of either a high water table or because large volumes of wastewater enter the latrine, conditions can become optimal for mosquito breeding (Chavasse, 1997).

2.5.2.3 Cockroaches

Cockroaches act as mechanical vectors transmitting diarrhoeal diseases, typhoid fever, dysentery and viral diseases. Cockroaches can become contaminated with pathogens that are readily transferred to food, utensils and food preparation when adult cockroaches scavenge for food at night. Although evidence is limited, Chavasse (1997) argues that cockroaches are less important than flies as disease vectors, except in cases of extreme infestation. Latrine programmes can inadvertently lead to an increase in local cockroach numbers if pit conditions are moist and suitable for breeding.
Reduction of flies, mosquitoes and cockroaches are therefore of critical importance in maintaining user satisfaction with latrines. Chavasse (1997) and Lacairn and Reed (1999) provide a comprehensive review of the methods that may be employed to control these three vectors. Summaries of these methods are listed below:

2.5.2.4 Fly control
- Reducing the number of breeding sites (principally via improved plot based management of animal dung and improved plot based management of domestic waste);
- Adoption of 'fly exclusion latrines' (those which prevent or discourage flies from entering or exiting the pit, or from breeding in the pit (i.e., urine diversion, VIP and pour flush latrines)
- Reducing fly-pathogen and fly-human contact (i.e., window screens, covering sleeping babies, etc)
- Chemical control of flies (although it is recognised that due to extensive use of chemicals, flies have developed resistance to insecticides);
- ‘Lobster pot’ mechanical trap at drop hole.

2.5.2.5 Mosquito control
- ‘Lobster pot’ mechanical trap at drop hole;
- Mosquito nets, curtains and coils;
- Chemical control measures (including insecticides applied during residual spraying, space spraying and larvicide treatment). Tables of insecticide use are reviewed by Lacairn and Reed (1999: 94-96);
- Application of a 1cm thick layer of polystyrene beads (Reiter, 1978). The beads prevent mosquito access to the water surface. Tests in Zimbabwe when one kilogramme of 4 - 6 mm diameter polystyrene balls were added to a pit reduced the emergence of mosquitoes from about 1,500 to 65 a week (Morgan and Mara, 1982). In 1988 all pits known to contain water were treated with polystyrene beads in Makunduchi, Zanzibar. In the following year the biting population of mosquitoes had been reduced by 98 per cent (Curtis, 1991). No information on the durability or frequency of this kind of treatment is available.
2.5.2.6 Cockroach control

- Indoor residual spraying of latrines, mainly on monthly basis (Lacairn and Reed, 1999).

2.5.2.7 Odour nuisance

There is a wide body of anecdotal evidence that supports the notion that latrines are malodorous. Pickford (1995) reports two instances of odour nuisance, one from a survey of 27 respondents in Yemen who complained about the smell from their existing latrines (cited from Mullick, 1987), and secondly in Juba, Sudan, where nearly half of all pit latrine owners said ‘smell’ was their chief complaint. In this latter study (Nichols, 1982) it is not clear whether ‘smell’ was a function of cleanliness in the latrine.

A study by Harris et al (1981) reworked earlier survey results from 353 households in Dar es Salaam looking at satisfaction levels. Latrines were considered to be satisfactory or unsatisfactory according to levels of cleanliness and freedom from unpleasant smells, flying and crawling insects. Poorest conditions were associated with tenure status, and unexpectedly, when households possessed piped water connections. Those toilets considered to be in the most satisfactory condition were associated with conditions where excreta levels in the pit were low (typically more than 2 metres deep), and when a male owner cleaned latrines.

2.5.3 Pit size, single and double pits

Large pits have many advantages. Experience in East Africa (Pickford, 1995) showed that if pits are deeper than four metres they ‘never’ fill up. A survey in Dar-es-Salaam (Harris et al, 1981) measured many pits which had served their households for more than twenty years and were still in use with no nuisance from smell or flies. As part of an upgrading scheme for urban areas in Malawi (Brandberg, 1988) the volume of pits was increased to one cubic metre per user. The lifetime of the pit was estimated to be between thirty and fifty years.

Pit latrines may have a double pit with each pit being used alternately. When one section is full it is ‘rested’ for two years, while the other section is in operation (see Figure 9). This resting period is currently considered sufficient for all pathogens, including roundworm, to die. At the end of this period the accumulated solids can be safely removed.
VIP latrine pits may be slightly offset, with the vents and removable slabs located outside the buildings. Pits with a removable slab lining facilitate the pit emptying process. Latrines similar to the VIP have been constructed with pits completely outside of the latrine shelter. Chutes direct excreta to the pits from seats or squatting slabs inside the superstructure. Known as ROEC, latrines of this type were constructed in southern Africa in the late 1970s, but are no longer popular as the chute becomes fouled, attracting flies.

With pour-flush latrines two quite separate pits can be built. In a Y-junction the flow from the pan can be directed into either pit. One of the twin pits (or one chamber of a double pit) is used continuously for two or three years during which it fills to within half a metre or so of the top. Then the other pit or chamber is used for the same period. Whilst the possibility of using the decomposed contents as a fertiliser is frequently stated, it is important to note that this will not necessarily be an option for householders in urban areas. In fact, disposal of the contents often presents problems.

However, in Kurunegela, Sri Lanka some householders failed to use twin pits properly (Cotton and Franceys, 1987) and there is anecdotal evidence from both Africa and Asia of poor operation. Frequently, both pits are used together and fresh solids are removed from both pits with attendant health hazards. Hoque et al (1994) reports on a survey of 214 households in Dhaka using double alternating twin pit latrines. Despite on-going health education programmes, 74 per cent of all families reported using only one pit, indicating that the routine of alternating pits was neither acceptable nor convenient to users in this context.

2.5.4 Solids accumulation and pit emptying

Pits gradually fill with accumulated solids and with liquid if the soil is not sufficiently permeable. The factors affected solids accumulation has been well-documented elsewhere (Schertenleib & Hawkins, 1983; Morgan & Chimbunde, 1982). Reed (1999) provides a concise overview attributing solids accumulation to six factors including number of users; shape of pit; volume of waste produced by each user; volume of other materials in the pit; decomposition rate of the deposited wastes; and permeability of the soil surrounding the pit. Although little reliable quantitative data about solids accumulation is available, field observations near Calcutta in the Gangetic plain with high groundwater
found that the rate of accumulation decreases with time (Adhya and Saha, 1986). This study has reassessed their data, giving a best-fit curve with the following equation: \( A = 150 + 6y \), where \( A \) is the long-term accumulation in litres per person after \( y \) years, with \( y \) greater than two.

In a UNDP sanitation programme in Jakarta small pits (about 1000 litre volume) required repeated emptying within 300 days of being desludged once. This was assumed to be due to the clogging of the soil around the pit. Larger (4000 litre) pits did not experience the same problem (de Kruijiff, 1987). Liquid in pits is derived from decomposition of faeces, urine, anal cleaning, latrine floor/pan cleaning, and sometimes from sullage tipped in the latrine. There are contrary views about whether sullage should be disposed of in pit latrines. Morgan (1990) and Feacham et al (1989) both advocate sullage disposal as an aid to promoting waste digestion. However, Harpham et al (1988) contrasts this view with studies taken from Addis Ababa. The percolation rate of liquid from the pit depends on soil conditions and the groundwater level relative to the liquid level in the pit.

Pits should be rested when they are filled to within half a metre of the top so as to prevent subsidence, and domestic animals from burrowing into the pit (Reed, 1999). If there is sufficient space on the plot a second pit may be dug. When full the first pit is topped up with soil and abandoned. A banana or other tree planted may grow well given the good supply of nutrients. In some places the floor slab and superstructure of the latrine are constructed in such a way that they can be moved relatively easily to the position of a new pit.

In urban contexts where land is scarce and it is technically difficult and expensive to re-excavate pits, latrines can be emptied (Muller and Rijnsburger, 1994). Typically, pits are emptied either manually or mechanically. Manual emptying is employed with more fluid types of waste and uses scoops and buckets, while thicker sludge is dug out by hand (Muller, 1998). Manual emptying of a recently filled pit is hazardous to health, as the material will carry live pathogens. Mechanical methods centre on use of vacuum tankers,
Figure 9: Pour-flush double pit latrine

Section

Plan

(Distance between pits (a) = width of one pit)
where atmospheric pressure forces pit contents along a hose into a tank under a vacuum. Emptying with a vacuum tanker (as used for septic tanks or street gullies) removes liquid, but thicker sludges present difficulties and may require water jetting or agitation with the end of the suction hose to increase viscosity and induce flow of the waste.

However, conventional vacuum tankers developed in industrialised countries with a tank volume of 4-6m³ have proven inappropriate in developing countries (Schertenleib & Hawkins, 1983, Muller 1998). Carroll (1985) reports on the use of tankers specifically designed for pit emptying in developing countries, but they have high fuel consumption costs, undergo rapid wear and cannot gain access to congested slum and peri urban settlements. Smaller, cheaper, slower and more manoeuvrable tankers have been developed which address these problems (Coffey, 1988; Riinsburger, 1991).

In Dar es Salaam, the Manual Pit Emptying Technology (MAPET) service has contributed to the improvement of environmental sanitation in unplanned areas through effective and hygienic latrine emptying services. The main components to the service are the high manoeuvrability of tankers in unplanned areas (handcarts are a maximum of 800mm in width with a volume of 1-3m³), responsiveness to the demands and needs of residents, the creation of self-employment opportunities, and hygiene improvements to the working conditions of pit emptiers (Kirango and Muller, 1997). The project was introduced in 1988 with seven teams in operation. In 1992, it was still running independently with five operational emptying teams (Muller & Riinsburger, 1994). Similarly, a small volume vacuum tanker (the 'vacu-tug') has been developed and field tested in Kibera, the largest low-income area in Nairobi, Kenya (Tayler, 1999; Wegelin-Schuringa and Coffey, 1999).

In many cases, the problems of pit filling are overcome either by having very big pits or using alternating twin pits. Characteristically, twin pits are quite shallow (1.5 metres on average), and are suitable on sites with groundwater or hard rock at shallow depth. With very shallow groundwater or rock the depth of excavation can be further reduced by raising the floor above ground level. The technique of allowing the full pit to ‘rest’ for about two years usually means that the contents can be manually dug out without presenting any significant health hazards.
2.5.5 Groundwater pollution
The links between latrines, groundwater and health have been extensively discussed and documented (Lewis et al, 1980; Fourie and Ryneveld, 1995; Cave and Kolsky, 1999). The following sections provide a brief summary of the key lessons learned emerging from these and other texts on the subject and the section concludes with a summary of policy considerations in relation to the provision of on-plot sanitation systems.

Sources of pollution from on-plot systems can be categorised as follows:

**Microbiological contaminants**: liquids percolating into the soil from latrine pits or septic tanks contain large numbers of micro-organisms of faecal origin, including viruses, bacteria, protozoa and helminths.

**Chemical contaminants**: including nitrogen and phosphorus. Chemical pollution extends much further than pollution by micro-organisms. In areas with high pit latrine densities, nitrate concentrations may build up to in excess of World Health Organisation (WHO) drinking water guidelines.

A particular problem in densely populated urban areas is the possible proximity of latrine pits and shallow wells on neighbouring plots. Whilst the levels of service for water supply remain poor, many urban dwellers are likely to use a nearby shallow well if the groundwater table is sufficiently high. The lack of effective urban development planning control means that it is very difficult to regulate and enforce the relative location of latrines and wells on plots, even in formally developed areas.

All types of sanitation pose a pollution threat to some degree. Fourie and Ryneveld (1995) argue that when considering pollution from on-plot sanitation, there are three primary aspects to consider:

1. That human excreta contains a number of different possible contaminants;
2. That at sufficiently high doses, these contaminants are potentially hazardous to human health and or the natural environment;
3. In order for a dose to be transmitted to a host, the contaminants must be sent by one route or another from the source to individuals or to the environment.

A key route to transmission is the subsurface, hence a clear understanding of contaminant movement and the range of factors which affect it is critical to the development of guidelines for minimising pollution risk to groundwater sources from on-plot systems. Microbiological contamination, its mobility and processes affecting it are reviewed in detail by Drewry and Eliassen (1968); Stumm & Morgan (1981); and Tim and Mostaghimi (1991). Key issues emerging from these sources include the effectiveness of physical filtration being linked to particle size of soil, and residence times of viruses in unsaturated zones to ensure removal via adsorption processes.

Hydrogeological factors affecting contaminant movement has been addressed by Romero (1972); Fekpe et al (1992); and Lewis et al (1980). Permeability of soils, varying hydraulic conductivities of soil types and the presence of macropores in soil profiles all affect contaminant movement to groundwater levels. Caldwell and Parr (1937); Gerba et al (1975); Cochet et al (1990); and Sikora and Keeny (1976) reviewed in detail the movement of viruses, bacteria and nitrates. Conclusions arising from these studies indicate that travel distances for viruses are limited to three metres from the pollution source before almost complete die-off results. For bacterial contamination, two metres of intact, unsaturated soil between groundwater and pollution source is acknowledged to be sufficient for removal of nearly all bacterial pollution. A figure of fifteen metres between a pollution source and downstream water point is generally regarded as acceptable for the removal of contaminants.

Summaries of the salient findings in relation to general contaminant movement include:

- On reaching the groundwater table, the rate of contaminant movement will be much greater than in the unsaturated zone, and this movement will be in the direction of the local groundwater flow;
- The presence of macropores in the soil (caused by channels formed from decomposed roots, or rock fissures) may significantly increase contaminant movement;
Studies by Sengupta (1996) indicate that contaminant travel is higher in sandy soils than in clayey silt or silty clay soils;

An understanding of the physical and chemical processes that remove contaminants from water during movement through the subsurface is important in understanding whether influent from a particular latrine will pollute a drinking water source;

The movement of contaminants through the subsurface is affected by processes which may affect the concentration and composition of the contaminants;

It is unclear to what extent nitrate can be denitrified in the soil to produce nitrogen gas that will escape into the atmosphere.

A report by Cave and Kolsky (1999) is one of the few texts which attempts to weigh the body of scientific evidence and abstract findings of relevance to practitioners. The thrust of their discourse is to categorise the main arguments into environmental concerns (where groundwater resources are considered sacrosanct) and to set this against wider public health concerns (actual risks to health from open defecation). Epidemiological evidence is reviewed in relation to the health aspects from drinking polluted groundwater and from wider community contact with excreta. Options for policy makers on the basis of these findings are presented. Three critical points are noted from this study:

Other than drinking water contamination, there is little reason to be concerned about the threat of groundwater pollution. Natural streams typically record faecal contamination levels of between $10^3$ to $10^4$ E. coli/100 ml, a level that is not considered unacceptable in either the industrialised or developing world unless specific activities (e.g. bathing, swimming, fishing or irrigation) are planned. Quality standards for bathing and irrigation are concentrated around a norm of 1000 E. coli/100 ml (Mara and Cairncross, 1989; Kolsky, 1999). If on-site sanitation leads to groundwater pollution at this level of contamination, then the rationale for treating water prior to drinking are similar to those for treating equivalently contaminated surface water. In cases where the pollution is one - two orders of magnitude lower than this, there is not significant epidemiological arguments that treatment is now required to prevent a significant hazard to health. In this context it is unwise to abandon the health benefits of improved sanitation to eliminate the risk of groundwater contamination of less than 1,000 E. coli/100 ml.
 Much of the policy debate about groundwater pollution assumes that it is a categorical phenomenon; either there is faecal contamination or there is not. This perspective may be appropriate when based on drinking water standards that are set 0 E. coli/100 ml as a means of minimising the risk of faecal-oral disease transmission. However, epidemiological evidence concerning the relationship between dose and response in drinking water suggests that pollution is significant at doses greater than $10^3$ E. coli/100 ml.

Groundwater pollution is therefore a 'grey' topic that cannot be easily resolved by reference to absolute water quality targets or guidelines. Rather it is more appropriate to aim for practicable quality standards that can be achieved within the wider development context. Such an approach will depend on the local alternatives of water supply. In the majority of cases, however, there need not be a conflict between on-site sanitation and groundwater quality. In most cases, where appropriate separation between the latrine and the water used for drinking can be maintained, and especially if the pit of the latrine can be kept above the water table, groundwater contamination by latrines need not be a serious concern.

In essence the debate concerning groundwater pollution revolves around an appreciation of relative hazards and relative risks. The thesis presented by Cave and Kolsky (1999) is that sector professional's reaction that pit latrines are 'unacceptable' in urban areas due to the risks posed by groundwater contamination needs more critical examination. This response is frequently predicated on unstated, untested and doubtful assumptions about the causal chain of disease and the choice of sanitation option. The contamination of the surface environment through open defecation is the primary environmental concern since this has the greatest potential to transmit health hazards to the wider community. There are obviously health hazards associated with groundwater pollution when communities are abstracting water from nearby shallow wells for domestic consumption, but these risks need to be viewed in relation to the risks from faecal contamination at the ground surface.

Cotton (1997) argues that groundwater pollution can be dealt with in two ways: modifications to the sanitation system (i.e., soakpit surrounded by sand envelope), or through changes to the water supply system (i.e., establishing a reticulation system with
standposts to reduce the need for using groundwater for domestic consumption). Other options for consideration include extracting water from a lower level in the aquifer, which is acceptable assuming low extraction rates and proper sealing of well casings as they pass through the pollution zone.

2.5.6 Small plots and high density populations

Critics of pit latrines often claim that they are unsuitable for small plots in urban areas. Whilst reviewing the literature it was clear that although the documented information on this topic is sparse, there is a widespread consensus amongst sector professionals that small plot size is a significant constraint to project implementation.

Typically, the literature highlighted small plot size in relation to references on planning norms. In Indonesia, planning regulations indicated that districts in excess of 250 persons per hectare should be classified as densely populated and therefore inappropriate for on-plot sanitation. In Jamaica, local planning regulations prohibited pit latrine construction in districts with a housing density higher than ten houses per acre (23 houses per hectare) (Alaerts and others, 1991). UNCHS (Habitat), in a manual on pit latrines (excluding VIPs) argued that these systems were, “unsuitable for use in even low density urban developments” (Roberts, 1987). Likewise, the smallest plot size recommended for twin-pit pour-flush latrines in India is 26 square metres (Ribeiro, 1985). Shahalam (1984), when comparing the basic requirements for different types of urban sanitary technologies, argues that the VIP and pour flush latrines are ‘not suitable’, although no specific guidance is given as to how this judgement had been reached. In general, the criteria applied in reaching these conclusions do not appear to have been triangulated through reasoned argument nor on evidence of performance.

In a survey of 3,264 households in Bihar, India, Sinha and Ghosh (1990) found that for those households that had failed to convert dry latrines to pour-flush latrines, only 0.9 per cent of respondents gave ‘lack of space’ as the reason for not taking advantage of the scheme. Adequate funding was made available to facilitate this conversion, therefore cost considerations could be discounted.
2.6 Health and social issues

2.6.1 Introduction

It is often difficult to conclusively prove that latrines lead to beneficial health outcomes. Rahman et al (1985) cites positive evidence from a study of mortality rates among 2,500 infants in Bangladesh. Mortality amongst infants over 4 weeks old was 3.12 times higher in households not using latrines, compared with those that had adopted latrine use. Likewise, Silva & Athukorala (1991) showed that in four similar low-income communities in Sri Lanka the only community in which people defecated in the open corresponded with the community with the highest incidence of diarrhoea. A discourse on the broad health implications arising from sanitation can be found in Cairncross & Feachem (1993). The authors caution against specific attribution between intervention and health outcome (see
discussion below), but argue generally that the combination of measures to improve personal and domestic hygiene and the provision of adequate water supplies and safe excreta disposal lead to health benefits

Although it is generally assumed that improved sanitation results in a reduction in the spread of diseases (and results in other social or environmental benefits) it is methodologically difficult to demonstrate a causal relationship in practice. Esrey et al (1991) in an epidemiological review of literature demonstrates that compared to a range of interventions, sanitation alone accounts for a 36 per cent median reduction in diarrhoeal morbidity. However, this is clearly a contentious area of debate, and other sources (UNCHS (Habitat), 1987 and Cairncross, 1990) provide an insight into the problems associated with measuring the impact of water and sanitation facilities on health.

Furthermore, low-income urban communities are seldom convinced by health statistics. Rather, it is socio-economic or socio-cultural factors that are important determining factors. Some households invest in toilets because of the status of having a latrine exclusively for their use (Franceys and Cotton, 1988; UNCHS, 1986a). For many, there is a convenience factor to be gained by avoiding a long walk to the nearest facility, or in women not having to visit communal facilities that are poorly lit. To illustrate this wider point, a survey by UNCHS (1986a) in five Nepalese urban centres examined motivations for construction of latrines outside government subsidized programmes. Only 28 per cent of respondents gave health as a reason; 43 per cent gave prestige, comfort, privacy or a combination of these factors. Studies by Jenkins (1999) in rural Benin reinforce this point with prestige and comfort being cited as the most important reasons for installing a household latrine.

Existing traditional latrines, although unsatisfactory in many design respects, do reflect local norms, sociological and cultural preferences and represent an investment by the people who built them. It may be possible to upgrade them to improve safety and hygiene (Wegelin-Schuringa, 1991). For example, Larbi (1990) reports that in Botswana the cost of separate components such as a concrete slab, vent pipe, flyproof vent screen and squatting pan was one-seventh the cost of a new BOTVIP (the local name for VIP latrines). The broader issue is the importance of respect for custom and culture and the recognition
that people do not come to projects as 'blank sheets', but have existing and well
developed ideas and practices. Beall (1997) argues that in recognising local norms, it is
critical to acknowledge that they are context specific and adapt to changing
circumstances.

2.6.2 Latrine use
A number of projects report that latrine construction is easier to achieve than latrine use
(Burgers, Boot & Wijk-Sijbesma, 1988). In general, the importance of user perception in
latrine use is discussed in detail by Jenkins (1999) in her work on rural latrine programmes
in West Africa.

The importance of involving householders in the planning and construction of latrines to
ensure satisfactory maintenance is widely acknowledged (DFID, 1998). User preferences
should always be considered, even if these preferences refer to details which outsiders
may consider irrelevant. Gibbs (1984) in a survey of Bangladesh latrines and user
perceptions found that superstructure quality was more important to the user than the
type of technology installed. In this example, latrine use by adult women was more
frequent if the superstructure was structurally sound and afforded the user privacy. By
contrast, children were typically unconcerned by the privacy issue, defecating in the open
where there was no fear of the dark or threat of falling down the squat hole.

Cotton (1993) reports that in Cuttack, India the key factor affecting latrine use was the
privacy afforded, particularly for women. The importance of locating a latrine so that
people can enter without being seen has been noted in several cultures in developing
countries (Burgers, Boot & Wijk-Sijbesma, 1988). In some societies, it is acceptable to be
seen going to have a bath (Morgan, 1990). Many people in Dar es Salaam like to take a
bucket of water to the latrine and bathe after defecation. A simple, low-cost latrine
superstructure design is therefore an essential part of any sanitation package in order to
maximise latrine use.

Kotalova (1984) further demonstrated the importance of culture and perception in latrine
use from a study in Kumasi, Ghana. The report reviews the outcomes following the
decision to adopt pit latrines in low-income communities after several master plans for
sewerage had been abandoned. The householder of the first demonstration unit refused to use the latrine because it faced the direction of Mecca. As a devout Muslim the user was concerned that latrine use would convey disrespect.

Jenkins (1999) disaggregated perception concerning latrine use amongst men and women in rural Benin. Findings indicated that women rated convenience, usefulness, suitability, cleanliness and smell of latrines higher than men. They were more likely to be motivated by comfort, personal protection and restricted mobility issues than prestige, physical safety and health benefits.

Irrespective of perception, latrine use may be compromised by inadequate support to communities in using and maintaining latrines. In the Baldia Soakpit project (Karachi, Pakistan) information including instructions about the use and maintenance of latrines were prepared for users. It was subsequently realised that most women in the community could not read, so adult literacy classes were established. In 1987, a consultant who surveyed pit latrines constructed in Baldia found that in almost all those latrines recorded as 'not in use', either the outflow had been redirected to the street's open drain or an overflow from the pit discharged to an open drain (Bakhteari & Wegelin-Schuringa, 1992).

More contemporary surveys carried out in India (Sinha and Ghosh, 1990) highlighted the range of problems facing householders and their impact on latrine use. 7 per cent did not use household latrines because they were blocked, 8 per cent because the pits were full and had not been cleared, 2 per cent because of water shortage, 12 per cent because the latrine lacked a superstructure and 4 per cent because of poor latrine location. A further 23 per cent experienced problems such as overflowing, blockage or damaged pits. Of the latrines in use, 37 per cent were cleaned less than once a week.

2.6.3 Children and latrines

Earlier sections of this study have reported how inadequate sanitation impacts most significantly on the vulnerable in communities, including children. The risk to children may be a function of their lower appreciation of hygiene behaviour issues, or to their limited immunity to diarrhoeal pathogens. By way of illustration, Feachem et al (1993) reports that children's stools are frequently infected and have high worm populations.
Sanitation systems appropriate for adults typically fail to account of the needs of children. Shared latrines may appear a reasonable option in urban areas, but for children a latrine even a short distance from the household plot presents significant problems. Children may be unable to wait to use the toilet, especially if they have diarrhoea, or may be jostled by adults and other children when queuing in line for the latrine (Bartlett, 1999). For many children, latrines are frightening places because they are dark and hazardous (smell, insects, etc). A UNCHS report (1986c) found that Kenyan schoolchildren mentioned the following fears when using latrines: 86 per cent mentioned snakes and other animals, 56 per cent mentioned falling into the pit, 48 per cent mentioned smells, filth and insects, 35 per cent mentioned black magic and 14 per cent were afraid of being left alone. Lindskog and Lund (1998) found a similar resistance to latrine use amongst children in both Malawi and Nepal. The study found children rarely used latrines until the ages of 5-7 because of their fear of falling into the pit.

However, there are some isolated examples of service providers taking children's sanitary needs seriously in the urban environment. A slum-upgrading scheme surveyed in Madras, India, included separate children's latrines. The superstructure consisted of a wall 600 mm high - tall enough to provide some privacy but low enough for a mother to lean over and attend to a small child. Where a children's latrine has a seat and a child is too short to reach it, a concrete block or stone can be put near the seat to put feet on (Mathebula, 1987). Likewise, SPARC (1998) highlight a case from Viyamshala Gymkhana slum in Bangalore, India. Prior to 1998 the community's 300 families had no functioning toilets, but Viyamshala's Mahila Milan constructed a children's and community toilet. Special design features for the latrine included sturdy handlebars for support when squatting, a central channel and single gully trap. The toilet block was kept clean of cobwebs, lizards and was well lit. Boundary walls had been painted with contemporary designs to produce a more relaxing atmosphere and in some cases pebbles had been inset into the walls so children can practise counting during visits to the latrine.

Health and social issues: key points

- It is often difficult to prove direct cause-effect relationships between specific sanitation interventions and improvements in health, although several studies show positive indications;
Low-income people are rarely convinced of the benefits of sanitation by health statistics, status, convenience and privacy are all important perceived benefits of on-plot sanitation;

Traditional latrines may be unsatisfactory, but careful attention should be paid to them as they reflect cultural and social preferences and a willingness to invest;

A lack of attention to the ideas and perceptions of users in planning and implementation is unlikely to result in long term use of latrines;

Limited surveys of latrine use and condition indicate a wide variety of problems linked to operation and maintenance that discourage their use.

2.7 Management issues

2.7.1 Management and bureaucracy

On-plot sanitation is normally the responsibility of those who live or work on the plot, and in many cases this will be the owner/occupier of the house (the 'householder'). Many latrine programmes which rely on central agency financial inputs do not receive the levels of political and financial backing needed to serve sizeable proportions of the urban poor (Harpham et al, 1988). Other than providing cash, governments and other agencies can support on-plot sanitation programmes through:

- 'Motivation', encouraging householders to construct latrines often in conjunction with a health education programme;
- Technical support through advice, training, preparation of leaflets and supervision of construction;
- Resolving legal problems, including lack of land tenure in informal areas and inappropriate building regulations;
- Making scarce materials available - cement, reinforcing steel and fly-proof netting are often difficult to obtain in the market place;
- Prefabricating components such as slabs, pans and water seal traps

Either independently, or in association with an external agency that facilitates the process, a community may manage an on-plot sanitation programme, undertaking some of the
activities listed above. For example, this may involve community organization and control of a revolving fund, using self-generated cash or a grant obtained from an NGO or external donor. It may also include a small community working together to dig pits for each member in turn. Kurup (1997) reports on the Bombay and Bangalore latrine construction programmes. In this case, the process of developing community participation was made simpler by focusing on infrastructure items that communities considered vital to their survival, that they could organise themselves and which increased their confidence and capacity to deal with other stages of service improvement.

The success of latrine programmes may be jeopardised by a bureaucracy applying too much persuasion. In Malawi prior to Independence, government officials mandated householders to dig latrines with the result that it became a sign of political integrity not to own a latrine (Pickford, 1995). Lohani & Guhr (1985) report that in the Bhaktapur project, Nepalese householder’s ‘choice’ of latrine type was in fact limited because local conditions and subsidies favoured only the twin pit pour-flush variety.

Many politicians, administrators and engineers are prepared to disregard the value of lower cost systems such as pit latrines in favour of more ‘modern systems’. This may be partially attributed to the didactic methods of education and university courses based on the problems of western industrialised countries that fail to consider ‘alternative’ engineering designs (Saywell and Cotton, 1998). However, it is clear that even in the 1970s, before the Water Decade promoted widespread consideration of options for sanitation other than conventional sewerage, the proportion of households being served by pit latrines was steadily increasing. For example, the percentage of the urban population in Zambia served by various systems was as follows (Iwugo et al, 1978b).

<table>
<thead>
<tr>
<th>Facility/year</th>
<th>1969</th>
<th>1974</th>
<th>1976</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flush toilet</td>
<td>56.7</td>
<td>46.2</td>
<td>43.9</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Aqua-privy</td>
<td>7.0</td>
<td>5.4</td>
<td>4.8</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Pit latrines</td>
<td>26.7</td>
<td>37.7</td>
<td>40.1</td>
<td>Increasing</td>
</tr>
<tr>
<td>Bucket latrines</td>
<td>2.1</td>
<td>1.5</td>
<td>1.4</td>
<td>Decreasing</td>
</tr>
<tr>
<td>None</td>
<td>7.5</td>
<td>9.2</td>
<td>9.9</td>
<td>Increasing</td>
</tr>
</tbody>
</table>
Another example of increased on-plot system coverage comes from Mozambique and the National Low Cost Sanitation Programme (PNSBC). In the immediate post-Independence period, Maputo city council provided 7,200 latrines free of charge in selected areas of the city. The project was of limited success because of the latrine's short design life and because free issue did nothing to encourage wider latrine construction (Brandberg, 1983). However, more success was achieved through the formation of the PNSBC programme. In this initiative, each unreinforced domed slab had a life-long guarantee and bore the maker's signature, so that defective slabs could be identified and the mason retrained. In an evaluation of the Programme, Saywell and Hunt (2000) reported that between 1985-1998, PNSBC sold and installed 230,646 improved latrines, benefiting an estimated 1,383,876 peri-urban users. The average coverage of improved latrines was estimated at 38 per cent of peri-urban households in the major cities, rising to a maximum of 60 per cent in Pemba.

There is now a strong move towards a 'demand' or 'market driven' approach rather than the previously used 'supply' or 'product driven' approach of service provision. This shift in thinking was largely in response to the unsatisfactory performance of past projects and programmes that were typified by neglect of user requirements, emphasis on large scale projects that restricted competition and poor attention to O&M of installed systems (Wright, 1997). Other commentators, such as Raj (1991) argue that an additional benefit of demand responsive approaches is that they address the inefficiencies of the public sector, which are characterised by government employee's job security, lack of incentive systems, inflexible use of staff and absence of links between productivity and salaries.

A central weakness of the emphasis placed on demand driven approaches is the significant institutional change they imply, and the ability of those institutions to respond to a changed institutional culture. Demand driven approaches involve different processes than the formal supply driven process of urbanisation (EHP, 1997a). Typically, urban sector institutions in developing countries are set up for the latter, and are not organisationally structured and prepared to carry out demand driven development. Institutions have their own laws and regulations, institution mission statements, goals, personnel and methods. Staff are trained in a supply oriented manner in their approach to urban planning, thus discussions of demand driven approaches often lead to confusion for staff about
institutional and personal responsibilities towards peri-urban communities. An additional problem with the approach is that assessing demand becomes an exercise that can inflate expectations about service delivery, which could be years in delivering, or simply not feasible. Regardless of this, recent research suggests that moves towards participation and a ‘demand’ based approach are only likely to work if providers see ways in which these moves will help them to achieve their perceived objectives. (GHK R&T, 1998).

One alternative approach is the creation of financially autonomous agencies for water supply and sanitation, as seen in Brazil and Tunisia (UNCHS, 1989). In practice, however, this financial autonomy is of limited value because the state or national government automatically pays any deficits.

2.7.2 Costs
A characteristic of appropriate on-plot sanitation systems is that most of the costs are for local material or labour. Imported supplies and equipment may have a range of prices, from low ‘official’ rates to ten or twenty times as much on the open market. Similarly, official conversion rates between local and ‘hard’ currency may be unrealistic. Consequently, attempts to give an international cost of different types of sanitation are of very limited value. To eliminate inter-country variations, financial statistics are often expressed in United States dollars, but this does not overcome the problems caused by the distortion of unrealistic exchange rates and date-specific costs. In addition, rates of inflation vary not only with time but also between different countries during the same period. Even allowing for shadow pricing, the costs of similar services show great variation. For example, the annual cost of providing a bucket latrine service in Kumasi, Ghana, in 1978 was four and a quarter times as much as in Ibadan, Nigeria, in the same year (Feachem et al, 1978).

The high cost of KVIP’s in Ghana (where they were first introduced) has seriously impeded the implementation of urban sanitation programmes (Brown, 1985). Although both the government and the Ghana Water and Sewerage Corporation have adopted the KVIP as the ‘approved’ type of on-plot sanitation there has been a comparatively low rate of construction because of high costs. In Kumasi, conversion costs from a bucket latrine to
KVIP were 60 per cent of the cost of a new KVIP. The savings made by sharing latrines can be seen from 1989 estimates which assumed that eight households would share one seat or squat hole (Whittington et al, 1992).

Comparison of the cost of conventional septic tanks and sewerage for houses that already have internal piped water supply in Malaysia showed that septic tanks dealing with all household wastewater are cheaper unless the population density is more than 150-180 persons per hectare. If a septic tank and soakaway only deal with WC wastes and sullage goes to roadside drains, sewerage only becomes cost-effective when population density exceeds about 350 people per hectare (Bradley, 1983). In rehabilitation camps for refugees in Bangladesh latrines of various types were built for comparison. Costs compared with a simple pit lined with concrete rings and with a bamboo floor were as follows (Williams, 1987):

| Table 4: Cost comparison between simple pit and other latrine types, Bangladesh |
|---------------------------------|------------------|
| Latrine type                      | Relative costs |
| Simple pit latrine               | 1.00            |
| Ventilated improved pit latrine (VIP) | 1.28          |
| Waterseal latrine                | 1.39            |
| 2 family aqua privy              | 1.48            |
| 5 family aqua privy              | 1.61            |
| Double vault compost latrine     | 3.14            |

Somewhat similar comparisons were made from a comparison of alternative systems in Cochin (Cotton, 1997), giving the following:

| Table 5: Comparison of latrine costs in Cochin, India |
|---------------------------------|------------------|
| Latrine type                      | Cost range (Rs) | Relative costs * |
| Water borne sewerage             | 1022-1460        | 100%           |
| Septic tanks                     | 584-657          | 50%            |
| Pit latrines                     | 350-438          | 32%            |

The single most useful figure for comparing sanitation costs is the total annual cost per household (TACH). This includes capital and recurrent costs adjusted to reflect real opportunity costs and averaged over time. Based on 1978 costs, a World Bank study
(Kalbermatten et al, 1982a) found the proportion of the TACH to be as shown below in columns A and B of table 6. The financial requirements for different types of sanitation were expressed as a percentage of the income of an average low-income household, as shown in column C.

Although these figures have been used widely, their value is limited because of the restricted number of observations, subsequent price increases in materials after 1978, and incorrect interest rate assumptions.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Proportion of TACH</th>
<th>Financial requirements % income of average low income household</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Capital</td>
<td>Recurrent</td>
</tr>
<tr>
<td>Low cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pour flush single pit latrine</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Simple pit latrine</td>
<td>100</td>
<td>Negligible</td>
</tr>
<tr>
<td>Communal septic tank</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Low cost septic tank</td>
<td>79</td>
<td>21</td>
</tr>
<tr>
<td>Compost latrine</td>
<td>92</td>
<td>8</td>
</tr>
<tr>
<td>Bucket latrine</td>
<td>57</td>
<td>43</td>
</tr>
<tr>
<td>Medium cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewered aqua-privy</td>
<td>78</td>
<td>22</td>
</tr>
<tr>
<td>Aqua privy</td>
<td>96</td>
<td>4</td>
</tr>
<tr>
<td>Japanese vacuum truck cartage</td>
<td>68</td>
<td>32</td>
</tr>
<tr>
<td>High cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional septic tank</td>
<td>62</td>
<td>38</td>
</tr>
<tr>
<td>Sewerage</td>
<td>67</td>
<td>33</td>
</tr>
</tbody>
</table>

The total cost of twin-pit VIP latrines in Lesotho was found to be almost the same as single pits over a twenty-year period. This was because removal and disposal of sludge from single pits was more expensive. It also brings greater health hazards (Read, 1980). The breakdown of the costs was as follows:

<table>
<thead>
<tr>
<th>Construction (excluding shelter)</th>
<th>Emptying (net present value)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single pit</td>
<td>100</td>
<td>37.7</td>
</tr>
<tr>
<td>Twin pit</td>
<td>134.6</td>
<td>5.4</td>
</tr>
</tbody>
</table>
2.7.3 Payment by householders, willingness to pay and cost recovery

Roy et al (1984) reports that the conversion charges made to householders in India was based on household connection to electricity, piped water and ownership of a household latrine. If a household possessed two or three of these elements, the householders' share of conversion costs to a pour-flush pit latrine was by 100 per cent loan. If the household had one, 50 per cent loan, 50 per cent grant; if none, 25 per cent loan, 75 per cent grant.

Willingness to pay depends on other factors than the value householder's place on sanitation. Tenure has been found to be critical. In Lima, Peru, it was found that with householders of similar socio-economic status those with secure tenure were willing to spend on average nine times as much on their dwelling as were those who had no tenurial rights (Soto, 1989).

In the 'willingness to pay' survey before the Kumasi Sanitation Project started (Whittington et al, 1992) the monthly sum householders would pay was almost the same for KVIPs (US$1.47) as for WCs (US$1.43) where there was already a water connection. The study concluded that the amount people were willing to pay for sanitation was affected by:

- Income: those with higher incomes were prepared to pay more;
- Tenure: owners were prepared to pay more than tenants;
- Those with piped water supplies would pay more;
- Those already paying a high sum for sanitation would pay more;
- Those most dissatisfied with existing sanitation would pay more;
- Those living in single-storey houses would pay more for KVIPs than those in multi-storey apartments.

The study did not reveal any effects of the educational level, sociological and cultural variations on willingness to pay. The lack of willingness to pay for household latrines was crucially affected by cash-flow problems; for example, public latrines require only a daily payment, whereas monthly payments would be required for a household latrine. Identifiable household assets used in a household survey in Kumasi were radios, fans, sewing machines, cassette players, refrigerators and motorcycles (Whittington et al, 1992).
The subsidy (actual cost less ‘willingness to pay’) required in Kumasi was about one third of the cost of a new KVIP, based on three year repayment with 30 per cent interest charges (Whittington et al, 1992). If repayment was made over twenty years with 10 per cent interest charges (the norm for public works) no subsidy would be required. For sewerage the required subsidy would be 80 per cent of the cost.

In Tegucigalpa (Honduras) loans up to US$200 per family repayable in three years were offered to the urban poor through the Co-operative Housing Foundation and UNICEF. Although interest rates were high (17 per cent per year) and the Ministry of Health had a long standing policy of providing a free service, many people took up the option and built a sanitation unit with water tank, washboard, shower and latrine (Aasen and Macrae, 1992).

**Affordability and types of financial assistance**

There is a degree of consensus in existing literature that indicates a range of 1.5-3 per cent of total household income represents an ‘affordable’ level of financing for household sanitation facilities (EHP, 1997). Amongst the poorest sections of the community, this figure may fall to 1-1.5 per cent of total income. Where the cost of a technology type exceeds this general range, then financial assistance of one form or another for construction of the facility will probably be necessary. All costs involved in operation and maintenance and future upgrading of the facility should be the responsibility of the user so as to ensure sustainability. There are a variety of approaches to financial assistance that may be considered.

**Subsidies and grants**

If a sanitation intervention is to target the poorest urban communities, then some form of subsidy and/or grant has to be provided (Roy, 1984). The use of subsidies can lead to numerous problems, many of which have been well documented. Typically, these might include:

- Money is not directed at sanitation provision;
Subsidies may lead to the adoption of a technology type which is financially unaffordable, ultimately leading to problems with the future operation and maintenance of the facility; Subsidies can lead to unfortunate or undesirable perceptions or associations which can taint a technology type; Means testing for subsidies may lead to richer members of a community misrepresenting their status in order to benefit from what is available; Subsidies reduce the profit potential for private sector contractors to become involved in latrine construction; Different agencies and donor organisations provide different subsidy levels.

If subsidies are to be introduced then certain key elements need to be designed into the scheme (EHP, 1997), including:

- Conduct willingness to pay surveys prior to designing the programme. Different sections of the community will be prepared to pay differential rates for adequate sanitation;
- Consider the full real cost of assisting the whole target population. Can this be met within the existing programme budget?;
- Allow potential for upgrading to occur by providing subsidy for only the most basic facility;
- Fund only the interventions which are likely to have the greatest health impact

Even with the poorest households, a nominal loan component is seen as an invaluable way in which to maintain household commitment to the programme and to ensure longer-term operation and maintenance of the facility.

**Loans and cost recovery**

Loan schemes, whereby money is made available from the government or a donor agency at normal or subsidised interest rates and repaid over time, is an important financing measure and offers opportunities for involving the poorest sections of a community in a way that community self-financing may not. However, ensuring regular repayment of the loan is difficult, and numerous examples of failed credit schemes have
been documented in the sector. EHP (1997) have identified commonalities about the situations in which these schemes have failed:

- Financial environments in which inflation has been, or is, high;
- Where it is not common to borrow money for capital goods;
- Where unplanned demands on household finances mean that regular repayment is unlikely.

Similarly, UNCHS (1989) identified the constraints to the establishment of full revenue recovery within organizations. These included:

- Political opposition to raising taxes and tariffs to appropriate levels;
- Deficiencies in the legal mandate to impose charges;
- Inefficient billing and collection procedures;
- Delayed or delinquent payments;
- A general lack of civil compliance.

Revolving funds are a specific type of loan scheme in which a limited fund of money is available for a particular programme, and it is incumbent on the beneficiary household(s) to repay their loan in order that other community members can access this fund. Peer pressure, peer guarantees or examples of social, rather than legal contracts for repayment, are increasingly important and effective methods of cost recovery. A good example of this form of social contracting is Operation Hunger’s sanitation initiative in Kwa-Jobe, KwaZulu/Natal, South Africa (Breslin, Madrid and Mkhize, 1997). In this scheme, residents agreed to pay 44 per cent of the capital costs of household VIP latrines (roughly US$78) over a six-month repayment period. The mechanism agreed on to ensure cost recovery was an existing tribal court system to ‘discipline’ those who failed to maintain repayment. Additionally, a staggered delivery system was used whereby funds and materials were only released for new applications once the sanitation committee could demonstrate reconciled accounts and that previous recipients had fully complied with the repayment schedule.
Lessons learnt for effective cost recovery include:

- Use of social rather than legal sanctions (Breslin, Madrid and Mkhize, 1997);
- There is a need for transparency in loan repayment arrangements. Householders must be able to have access to and understand the status of a revolving fund. In Kumasi, Ghana, householders had no access to the repayment schedules used in the household sanitation component, and were suspicious of over-billing (Saidi-Sharouze, M, 1994);
- An incremental approach to lending allows the borrow to gradually increase debt burden, and the lender to assess credit worthiness or debt recovery capacity (Varley, 1997);
- Loans for latrines should have shorter repayment periods than for housing, since the perceived benefits of latrines are limited and may not sustain payments over a longer period;
- Some form of commitment from the beneficiary (either in the form of a deposit or labour during construction) is desirable. If a programme does not capture participation from the community in this form, then low returns on loan schemes are probable;
- Interviewing potential beneficiaries before granting loans may help to reduce defaulting. In Ouagadougou, Burkina Faso, beneficiaries under the Strategic Sanitation Plan were filtered according to their ability to make substantial savings (Saidi-Sharouze, M, 1994).

Although the Orangi Pilot Project (OPP) and Faisalabad Area Upgrading Project (FAUP) demonstrate that direct cost recovery of capital costs through user contributions is possible, there are still questions relating to community preparedness to pay for on-going running costs of the systems. In OPP it was evident that many users were unwilling to assume the necessary responsibility for financing recurrent costs of maintenance given the frequency with which the systems had to be cleaned and the rising charges made by scavengers for this maintenance service. In consequence, it was found that regular cleaning of manholes, pipes and replacement of covers was often left unattended. This example has wider relevance for the sustained management and maintenance of on-plot systems (Tayler, 1997).
2.7.4 Public and community latrines

A brief review of communal and public latrines is included because they are frequently the only existing forms of sanitation in low-income urban areas. Pickford (1995:126) states that "communal latrines are those outside household plots that are used by people for their daily needs when at home. Public latrines are in or near markets, lorry parks and are intended for people away from their homes". Communal latrines as an alternative to household latrines in congested areas are rarely satisfactory. Wagner and Lanoix (1958) reported that 'in most instances communal latrines, irrespective of the type of design, proved to be failures'. With notable exceptions communal latrines are unpopular. In 1990, 71 per cent of those who used public latrines in Kumasi, Ghana, were not satisfied with them (Whittington et al, 1992).

It has been suggested that the three most important reasons for unsatisfactory communal latrines are operation and maintenance (Pickford, 1995), cleanliness and lighting (Marais, 1973). When a communal latrine is fouled, subsequent users inevitably add to the fouling problem. Increased misuse is probable due to the frequently inadequate lighting arrangements at night in the latrine structure. A 1988 study of a Madras slum-upgrading project that included construction of latrines found that in one upgraded slum four out of the seven communal latrines built in 1980 were permanently out of order. As a result, 30 per cent of the slum population had again resorted to open defecation (Dewit and Schenk, 1989).

Overuse of public latrines is a common problem that is often made worse because authorities are disinclined to build more if the existing facilities already have a bad reputation. In Manila, a 1970's study found that one latrine which was originally intended for 200 people (four seats for women and four for men), was being used by 3,000 people daily (Ilustre, 1980). Mensah (1996), in a study of public toilets in Kumasi, indicated that on the basis of estimated user rates of 54,300 visits per day, the city faced a shortfall of 37 public toilet facilities (of 10 seats each). In some districts of the city, 10 seater public toilets were recording user rates of between 3500-4500 visits per day.

More successful were the aqua-privy communal latrines built in Calcutta during the 1970's. Each had single chambers built for use by both men and women, and were planned at a
rate of one for every 25 people (Maitra, 1978). The latrines were conveniently located within small groups of users, who were responsible for their cleanliness, an arrangement which proved to work on the evidence of unexpected inspections. The key issue seems to be the identification of a defined user group.

In Indonesia the 'Kampong' head makes a list of people selected by their families to clean and maintain the MCK during the next week (MCK: 'mandi' = bathing; 'cuci' = cleaning and 'kakus' = toilet). The Kampong head assesses the quality of the work. Families who participate can use the MCK free of charge. Money is collected from all families for desludging the septic tank.

In 1990 there were an estimated 400 communal latrines located throughout Kumasi, used by approximately 40 per cent of all households. All city centre public latrines and roughly half of the communal latrines elsewhere charged adults US$ 0.015 per visit, although children and the elderly were admitted free (Whittington et al, 1992). The charge per visit (in 1992) was 5 cedis (US$ 0.015) for old pan latrines, 10 cedis for newer KVIP's, and 20 cedis for new facilities with WC's. Fees were collected at a ticket booth by an attendant, who provides each visitor a piece of newspaper for anal cleaning. A typical family in Kumasi relying on public latrines in 1990 paid about the same monthly amount for rent (US$ 1.51), water (US$ 1.26), sanitation (US$ 1.14) and electricity (US$ 1.63).

Operation by private sector contractors is often seen as a potential solution to some of the management problems of communal/public latrines. One example is the sanitation complexes run by Sulabh International in India. The first such facility was built for the Patna Municipal Corporation near Gandhi Maidan in 1978, and by 1993 Sulabh had constructed an estimated 2500 similar complexes nationally. Operation and maintenance were covered by a pay-and-use contract, while the Municipality covered water and electricity charges (Pickford, 1995). The advantage of this system was that the contractor knows that his income from users will drop if the standard of cleanliness falls. For example when the piped water supply to the contractor of latrines in Chittagong, Bangladesh failed, the contractor had to hire men to carry water from a far distant source in order to maintain his income from users (Gibbs, 1986).
In Cuttack, India, the municipality operates 35 public latrines near to low-income areas. The operation costs were funded from local taxation; whilst they are very popular with the users, there were far too few to cater for the increasing population, and the corporation could not commit itself to constructing additional units. Operation of some of the latrines was contracted out, but the contractors performance was so poor that the corporation took back operation (Cotton, 1993). Contractors were also unable to make community latrines work successfully in some low income areas in Vishakapatnam. People were unwilling to pay and resorted to open defecation.

In Lagos the charge made for public latrines in the mid-1980s was sufficient to cover the costs of the attendant, toilet paper, soap and water for hand washing, and cleaning materials. Operation and maintenance of latrines by contractors was tried, but was not successful (Lochery and Adu-Asah, no date).

**Management issues: key points**

- Responsibility for construction, operation and maintenance usually rests with the owner or occupier of the plot;

- The proportion of urban households worldwide served by on-plot sanitation is increasing;

- Urban government has a crucial role to play in ensuring that its actions and regulations facilitate the use of on-plot sanitation;

- The adoption of a standard type of latrine by urban government in Ghana has impeded programme implementation because of the high unit cost;

- The total annual cost per household incorporates capital, operation and maintenance costs and is a useful cost indicator intra-nationally. International cost comparisons cannot realistically be made;

- A major survey in Kumasi, Ghana, revealed that willingness to pay is significantly affected by: income level; tenure status; existence of piped water supply; existing level of payment for sanitation services; and dissatisfaction with existing sanitary arrangements. Educational, socio-logical and cultural variations were not found to have a significant impact;

- In densely populated areas, for example in parts of Calcutta, latrines shared by several plots, with a
clearly defined group of users, operate successfully;

- Communal latrines having unrestricted access are rarely maintained sufficiently well to give user satisfaction, unless urban governments or in a few cases non-public sector groups operate them satisfactorily.

### 2.8 Sanitation selection models

Sections 2.4.2 and 2.7.1 have alluded to different models and approaches to sanitation provision. A further distinction to be made is between those interventions that form part of a managed programme (as in the case of Mozambique and the PNSBC) as compared to unsupported initiatives undertaken individually by the householder. In both circumstances, a clear but unstated need has to be addressed: how to establish and structure guidance on choice of sanitation systems in those circumstances. The following section reviews highlights the key texts and approaches on this topic.

A recent meeting of sanitation sector professionals in Zurich (Loetscher, 2000) reached a consensus that the main obstacle to improving sanitation coverage was not the lack of technical options, but the lack of alternatives available to developing country stakeholders and an understanding of the factors affecting their suitability.

Attempts to provide guidance to policy makers and implementers regarding the appropriate choice of sanitary technology in urban (and rural) contexts enjoy a long line of precedents (Shahalam, 1984). These typically include various types of tools such as flow diagrams, decision-making algorithms, expert systems, and computerised decision support systems. The initial steps at developing suitable sanitation selection models for developing countries were undertaken by USAID and the World Bank (Kalbermatten et al, 1980; Mara et al, 1980; Feachem et al, 1980). The algorithm developed by the World Bank placed emphasis on physical factors related to the given area, access to water source and cost considerations. Background information was collected on health, social, behavioural, institutional and environmental conditions, although these factors were dealt with only indirectly.
Reid and Coffey (1978) developed a similar algorithm that included directly socio-economic, socio-technical and health aspects into the decision-making process. Shahalam (1984) logically develops this and other models further by formulating a technology selection methodology, based on an algorithm. The principal objective of the methodology was to "achieve the ultimate sanitation service which is the least costly, hygienically sound, structurally permanent and aesthetically acceptable and which has maximum convenience in use with least negative effect on the environment" (Shahalam, 1984:40). The method recognised that achieving all these aspects simultaneously was impossible, and therefore introduced the idea of a planning horizon to achievement of objectives.

More recent versions of such a decision-making algorithm continue to stress technical factors in isolation from broader considerations (Franceys et al, 1992) (see figure 10 below).

Loetscher and Keller (1999) employ a similar approach but to a different aspect of sanitation selection. SANEX™ is a computer based expert system designed for the evaluation of sanitation alternatives in developing countries. The complex algorithm uses 50 technical, socio-cultural and financial criteria in order to assess and prioritise 80 sanitation systems.

Although widely employed and advocated as decision-making tools in the sector, several fundamental limitations can be noted with these types of algorithms and expert systems:

- Supply driven criteria are applied in isolation of user perspectives;
- An exclusive focus on hardware issues, with passing reference to software issues;
- Rigidity of the model to deal with varying conditions;
- Unrealistic assumptions made about availability of data;
- Unrealistic assumptions about the objective of the model (such as achieving an ‘optimal’ technology choice);
- Assumption that there is a simple ‘yes’ or ‘no’ answer to key questions.
Figure 10: Decision tree for selection of sanitation (after Franceys et al, 1992)

(Note: ▲ = A different option must be chosen)

START
- METHOD OF ANAL CLEANSING
- WATER AVAILABLE AND/OR USE FOR FLUSHING
- Affordability - Capital and maintenance costs (Note 1)
- Population density
- Demand for re-use of faecal waste?
- Mechanical pit emptier available?
- Land for new pits available OR ground suitable for extra-large pits?
- Permeable ground?
- Ground of limited permeability?
- Ground impermeable?
- Ground water or hard rock less than 2m below surface?
- Choice acceptable to the people?

TYPE OF SANITATION REQUIRED
- Sewage
- Septic tank
- Pour flush twin pit
- Pour flush single pit direct
- Twin pit ventilated
- Single pit sealed lid
- Compost latrine (Note 3)

Note 1: Not all possibilities are illustrated as it is assumed that water availability is related to affordability
Note 2: Use extra large pits or consider composting
Note 3: Also dependent on willingness to collect urine separately, demand for compost, availability of ash or vegetable matter etc.
2.9 Summary

The literature review provides detailed insights into the technical, socio-cultural, institutional and management issues associated with urban on-plot sanitation. Valuable and comprehensive surveys of urban sanitation have been undertaken in India (Sinha and Ghosh, 1990), Bangladesh (Chadha and Strauss, 1991) and Ghana (Whittington et al., 1992). Additionally, reports of achievements in the field that are particularly useful are those of Brandberg in Mozambique and Malawi and Morgan in Zimbabwe.

However, the review indicates that few publications have covered the issue of the sustainability of on-plot sanitation systems nor their relevance to urban conditions. In particular, no substantive information was found which relates to the following important issues for on-plot sanitation in urban areas:

- User perceptions of urban on-plot sanitation technologies;
- User satisfaction of latrine performance;
- The effectiveness over time of operation and maintenance for various types of on-plot latrine (as opposed to an extensive literature on 'what ought to be done');
- The effect and relevance of local legislation, for example in relation to plot size or groundwater pollution;
- The reasons for the absence of household sanitation; and
- Indicators of sustainability factors for on-plot sanitation systems.

These gaps in knowledge and practice are used to help define the key research questions stated in Chapter 3, section 3.4.

<table>
<thead>
<tr>
<th>Literature review: key points</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The literature is weakest in relation to 'sustainability' notions;</td>
</tr>
<tr>
<td>• Few detailed studies have been conducted on the performance of different latrine systems in the urban context;</td>
</tr>
<tr>
<td>• User perspectives and perceptions of technology provision is an area of importance where there is a gap in recorded experience.</td>
</tr>
<tr>
<td>Section</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>3.1</td>
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<td>3.2</td>
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<td>3.3</td>
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<td>3.4</td>
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<td>3.5</td>
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<tr>
<td>3.5.1</td>
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<tr>
<td>3.6</td>
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<tr>
<td>3.6.1</td>
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<tr>
<td>3.6.2</td>
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<tr>
<td>3.6.3</td>
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<td>3.7</td>
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<tr>
<td>3.7.1</td>
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<tr>
<td>3.7.2</td>
</tr>
<tr>
<td>3.7.3</td>
</tr>
<tr>
<td>3.8</td>
</tr>
<tr>
<td>3.9</td>
</tr>
<tr>
<td>3.10</td>
</tr>
</tbody>
</table>
Research design and methodology

3.1 Chapter outline
This chapter considers the methodological approach adopted during this research. The objectives of the research, the guiding hypothesis and research questions are stated. The overall research design, process of field research and analytical framework for data are described and explained. Particular emphasis is given to the sources of data, the rationale underpinning data selection and the methods for collection and analysis.

3.2 Objectives
This research is designed to help facilitate decision making processes regarding on-plot sanitation provision by intermediaries (NGO's, government, international organisations) in low-income urban communities. The central focus of the research is to investigate how appropriate and acceptable on-plot sanitation is for the user in the urban context, to identify what factors affect sustainability, and to develop guidance on technology selection for a range of sector stakeholders (as defined above). As such it seeks to address the two key tenets of critics of on-plot sanitation; that the systems lack technical suitability in urban contexts and that users will be dissatisfied with the systems.

The work encompasses a wide variety of issues including socio-cultural, institutional, financial and technical considerations. However, the most important theme is that it focuses on the perceptions of the users of on-plot sanitation. Frequently, assessments and judgements on the effectiveness of sanitary technologies are made from a technologically biased and purely external perspective. Those who are not likely to themselves be regular users of improved pit latrines are responsible for many technical evaluations and policy developments. Thus, attention in this work has been directed to establishing what the concerns of the users of on-plot sanitation systems are in urban areas and to reflect these in an analysis that proposes guidelines for their selection.
The objective of the research is therefore to investigate the factors that affect the acceptability of on-plot sanitation in low-income urban communities. In particular, the work seeks to answer five key questions about on-plot systems in urban areas:

- What are the reasons for the absence of household sanitation?
- Will users be satisfied with on-plot solutions to sanitation?
- How does plot size constrain the use of on-plot sanitation?
- What operational problems arise with on-plot sanitation?
- Do maintenance problems arise when pits and tanks fill up?

Details about these questions are outlined in section 3.4 below.

The study concentrates on a number of commonly used on-plot sanitation systems (ventilated improved pit (VIP), simple pit, pour-flush, double pit, septic tank and bucket) and user perceptions of latrine performance.

3.3 Hypothesis

The hypothesis of the research to be examined is stated as follows:

On-plot sanitation is an acceptable sanitary technology option for users in low-income urban communities, not only technically, but also from socio-cultural perspectives.

3.4 Research question/s

Having earlier reviewed the existing literature on urban sanitation provision in low-income communities, the first and most critical task for the researcher is to identify the research question/s, since this will in turn decide the research design to be used during investigation (Yin, 1984). Multiple research questions have been identified which arose

1 'Acceptable' is defined in the thesis as meaning 'adequate, satisfactory' and is used as a proxy measure of satisfaction
from the analysis of gaps in the subject literature. The research questions have been
disaggregated between primary and secondary areas of investigation.

The primary research question can be defined as what factors affect the acceptability of
on-plot sanitation systems in low-income urban communities, and how? A series of
secondary research questions, associated with this main question, can be identified,
including:

- **What factors account for the absence of household latrines?** Objective: to investigate
  the range of reasons contributing to the success or failure of on-plot sanitation
  programmes, and to the absence of more widespread latrine construction outside of
  specific programmes

- **What levels of dis/satisfaction do users express about different latrines?** Objective: to
  investigate parameters of performance in relation to the perceptions of the users,
  which may impact on expansion of sanitation programmes

- **Does plot size constrain the use of on-plot sanitation systems?** Objective: to determine
  what on-plot sanitation systems have been used on small plots, and how plot size has
  affected operation and maintenance

- **Do maintenance problems arise when pits and tanks fill up?** Objective: to identify what
  user problems are associated with pit emptying and to determine satisfactory systems
  for the desludging of pits and tanks and the hygienic disposal of sludge

- **Do operational problems arise with on-plot sanitation systems, and why do they occur?**
  Objective: to investigate the extent of, and reasons for, incorrect operation of on-plot
  systems. An understanding of the extent of odour and insect nuisance is considered in
  this sub-question

III: Research design and methodology

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3.5 Research design

Research design is essentially a logical sequence of steps linking the initial research questions to the data collected and ultimately to a series of conclusions arising from the study (Yin, 1984). Others have considered it to be the, ‘logical model of proof that allows the researcher to draw inferences concerning causal relations among the variables under investigation.’ (Nachmias and Nachmias, 1990: 77-78), or ‘the design serves as an architectural blueprint., linking data collection and analysis activities to the research questions..’ (Bickman and Rogl, 1998: 11). The purpose of a research design is more than establishing a workplan for the study; it is to ensure that the logic of the study's approach is maintained, thereby avoiding situations in which the evidence fails to address the initial research question/s posed.

Yin (1984) argues that research designs should comprise five components. These are described in relation to this study's focus:

1. **Study question/s**: What factors affect the acceptability of on-plot sanitation systems in low-income urban communities, and how?

2. **Study propositions**: On-plot sanitation is an acceptable and sustainable system for use in low-income urban communities in the developing world.

3. **Unit of analysis**: The unit of analysis is the household, living on recognisable household plots, within low-income urban communities of developing country cities.

4. **Logic linking data to proposition/s**: The method by which the data is linked to the hypothesis. It provides guidance on data to be collected and methods for analysing the data.

5. **Criteria for interpreting the findings**: Referring to the analytical framework used to manage the data collected

Clearly, the majority of research questions posed in section 3.4 can be categorised as 'what', 'how' and 'why' type questions. In deciding on the choice of research design
appropriate to the research questions posed, the thesis has adopted the framework offered by Yin (1984), in which research design selection is guided by three key conditions:

- The type of research question posed;
- The degree of control over behavioural events the investigator can exercise;
- The extent to which the investigation focuses on contemporary rather than historical events;

Table x below illustrates these three conditions when applied to each research design type.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Form of research question</th>
<th>Control over behavioural events?</th>
<th>Focus on contemporary events?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>how, why</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Survey</td>
<td>who, what, where, how many, how much</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Archival analysis</td>
<td>who, what, where, how many, how much</td>
<td>no</td>
<td>yes/no</td>
</tr>
<tr>
<td>History</td>
<td>how, why</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Case study</td>
<td>how, why</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

By cross-referencing the key elements of the study against such a framework, a research design begins to define itself. Urban sanitation provision in low-income communities is a contemporary, not historical phenomenon (removing archival analysis as a form of enquiry). There are many variables to consider, which are typically multi-faceted, complex to understand, difficult to identify and define and not easily explored through experimental analysis. Because the research could exercise no control over the phenomenon in question, experiment, as the key research strategy, was not feasible.

The main emphasis, as stated, is on ‘what’, ‘how’, ‘how many’ and ‘why’ type questions, which lend themselves to the selection of survey, and case study analysis methodologies. The research design thus employed more than one methodology simultaneously, including surveys (both field and postal), case studies and some limited field experiments.
3.5.1 Maximising validity and reliability

A credible research design is one that attempts to maximise both validity and reliability (Bickman and Rog, 1998).

Validity is the extent to which answers correspond to some hypothetical ‘true value’ of what is being described or measured (Cronbach & Meehl, 1955). Four types of validity are commonly referred to in research (Cook and Campbell, 1979):

- **Internal**: the extent to which causal conclusions can be made;
- **External**: the extent to which generalisations can be inferred from the data and local context to wider populations and settings;
- **Construct validity**: the extent to which the constructs in the conceptual framework can be successfully measured in the research study;
- **Statistical conclusion validity**: the extent to which the study has used design and statistical methods appropriately to detect the effects that are present.

Although all types of validity are important when undertaking applied research, the relative emphases may vary, being dependent on the type of question being studied. Researchers undertaking impact studies will be more concerned with establishing causal relationships (i.e., internal and statistical conclusion validity) than on the transferability of the effect to other locations. More descriptive research design questions, which require the development of a comprehensive picture of a phenomenon, will place greater emphasis on external and construct validity.

Reliability is the degree to which a measurement procedure yields consistent answers irrespective of the number of times the procedure is adopted.

The research design relied on selected measures to improve validity and reliability of the study, including:

- Triangulation of methods and measures;
- Multiple sources of data;
- Analysis of discrepant evidence and negative cases;
Peer review of methods to reduce bias and expose erroneous assumptions;
Use of ‘rich data’ gathering; and
Employing quantitative and qualitative techniques within the same study.

A discussion of these elements is reviewed in section 3.7 below.

3.6 Data sources

As the study focuses on an investigation into the acceptability and appropriateness of on-plot sanitation systems, relevant primary and secondary data sources pertaining to the longer-term performance of latrine systems within low-income urban communities in developing world cities was sought. For primary sources of data, the researcher relied on interviews with key informants, independent descriptive observations, and quantitative tests on odour/insect nuisance in latrine superstructures. Secondary sources of data included analysis of administrative reports, economic and social indicators and various types of documentation (both published and grey literature).

The approach to the selection of primary data sources can be analysed at the macro, meso and micro scales. At the macro-scale, the three countries in question chosen for fieldwork (Ghana, Mozambique and India) were selected on the basis that:

- They afforded inter-regional/national and cross-cultural comparisons;
- Each country permitted an analysis of at least one key technology type in detail (i.e. VIP latrine (Ghana); SanPlat (Mozambique) and pour-flush latrine (India);
- There was existing knowledge of appropriate urban sanitation initiatives in-country;
- Good institutional links with organisations involved in the provision of urban sanitation had previously been developed.

Each country offered particular comparative advantages, which enhanced the overall richness of the data gained. Comparisons of the relative merits of each location are summarised in the following table. An important point to note is that it was not possible
to sample equivalent ranges of latrine types in each country, simply because the nature of
the sanitation projects under examination tended to favour particular latrine type/s.

| Table 9: Relative merit of fieldwork conducted in each study country |
|---|---|---|
| Country | Issue | Advantage/s |
| Ghana | Technical | • Operation of VIP latrines
• Insights into bucket/pan latrine & WC to septic tank operation
• Vent pipe operation |
| | Management | • Contrast between government led and NGO facilitated schemes |
| | Financial | • Operation of cost recovery schemes |
| India | Technical | • Operation of pour-flush latrine types
• Extreme conditions of population density
• Insight into pit emptying processes |
| | Management | • Highly supply driven scheme |
| | Other | • Socio-cultural impacts on latrine programmes |
| Mozambique | Technical | • Operation of SanPlat latrine
• Insight into impact of cockroach nuisance |
| | Management | • Operation of nation-wide sanitation programme
• Institutional co-ordination |
| | Other | • Development of sanitation promotion campaigns |

At the meso-scale, a range of urban centres were covered during the study (from small towns (population >50,000) to large cities (population >500,000). The rationale behind selecting a cross-section of city sizes was partly pragmatic (some smaller cities offered more effective collaborative arrangements) and partly by design (to improve representativeness across a range of urban contexts). Following an initial inception visit to each country in 1995, several cities were surveyed for suitability for inclusion in the study. In two cases (Kumasi, Ghana and Patna, India) no subsequent fieldwork was conducted because of the difficulties in gaining support from local agencies for data collection. Table 10 indicates those cities in which fieldwork was conducted.

| Table 10: Cities selected for fieldwork |
|---|---|---|
| Country | City | Population size |
| Ghana | Accra | 1,800,000 ² |
| | Cape Coast | 80,100 ³ |
| | Tamale | 193,000 ³ |
| Mozambique | Maputo | 3,250,000 ² |
| | Quelimane | 127,000 ³ |
| India | Vijayawada | 700,000 ³ |

Key: Year population data recorded; 1 = 1996; 2 = 1998; 3 = 1999
At the micro-scale, specific urban communities were selected with assistance from the local organisations collaborating on data collection. The criteria applied to this selection process centred on the identification of urban communities in which (ideally) there was a:

- Range of latrine types (in operation for several years);
- Range of housing densities;
- Range of household incomes;
- Range of physical site conditions (i.e., geology, water table, etc.);
- Range of plot sizes;
- Use of double pit latrines;
- Variety of pit emptying practices;
- Households without on-plot sanitation;
- Mixture of informal/formal settlements.

The exact location/s and districts in which fieldwork was conducted was agreed in conjunction with local collaborators’ knowledge of on-plot sanitation provision in each city. Typically, fieldwork data was drawn from a cross-section of urban districts. Details of the organisations involved in data collection and the urban communities selected are presented in the following sections (3.6.1-3.6.3).

3.6.1 Ghana

Collaborative arrangements for data collection were reached with four organisations in Ghana. Details of the arrangements for household questionnaires are aggregated in table 11 below, and a description of each organisation subsequently follows.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Bucket</th>
<th>Simple pit</th>
<th>VIP</th>
<th>WC Sewer</th>
<th>WC Septic tank</th>
<th>Pour flush</th>
<th>WC open drain</th>
<th>Absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMA</td>
<td>66</td>
<td>24</td>
<td>28</td>
<td>4</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>108</td>
<td>250</td>
</tr>
<tr>
<td>ProNet</td>
<td>28</td>
<td>5</td>
<td>10</td>
<td>0</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>37</td>
<td>101</td>
</tr>
<tr>
<td>CEDECOM</td>
<td>136</td>
<td>14</td>
<td>5</td>
<td>0</td>
<td>86</td>
<td>0</td>
<td>0</td>
<td>259</td>
<td>500</td>
</tr>
<tr>
<td>VWR</td>
<td>34</td>
<td>2</td>
<td>9</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>49</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>264</td>
<td>45</td>
<td>47</td>
<td>6</td>
<td>131</td>
<td>0</td>
<td>0</td>
<td>453</td>
<td>951</td>
</tr>
</tbody>
</table>
Accra

Accra Metropolitan Assembly (AMA) (Waste Management Department (WMD))

Part of the municipal authority for the Ghanaian capital, the Waste Management Department has a wide remit covering solid waste, drainage and human excreta management. Between 1992 - 1995, WMD initiated and managed a K-VIP project that aimed to construct 1000 household double KVIP latrines. By 1996, the project had succeeded in constructing 1451 household latrines in a series of marginalised low-income districts in Accra. Cost estimates for single seater K-VIP latrine were 222,365 cedis (1996 prices), with an initial household deposit of 70,000 cedis and a repayment period for the balance of 20 equal monthly instalments.

Fieldwork arrangements with AMA led to 250 completed household questionnaires.

ProNet:

A national NGO, at one time supported by the UK organisation, WaterAid. More recently, ProNet has acted independently, undertaking a range of consultancy, training and research services. ProNet currently offers capacity-strengthening support to a range of smaller, grassroots based NGO’s working in the sector. Between 1988-1992 ProNet was involved in a government-international agency sponsored programme ('Urban 1') to provide water supply, sanitation, electricity and roads to Maamobi, a low-income urban district in central Accra. ProNet’s function was to take responsibility for the sanitation planning component, which involved community consultation, working with community based sanitation committees, designing facilities and promoting the project. The outcome from the component was the installation of 97 household VIP latrines. The total cost of the latrine was 157,000 cedis (1996 prices) with monthly repayment levels set at 6000 cedis.

Table 12: Population levels for urban districts in Accra used in fieldwork

<table>
<thead>
<tr>
<th>District</th>
<th>1970</th>
<th>1984*</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maamobi</td>
<td>14,923</td>
<td>25,815</td>
<td>na</td>
</tr>
<tr>
<td>James Town</td>
<td>30,595</td>
<td>34,836</td>
<td>0.9</td>
</tr>
<tr>
<td>Chorkor</td>
<td>na</td>
<td>19,267</td>
<td>na</td>
</tr>
<tr>
<td>La</td>
<td>39,771</td>
<td>55,648</td>
<td>2.4</td>
</tr>
<tr>
<td>Madina</td>
<td>na</td>
<td>28,364</td>
<td>na</td>
</tr>
</tbody>
</table>

Key: na = Not available; * Most recent official figures available
In Accra, five districts were sampled within the boundaries of the Accra Metropolitan Assembly and Ga Rural District including Maamobi, James Town, Chorkor, La and Madina. Basic population characteristics for these districts are listed in table 12 above.

Fieldwork arrangements with ProNet led to 101 completed household questionnaires.

Cape Coast

Central Economic Development Commission (CEDECOM)

Part of the local authority structure, with responsibility covering basic service provision in the Cape Coast area. Two junior technical professionals linked to Cape Coast University facilitated fieldwork, data collection and analysis.

Fieldwork arrangements with CEDECOM led to 500 completed household questionnaires.

Tamale

Village Water Reservoirs (VWR)

A Catholic Church funded NGO, specialising in rural development projects in Ghana’s Northern region. Institutional contacts between Village Water Reservoirs and WEDC facilitated fieldwork with this organisation.

Fieldwork arrangements with VWR led to 100 completed household questionnaires.

3.6.2 Mozambique

In Mozambique, fieldwork was conducted with the assistance of the National Programme for Low Cost Sanitation (PNSBC), a Government of Mozambique (GOM) agency formally

<table>
<thead>
<tr>
<th>Agency</th>
<th>Bucket</th>
<th>Simple pit</th>
<th>VIP</th>
<th>WC Sewer</th>
<th>WC Septic tank</th>
<th>Pour flush</th>
<th>WC open drain</th>
<th>Absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNSBC</td>
<td>1</td>
<td>352</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>361</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>352</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>361</td>
</tr>
</tbody>
</table>
established in 1985. Details of the arrangements for household questionnaires are aggregated in table 13 above, and a description of PNSBC subsequently follows.

PNSBC’s stated objectives include:

- Identification and development of a suitable technology and method for large-scale implementation of improved sanitation in peri-urban areas;
- Contribute to improved living conditions and poverty alleviation by (i) promoting and implementing an expanded low cost sanitation programme... and (ii) creating local employment opportunities and management capacities, with particular attention to the needs of vulnerable groups, by promoting the establishment of latrine production and sales units (Hammar and Junior, 1994:11).

Focused on the production and installation of simple, unreinforced domed concrete squatting slabs, the PNSBC has gained international recognition as a pioneering programme in the field of low-cost technology provision for peri-urban communities.

The PNSBC is managed at the national level in Maputo by a Central Management Unit (CMU) located (institutionally) in the Institute for Rural Development (INDER). The CMU has responsibility for centralised management and implementation of the programme, and oversees the work of 38 provincial units that are active in all provincial capitals and in nine of the large district towns. Between 1985 and 1998, the programme sold and installed 230,646 improved latrines benefiting an estimated 1,383,876 urban users. Average latrine slab production capacity grew to roughly 25,000 per annum in 1998, and average latrine coverage is estimated at 38 per cent of peri-urban households in the major cities (GOM/UNDP, 1998).

Fieldwork arrangements with PNSBC led to 361 completed household questionnaires.

3.6.3 India
Details of the arrangements for household questionnaires are aggregated in table 14 below, and a description of Vijayawada SIP subsequently follows.
The Department for International Development (DFID) of the British Government has funded a series of slum improvement programmes (SIP's) in several Indian cities (Hyderabad, Vishakapatnam, Indore, Cochin, Cuttack, Calcutta and Vijayawada), designed to improve the basic service provision to the urban poor. The SIP's espouse an integrated urban development philosophy, where physical improvements in basic service provision (water supply, sanitation, drainage, solid waste, etc) are coupled with social development programmes focusing on non-formal education, literacy campaigns, primary health care and community development. Community participation is encouraged through the formation of community based organisations.

This research focused on the activities of the Vijayawada SIP which aimed at planning and implementing civic infrastructure (i.e., drainage, roads, low cost sanitation, street lighting), health and socio-economic activities in an integrated manner with active participation from slum dwellers. The project spanned three phases of development, with civic infrastructure improvements (one year in duration) implemented in 1990-91, 1991-92 and 1992-93. Health and community development inputs (three years in duration) were completed between 1990-93, 1991-94 and 1992-95 respectively. 136 slums were identified for project improvement, involving a population of 248,000 in 54,000 families. Of the slums involved in the project, 21 were located on hill slopes, 94 on the plains, and 21 were relocation (where slum populations living on marginal lands were relocated to less vulnerable, purposefully acquired sites).

Fieldwork arrangements with Vijayawada SIP led to 531 completed household questionnaires.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Bucket</th>
<th>Simple pit</th>
<th>VIP</th>
<th>WC Sewer</th>
<th>WC Septic tank</th>
<th>Pour flush</th>
<th>WC open drain</th>
<th>Absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-SIP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>28</td>
<td>394</td>
<td>7</td>
<td>78</td>
<td>531</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>28</td>
<td>394</td>
<td>7</td>
<td>78</td>
<td>531</td>
</tr>
</tbody>
</table>
3.7 Data collection and justification

The fieldwork employed multiple data collection techniques, and details of each method are summarised in sections 3.7.1 - 3.7.3 below. As the quality of the research findings are inextricably linked to the quality of the data gathered, much emphasis in the research has been placed on sample selection, participant acquisition, data collection, data management and analysis. A series of general measures were employed to improve the reliability and validity of the data collection process, including:

- **Triangulation strategies**: Triangulation reduces the risks of distortion inherent in the use of only one data collection method. Interviews, questionnaires and documents are all vulnerable to self-report bias or ideological distortion: effective triangulation implies the use of additional methods to verify research findings. In this research, triangulation took the form of cross-checking reported figures gathered using one method, with information found from alternative sources. For example, information from key informant interviews with Indian pit latrine emptiers ('scavengers') were cross-checked with staff from the Slum Improvement Programme operating in Vijayawada. A triangulation matrix developed for the study indicates the degree of cross-checking of data by methodological tool employed (see table 16 below).

- **Rich data**: ‘Rich data’ (Bickman and Rog, 1998) are detailed and complete sources of information that provide a full and comprehensive picture of a phenomenon, thereby reducing the opportunities for respondent duplicity or observer bias. Rich data sources for this research focused on the use of verbatim transcripts of key informant interviews, rather than simple note taking, which increases the potential for the researcher to (inadvertently) introduce bias into the research.

- **Peer review / feedback**: Soliciting feedback from key sector professionals is a valuable method of testing researcher bias, assumptions, and flaws in logic or methods. During the preparatory stage for this research, peer review of questionnaire design was sought from colleagues at the London School of Hygiene and Tropical Medicine. This in turn led to changes in emphasis for the questionnaire survey. Similarly, when conducting fieldwork with project partners, a pre-test of the questionnaire was...
conducted, and amendments made according to local comment and opinion.

- **Mixed methods:** Mixtures of quantitative and qualitative techniques were employed during the research, including questionnaire and postal surveys, key informant interviews and field observations. This allowed for varied perspectives on the same issue to be obtained.

More specific checks for validity and reliability are described in detail in the following sections outlining the main methodological tools employed.

### 3.7.1 Questionnaire surveys

Questionnaire surveys were used to elicit information about on-plot sanitation both from individual householders (household surveys) and from a cross-section of engineers, administrators, development workers, health officials, and planners (postal survey). Although the surveys differed in content emphasis (see table 15), their purpose was largely similar, namely:

- To gather baseline data about on-plot sanitation (if at different scales of investigation);
- To explore respondent perceptions relating to various aspects of on-plot sanitation.

<table>
<thead>
<tr>
<th>Household survey</th>
<th>Postal survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household related information</td>
<td>City name and population size</td>
</tr>
<tr>
<td>Absence of household latrine from plot</td>
<td>Effect of plot size</td>
</tr>
<tr>
<td>Categorisation of latrine type</td>
<td>Categorisation of latrine types</td>
</tr>
<tr>
<td>Reason for constructing latrine on-plot</td>
<td>Operating problems with latrines</td>
</tr>
<tr>
<td>Reason for constructing specific latrine type</td>
<td>Absence of household latrine from plot</td>
</tr>
<tr>
<td>Operating problems with latrine</td>
<td>Reason for constructing latrines on-plot</td>
</tr>
<tr>
<td>Responsibility for latrine maintenance</td>
<td>Capital / recurrent costs for latrine types</td>
</tr>
<tr>
<td>Standard and frequency of latrine cleaning</td>
<td>Estimated average income of households</td>
</tr>
<tr>
<td>Position of latrine within the plot</td>
<td>Insect and odour nuisance / control</td>
</tr>
<tr>
<td>Latrine cost and method of payment</td>
<td>Pit emptying methods / problems</td>
</tr>
<tr>
<td>Details of repayment schedule</td>
<td>Operation of double pit latrines</td>
</tr>
<tr>
<td>Insect and odour nuisance / control</td>
<td>Other information</td>
</tr>
<tr>
<td>Anal cleansing material preferred and disposal</td>
<td></td>
</tr>
<tr>
<td>Sludge disposal practices</td>
<td></td>
</tr>
<tr>
<td>Pit / tank emptying practices</td>
<td></td>
</tr>
<tr>
<td>User satisfaction levels</td>
<td></td>
</tr>
<tr>
<td>Impact of operating problems on use of latrine</td>
<td></td>
</tr>
<tr>
<td>Improvements to latrine type</td>
<td></td>
</tr>
</tbody>
</table>

NB: Areas where content overlapped between household and postal survey are highlighted in bold font.
### Table 16: Triangulation matrix

<table>
<thead>
<tr>
<th>Item</th>
<th>Household survey</th>
<th>Postal survey</th>
<th>Semi-structured interview</th>
<th>Field tests</th>
<th>Field observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absence of latrine</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Latrine type</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Reason for latrine construction</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Reason for construction on-plot</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Operating problems with latrines</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Responsibility for latrine cleaning</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Position of latrine within plot</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Standard and frequency of latrine cleaning</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Latrine cost and method of payment</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Repayment schedule</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Insect / odour nuisance</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Anal cleansing material</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Sludge disposal practice</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Pit emptying</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Impact of operating problems</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Improvements to latrine type</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Effect of plot size</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Operation of double pit latrines</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td>•</td>
</tr>
</tbody>
</table>
The postal questionnaire was brief in content as part of a deliberate effort to improve response rate (on the assumption that short questionnaires have a higher chance of being completed). Additionally, the postal survey fulfilled a different function, namely to elicit further information on sector professional's perceptions on key research questions, and to gain an insight into capital/recurrent costs for different latrine types.

The quality of data derived from a questionnaire survey depends on four critical elements (Bickman and Rog, 1998), including the size and representativeness of the sample, the techniques used for collection, the quality of interviewing and the extent to which the questions used were good measures of survey objectives. Work by Fowler & Mangione (1990) reinforce the importance of good question design amongst these criteria, since this was found to be one of the major sources of error in survey estimates.

For this research, the design and preparation stage for both household and postal surveys has been guided by these references. In particular, two checklists summarise the key elements of survey question design outlined in these references, one relating to what constitutes a good question in surveys (see Box below), the second a general checklist for designing survey instruments (see Appendix 3). These checklists were used to alter content, phrasing and emphasis of pre-evaluated survey questions.

**Characteristics of questions and answers fundamental to good measurement process** (Bickman and Rog, 1998)

- Questions need to be consistently understood;
- Questions need to be consistently administered or communicated to respondents;
- What constitutes an adequate answer should be consistently communicated;
- Unless measuring knowledge is the goal of the question, all respondents should have access to the information needed to answer the questions accurately;
- Respondents must be willing to provide the answers called for in the question.

Additionally, as mentioned in section 3.7 above, the household and postal survey questions were subject to evaluation to ensure that respondents could understand the questions asked, to check for any ambiguity in question phrasing, and to identify local cultural differences between regions which may affect user responses. This was achieved through:

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III: Research design and methodology
• Discussions with colleagues at the London School of Hygiene and Tropical Medicine about question design and emphasis;

• In-country field pre-testing (for household surveys only). Field pre-tests were typically based on a 5-10 per cent sample (in areas with similar characteristics to those chosen for the full survey). Data collection procedures were consistent with those used in the main planned survey, although for the pre-test household selection was determined by convenience rather than a rigid sampling procedure. Surveyors were asked to note any problems or difficulties experienced when conducting the field pre-test and to summarise these in a report sent to the researcher. Following pre-testing in each country, amendments to questionnaire survey forms were made.

Copies of the proformas for both household and postal surveys used during the research are available in Appendices 1 and 2. Information relating to how the surveys were administered feature in the following sub-sections.

**Household survey**

**Administration**

House to house surveys formed a central part of the data collection process. In each of the areas visited, a layout map and house numbers of the area were used and in this way randomly sampled houses were recorded. If a household was found to be unwilling to answer the questions, or householders were absent, this information was recorded and the interview was conducted with the next available household in the vicinity.

Enumerators were engaged to conduct the house to house surveys. Individuals with previous experience in collecting data and administering surveys were employed in this process. Where possible, the researcher joined enumerator teams as an observer. Inevitably, the background of enumerators tended to vary from location to location, and was governed by the particular relationships and links that the researcher had with the collaborating agencies. For example:

• In Mozambique, the PNSBC permitted local sanitation animators (majority of whom are women) already employed by the programme to conduct the work;
In Ghana, enumerators ranged from agency staff members (Village Water Reservoirs; CEDECOM, AMA) to National Service Personnel (ProNet); in India, local college students participated in survey data collection;

In all cases, a strict procedure was developed to guide survey administration. This involved an orientation course for enumerators (typically one day in duration, presented either by the researcher or collaborating agency staff members), a field pre-test (followed by questionnaire revision and discussion), full sample survey, and verification sample (5 per cent of the full sample was re-tested and compared with original survey results). The orientation course provided general guidance on the purpose of the research, general survey administration, and specific guidance in relation to particular questions arising in the survey. A particular point to note is that a strong gender balance was maintained for enumerator teams which was important when discussing sensitive or taboo issues with female household members. A briefing note outlining the key orientation points conveyed during these sessions is available in Appendix 6.

**Sampling**

A probability sampling technique (stratified) was selected as the preferred means of conducting the household survey. Stratified sampling refers to the process whereby a population is divided into strata (or groups) and a simple random sample of each stratum is collected (Bickman and Rog, 1998). The stratified population can be sampled on either an equal or unequal probability basis. In this case, the strata (districts) were sampled non-randomly, with random sampling of individual households.

The study aimed to develop as sizeable a data set in each country within the logistical constraints in place. Sampling was conducted in a range of districts in each city in the study, thereby ensuring that the responses gained were representative of a cross-section of householder’s opinion and views. In India, household surveys were conducted in 33 different low-income districts; in Mozambique and Ghana similar figures were 7 and 26 respectively. The average sample size figure per district in each country was 51 (Mozambique); 16 (India) and 36 (Ghana).
The research did not aim to prove that results from the survey were statistically significant, but rather to establish credible relationships between selected variables.

Response

1843 household questionnaires were completed as part of this component of the research (51 per cent from Ghana; 29 per cent from India and 20 per cent from Mozambique). The main reliability and validity issues with regard to data collection are included in the list below. Efforts to mitigate error arising in these forms are also detailed.

- **Sample selection bias** (the basis for drawing a list for sampling may be incomplete or faulty). The districts to be sampled in this research were discussed in negotiation with project collaborators to ensure that those areas complied with agreed criteria for site selection.

- **Non-response error** (the biased nature of the responding sample). The discussions to determine site selection addressed the issue of representativeness of the study population in those districts.

- **Item non-response error** (failure of respondents to answer individual questions). Analysis of missing values from the questionnaire indicates acceptably low levels of item non-response for the majority of variables. In the majority of cases, this value ranged from 2.6% - 4.1%. Questions that addressed more sensitive issues, however, did record much higher error figures, and results from these questions need to be interpreted with caution. Examples include: *Number of people currently with diarrhoea?* (52.3% missing); *How was the toilet paid for?* (37.5% missing); *How many months of the loan are left to repay?* (87.4% missing); *When was the toilet last cleaned?* (96.4% missing). In retrospect, these questions recorded high error rates because either the information being requested was sensitive or potentially embarrassing in nature, or the interviewee could not recall the information required.

- **Response error** (respondents misunderstand the wording of questions as presented). Attention was paid to providing enumerators with a detailed orientation towards the research and the questionnaire questions prior to fieldwork (see Appendix 6).
Furthermore, a 5 per cent resample was conducted with each collaborating agency and the reliability of responses cross-checked.

**Postal survey**

*Administration*

The decision to use a postal survey was governed by the need to sample the opinions of a cross-section of engineers, administrators, development workers, health officials, and planners regarding on-plot sanitation in urban areas. A questionnaire was designed for this purpose and 305 sector professionals were contacted and asked to participate in the research. A copy of the questionnaire can be found in Appendix 2.

Several general rules (beyond those already listed in Box above) governed the administration of the postal survey (Andreason, 1970; Champion & Sear, 1969; Simon, 1967):

- The respondent letter needed to be short (single side A4);
- Guarantee confidentiality (made in covering letter sent with questionnaire);
- Send out reminders (two reminders sent out);
- Provide incentives for responding (a copy of the aggregated results from the survey was posted to all contributors);
- Make instructions clear, give examples of how to answer;
- Keep the questionnaire modest in length.

**Sampling**

The strategy applied in this case was a non-probability sampling design, including elements of 'critical case' (i.e., cases selected are key or essential for overall acceptance or assessment) and 'snowball' (i.e., group members identify additional members to be included in the sample) sampling types. Those individuals initially contacted were drawn from a known database of sector professionals that had responded to an earlier postal survey on a related topic. Each postal survey carried an end section requesting the respondent to nominate a colleague who might be willing to participate in the research. This led to several further contacts being made.
Response

57/305 completed questionnaires were returned, representing a response rate of 19 per cent. Such a low rate presents difficulties with nonresponse error, or the potential for bias to enter into survey results because of the failure to obtain returns from 100 per cent of the sample. The size of this error is largely dependent on how significant the nonresponse error is and how different the nonresponders are from the responders (Bickman and Rog, 1998). Despite efforts to mitigate poor response, including posting 2-3 reminders and the inclusion of non-monetary incentives (an offer of a copy of the aggregated findings from the fieldwork), few completed survey forms were received. In mitigation, error arising from the difference between nonresponders and responders may not be significant, since the survey was posted to known water and sanitation sector professional contacts. However, it does imply that the results from the postal survey as a whole need to be interpreted with caution.

<table>
<thead>
<tr>
<th>Country of Origin</th>
<th>Number</th>
<th>Percentage</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>11</td>
<td>19.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>5</td>
<td>8.8</td>
<td>28.1</td>
</tr>
<tr>
<td>Tanzania</td>
<td>9</td>
<td>15.8</td>
<td>43.9</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>5</td>
<td>8.8</td>
<td>52.6</td>
</tr>
<tr>
<td>India</td>
<td>4</td>
<td>7.0</td>
<td>59.6</td>
</tr>
<tr>
<td>Kenya</td>
<td>4</td>
<td>7.0</td>
<td>66.7</td>
</tr>
<tr>
<td>Mozambique</td>
<td>2</td>
<td>3.5</td>
<td>70.2</td>
</tr>
<tr>
<td>Bhutan</td>
<td>3</td>
<td>5.3</td>
<td>75.4</td>
</tr>
<tr>
<td>Nigeria</td>
<td>7</td>
<td>12.3</td>
<td>87.7</td>
</tr>
<tr>
<td>Trinidad</td>
<td>1</td>
<td>1.8</td>
<td>89.5</td>
</tr>
<tr>
<td>Zambia</td>
<td>1</td>
<td>1.8</td>
<td>91.2</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2</td>
<td>3.5</td>
<td>94.7</td>
</tr>
<tr>
<td>Uganda</td>
<td>1</td>
<td>1.8</td>
<td>96.5</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1</td>
<td>1.8</td>
<td>98.2</td>
</tr>
<tr>
<td>Botswana</td>
<td>1</td>
<td>1.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Total 57 100.0

3.7.2 Semi-structured interviews

Semi-structured interviews were conducted with key sector personnel in each country as a way of examining perceptions relating to on-plot sanitation and to elicit more detailed information on the five key research questions identified earlier in this chapter. Thirty-five interviews were conducted during the course of the research with informants ranging across organisational types and disciplines; fourteen of these interviews yielded data
relevant to the thesis. Each interview typically lasted an hour in duration, and was guided by an aide-memoire of questions (see below). As relevant issues arose during conversation, further questions, not included in the aide-memoire were posed. Each interview was recorded using a hand-held tape recorder and the interviews transcribed at a later date (typically within one week of the interview). Confirmation was sought from respondents with regard to their willingness to be quoted in the research prior to beginning each interview. No interviewees requested anonymity. The transcriptions were then entered into a database of qualitative information stored on NUDIST qualitative data software for subsequent interrogation and analysis.

Prior to the commencement of the interview, interviewees were informed about:

1. Purpose of interview and wider research;
2. Estimated length of interview;
3. Use of tape recorder (if necessary establishing consent)
4. Anonymity (if requested)

An aide-memoire was used by the researcher to trigger discussion (see table 18 below) during the interviews. This was not rigidly applied, and there was flexibility to ask follow up questions to particular answers as the interview progressed.

<table>
<thead>
<tr>
<th>Table 18: Aide-memoire used during key informant interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROGRAMME related issues</strong></td>
</tr>
<tr>
<td>Implementation procedures</td>
</tr>
<tr>
<td>Criteria and conditions for programme</td>
</tr>
<tr>
<td>Target groups &amp; priority areas</td>
</tr>
<tr>
<td>Key change agents in community</td>
</tr>
<tr>
<td>Community needs and aspirations</td>
</tr>
<tr>
<td>Existing constraints</td>
</tr>
<tr>
<td>Integration of community and municipal activities</td>
</tr>
<tr>
<td>Effective community participation</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Agencies</td>
</tr>
<tr>
<td>Strategic overview. Partnerships</td>
</tr>
<tr>
<td>Responsibilities</td>
</tr>
<tr>
<td>Conflict defined roles</td>
</tr>
<tr>
<td>Innovative approaches, if any</td>
</tr>
<tr>
<td>Institution versus householder roles</td>
</tr>
</tbody>
</table>
Success - failures
Strengths and weaknesses
Contributing factors
Unsupported initiatives
Scaling-up of projects. Conditions / criteria
Major challenges facing urban sanitation

User satisfaction
Experiences
How defined?
Integration into design, provision & management

Programme financing
Basic mechanism. Agency approach
Internal financing - user contribution
Willingness to pay - experiences
Repayment rates
Savings and credit schemes

Details of individuals involved in the research, together with designation and organization are listed below. Those interviews that are included as qualitative data in the thesis are listed in bold.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emmanuel Bawa</td>
<td>Watsan officer, UNICEF, Accra Ghana</td>
</tr>
<tr>
<td>2</td>
<td>Nicholas Pron</td>
<td>Urban officer, UNICEF, Accra Ghana</td>
</tr>
<tr>
<td>3</td>
<td>Harry Reynolds</td>
<td>World Vision International, Accra, Ghana</td>
</tr>
<tr>
<td>4</td>
<td>Odouroi Donkor</td>
<td>Project officer, ProNet, Accra, Ghana</td>
</tr>
<tr>
<td>5</td>
<td>William Abagre</td>
<td>Project officer, ProNet, Accra, Ghana</td>
</tr>
<tr>
<td>6</td>
<td>N A Armah</td>
<td>Chief Engineer, Wastes Management Department, Accra Metropolitan Assembly, Accra, Ghana</td>
</tr>
<tr>
<td>7</td>
<td>M Ansu Tutu</td>
<td>Engineer, Wastes Management Department, Accra Metropolitan Assembly, Accra, Ghana</td>
</tr>
<tr>
<td>8</td>
<td>F N Arko</td>
<td>Executive Secretary, CEDECOM, Cape Coast, Ghana</td>
</tr>
<tr>
<td>9</td>
<td>Sey-Hayzel</td>
<td>Technical Officer, CEDECOM, Cape Coast, Ghana</td>
</tr>
<tr>
<td>10</td>
<td>G de Graff-Johnson</td>
<td>Technical Officer, CEDECOM, Cape Coast, Ghana</td>
</tr>
<tr>
<td>11</td>
<td>Soloman Arhinfu</td>
<td>Senior Environmental Health Officer, Cape Coast Metropolitan Assembly, Cape Coast, Ghana</td>
</tr>
<tr>
<td>12</td>
<td>Eugene Larbi</td>
<td>Manager, TREND, Kumasi, Ghana</td>
</tr>
<tr>
<td>13</td>
<td>J Dennis-Antwi</td>
<td>Head of Kumasi Health Education Unit, Kumasi, Ghana</td>
</tr>
<tr>
<td>14</td>
<td>Lukman Salifu</td>
<td>Deputy Director, Waste Management Department, Kumasi Metropolitan Authority, Kumasi, Ghana</td>
</tr>
<tr>
<td>15</td>
<td>Charles Mensah</td>
<td>Community Development Officer, Kumasi Sanitation Project/Waste Management Department, Kumasi, Ghana</td>
</tr>
<tr>
<td>16</td>
<td>John Addy</td>
<td>Technical Officer, Village Water Reservoirs, Tamale, Ghana</td>
</tr>
<tr>
<td>17</td>
<td>Patrick Mwintuur</td>
<td>Project Manager, Village Water Reservoirs, Tamale, Ghana</td>
</tr>
<tr>
<td>18</td>
<td>Steve Adongo</td>
<td>Environmental Health Technologist, Tamale Metropolitan Assembly, Tamale, Ghana</td>
</tr>
<tr>
<td>19</td>
<td>Matthew Adombre</td>
<td>Acting Director, GWSC, Accra, Ghana</td>
</tr>
</tbody>
</table>

III: Research design and methodology
<table>
<thead>
<tr>
<th>20</th>
<th>Dan Ayivie</th>
<th>Project Manager, Accra Sustainable Programme, Accra, Ghana</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Ben Doe</td>
<td>Project Manager, Accra Sustainable Programme, Accra, Ghana</td>
</tr>
<tr>
<td>22</td>
<td>Tamale Sanitation Committee members</td>
<td>Tamale, Ghana</td>
</tr>
<tr>
<td>23</td>
<td>Francis Awindaogo</td>
<td>Regional Coordinator, GWSC, Tamale, Ghana</td>
</tr>
<tr>
<td>24</td>
<td>P O Monteiro</td>
<td>National Coordinator, PNSBC, Maputo, Mozambique</td>
</tr>
<tr>
<td>25</td>
<td>V Macambe</td>
<td>PNSBC, Maputo, Mozambique</td>
</tr>
<tr>
<td>26</td>
<td>L Elias</td>
<td>National Coordinator of Water Affairs, DNA, Maputo, Mozambique</td>
</tr>
<tr>
<td>27</td>
<td>C N Laisse</td>
<td>Technical Officer, PNSBC, Maputo, Mozambique</td>
</tr>
<tr>
<td>28</td>
<td>Evaristo F Baquete</td>
<td>Head of Environmental Department, Ministry of Health, Maputo, Mozambique</td>
</tr>
<tr>
<td>29</td>
<td>Alice Santos Silva</td>
<td>Health Specialist, PNSBC, Maputo, Mozambique</td>
</tr>
<tr>
<td>30</td>
<td>M Dos Anjos</td>
<td>Head of WSS Department, Ministry of Health, Maputo, Mozambique</td>
</tr>
<tr>
<td>31</td>
<td>J Naene</td>
<td>Sanitation Animator, PNSBC, Maputo, Mozambique</td>
</tr>
<tr>
<td>32</td>
<td>Helena Covane</td>
<td>Sanitation Animator, PNSBC, Maputo, Mozambique</td>
</tr>
<tr>
<td>33</td>
<td>S N Jha</td>
<td>Sulabh International (Bihar State Branch), Patna, India</td>
</tr>
<tr>
<td>34</td>
<td>P Srinivasa Rao</td>
<td>Engineering Consultant, DFID, Hyderabad, India</td>
</tr>
<tr>
<td>35</td>
<td>M R K Murthy</td>
<td>Additional Commissioner, Vijayawada Slum Improvement Project, Vijayawada, India</td>
</tr>
<tr>
<td>36</td>
<td>K R Prasad</td>
<td>Executive Engineer, Vijayawada Slum Improvement Project, Vijayawada, India</td>
</tr>
<tr>
<td>37</td>
<td>G Meka</td>
<td>Assistant City Planner, Vijayawada Slum Improvement Project, Vijayawada, India</td>
</tr>
</tbody>
</table>

Full transcripts of interviews are reproduced in Appendix 8.

### 3.7.3 Field observations

One of the objectives of the research was to investigate the issue of insect and odour nuisance associated with on-plot sanitation. The approach adopted included recording qualitative judgements (users were asked to measure on an interval scale the odour and insect nuisance found in their latrine (refer questions 5.1 and 5.2 in household survey proforma, Appendix 1) and quantitative tests on latrine superstructures. This section governs the procedure applied to the latter.

**Insect nuisance**

71 tests were completed on latrines in all three countries during the research. Insect flypapers, suspended inside the latrine superstructure were used to catch flying insects. Each ‘test’ was timed over a three-hour period, and tests were conducted at variable times during the day to take account of activity patterns. Although not designed to provide an absolute measure of the number of flying insects found within the latrine during the test period, the exercise was an attempt to measure the density of flying insects (namely *M.*
domestica (Housefly), M. sorbens (Facefly), Chysomya spp (Blowfly) and various mosquito species. Indirectly, the results from the tests could be used to establish a proxy indicator of nuisance. Identification of insect species was aided by descriptions and visual representations of insect species available in Lanoix and Roy (1976). A record of the outcomes from these tests can be found in Appendix 5.

A constraint of this test was that it only measured flying insects, and failed to encompass nuisance from ground level crawling insects such as cockroaches.

**Odour nuisance**

During initial feasibility tests in Ghana, attempts to quantify odour in latrine superstructures proved inconclusive (no such tests were conducted in Mozambique or India, where respectively superstructures are not enclosed by a roof and water seals are in place). In Ghana, concentrations of assumed indicator gases (methane, hydrogen sulphide and ammonia) in latrine superstructures were measured using Dräger ‘accura’ gas detection equipment. Throughout a series of tests conducted under varying temperatures, sampling and (perceived) odour conditions, no significant gas measurement was achieved.

With VIP latrines, wind speed across the top of vent pipes was measured using an AM 5000 anemometer, in conjunction with a laboratory stopwatch capable of reading to 1/10th second. The intention here was to correlate measured indicator gases with wind speed to determine if poorly sited or incorrectly constructed vent pipes impacted on odour nuisance. The results from anemometer tests proved to be inconclusive and a decision was made to abandon this type of testing.

On reflection these tests indicated that:

- Odour which is present in some latrine superstructures may be attributable to trace gas concentrations which cannot realistically be measured and;
- Odour in superstructures may be a function of a complex host of factors (ventilation, diet, behaviours, and operation) which are difficult to reliably quantify and compare.
The researcher concluded that quantitative testing for odour should be replaced by qualitative measurement of user's perception of odour.

3.8 Database summary

This research generated a large quantity of qualitative and quantitative data relating to urban sanitation provision. Although a synthesis of this information is provided in subsequent chapters, the bulk of the raw data is not presented in this thesis. However, the data is publicly accessible, and a synthesis of the information contained in this database is provided in table 20 below.

<table>
<thead>
<tr>
<th>Information item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire surveys</td>
<td>1843</td>
</tr>
<tr>
<td>Postal surveys</td>
<td>57</td>
</tr>
<tr>
<td>Semi-structured interviews</td>
<td>22</td>
</tr>
<tr>
<td>Quantitative tests on latrine superstructures</td>
<td>71</td>
</tr>
<tr>
<td>Documents reviewed</td>
<td>380</td>
</tr>
<tr>
<td>Video film (30 minutes)</td>
<td>3</td>
</tr>
</tbody>
</table>

This information can be further analysed by country, resulting in the following data breakdown:

<table>
<thead>
<tr>
<th>Information item</th>
<th>Ghana</th>
<th>India</th>
<th>Mozambique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire surveys</td>
<td>951</td>
<td>531</td>
<td>361</td>
</tr>
<tr>
<td>Postal surveys</td>
<td>11</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Semi-structured interviews</td>
<td>12</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Quantitative tests on latrine superstructures</td>
<td>22</td>
<td>20</td>
<td>29</td>
</tr>
<tr>
<td>Video film</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

1 A total of 57 postal surveys were recorded - this table indicates only those listed in the fieldwork countries.

3.9 Data analysis

The data collected during this study was both qualitative and quantitative in nature. Qualitative data was generated through a series of semi-structured interviews with key
informants and selected case histories with householders. Where a translator was used to facilitate interviewing (in Mozambique with two sanitation animators), strict guidance to interpret verbatim was specified so that no ‘third party’ bias could be introduced. Field notes from these interviews were written on the day of that activity, with transcripts of taped interviews completed within a week of the discussion.

Quantitative data was generated from the household and postal questionnaires, and through field based tests on insect nuisance. Notes and observations as part of these activities were made by enumerators during the course of their surveys and presented in reports on activities. Similarly, difficulties encountered with conducting tests on insect nuisance were recorded on the day of the test and entered onto a spreadsheet file the same day.

All the quantitative data from household and postal questionnaires were analysed using Statistical Package for Social Scientist (SPSS) software (versions 9.0 and 10.0). Chi-square and Cramer's V tests were applied to the data to identify respectively the significance of relationships and the degree of association between variables. Methodological details of these tests are included in Appendix 7. Field based insect nuisance test results were analysed from records stored on Microsoft Excel software, and transcripts of all interviews were analysed using Non-numerical Unstructured Data Indexing Searching and Theory-building (NUD.IST 3.0) software (a specific programme designed to code, search, organise and analyse relationships in qualitative data).

Detailed data analysis is presented in the following chapters.

3.10 Summary

This chapter reviews the hypothesis, objectives and key research questions that have guided the work. Several critical points can be highlighted. In an attempt to understand the issues at stake in this research from a variety of perspectives, a mix of methods has been adopted within the overall methodological design. Thus, quantitative and qualitative methods were combined and a cross-section of stakeholders interviewed with regard to key issues. Considerable effort was paid to systems and procedures through which
validity of the data could be maintained (e.g., triangulation matrix), and a cross-section of cities and technology types were sampled in order to improve the reliability of the findings. The analysis of the data followed a framework designed to examine and extract relevant material in relation to the guiding hypothesis and research questions.

Three methods did not meet with initial expectations. First, attempts at measuring odour nuisance in latrine superstructures could not be pursued due to limitations with the field equipment available. Second, efforts to measure wind speed across VIP latrine vent pipes proved inconclusive and was abandoned. Third, the level of response from the postal survey of sector professionals was disappointingly small, introducing concerns over non-response error of the survey's findings. Although unfortunate, these setbacks to the methodology were of secondary importance and did not compromise the overall integrity of the research findings.
PAGE
NUMBERING
AS ORIGINAL
Analysis of findings

4.1 Chapter outline

This chapter reviews the main research findings following quantitative and qualitative data analysis. The intention of the chapter is to provide evidence drawn from household/postal surveys, field observations and key informant interviews to address the key research questions identified in Chapter 3 (section 3.4). The relationship between these research questions and the presentation of sections in this chapter is reflected in the following table:

<table>
<thead>
<tr>
<th>Key research question</th>
<th>Section/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>What factors account for the absence of household latrines?</td>
<td>4.2, 4.4.4, 4.8.1, 4.8.1.1</td>
</tr>
<tr>
<td>What levels of dis/satisfaction do users express about different latrines?</td>
<td>4.3</td>
</tr>
<tr>
<td>Does plot size constrain the use of on-plot sanitation systems?</td>
<td>4.4, 4.2.2</td>
</tr>
<tr>
<td>Do maintenance problems arise when pits and tanks fill up?</td>
<td>4.6, 4.8.3</td>
</tr>
<tr>
<td>Do operational problems arise with on-plot sanitation systems, and why do they occur?</td>
<td>4.5, 4.6.7, 4.7, 4.8.2, 4.8.4</td>
</tr>
</tbody>
</table>

The chapter is divided into two parts; Part A focusing on quantitative data analysis, and Part B focusing on qualitative data analysis. Each section of the text typically begins with a short background note reprising the critical issues associated with this topic. Similarly, each section concludes with a bullet point listing that reflects the main findings from this piece of research in relation to the thesis' key research questions. Where appropriate, text is supported by tables and case studies that explain and expand the chapter's narrative. Appendix 7 provides further details on the statistical tests applied to the data. In the majority of cases, findings in this chapter are based on household survey results. However, sections 4.4.5 – 4.4.6 relate primarily to postal survey results, and Part B is based on case histories of householders. Chapter 3 (section 3.7.1) raises methodological limitations associated with the results from the postal survey, and the presentation of information in these sections of this chapter needs to be viewed with this caveat in mind. The chapter concludes with an aggregated summary of findings.
4.2 Absence of household latrines

4.2.1 Background

In the urban context, the factors that determine whether sanitation facilities are present or absent from the household plot are diverse, including issues such as poverty, cost of technology, available space, indebtedness and problems with operation and maintenance. The current literature emphasises the importance of the lack of space in the urban environment as a key feature explaining absence of household sanitation.

4.2.2 Plot size a determinant of absence of household latrine?

As mentioned in Chapter 2, criticism of pit latrines focuses on their assumed inappropriateness on small plot sizes. Results from the household survey indicate that for users, absence of a household latrine is more a function of poverty than the actual or perceived availability of space on the plot. When answering the question, 'Why is there no household toilet?' the single largest responses from users recorded 'high cost' (24%); and 'use public latrines' (13%); factors directly or indirectly linked to household income levels. 'Lack of space' was ranked as the third most important response (13%). The remaining 34% of cases (described as 'other') include combinations of the top five ranking factors. These figures indicate that levels of poverty and indebtedness may lead householders to prioritise the use of available space on plot to other functions (ceremonial, livelihood, etc), which may not be consistent with sanitary needs.

<table>
<thead>
<tr>
<th>Table 23: Reasons for absence of household latrines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>High cost</td>
</tr>
<tr>
<td>Use public latrines</td>
</tr>
<tr>
<td>Lack space</td>
</tr>
<tr>
<td>Difficult O&amp;M</td>
</tr>
<tr>
<td>No facility provided</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Figures from the postal survey of sector professionals (n=57) tend to reinforce these findings, with 'cost' (19%) and combinations of 'cost' and 'lack of space' (19%) being cited...
as the most frequent factors accounting for absence of household latrines. ‘Lack of space’ was the third most commonly identified factor (11.3%).

Plot size records for households without a sanitary facility are relevant to this section of the analysis. If plot size were a significant factor restricting the ability to construct a latrine, concentrations of households without latrines grouped around the smallest plot size category would be assumed. Table 24 below counters this argument by demonstrating the generally even spread of households across all plot size categories. Where a trend is evident, it is towards absence and larger plot sizes, a point that is further explained in sections 4.4.2-4.4.4 below.

### Table 24: Absence of household latrine by plot size category

<table>
<thead>
<tr>
<th>Plot size category</th>
<th>1-124 m²</th>
<th>125-326 m²</th>
<th>327-625 m²</th>
<th>626 m²-highest</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>49</td>
<td>111</td>
<td>104</td>
<td>114</td>
<td>378</td>
</tr>
<tr>
<td>% Total</td>
<td>13.0</td>
<td>29.4</td>
<td>27.5</td>
<td>30.2</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: Plot size category defined in quartiles

4.2.3 Relationship between cost, technology choice and income level

At a further level of analysis, the research aimed to understand the impact of income on factors affecting absence of household latrines. Table 25 below shows the outcome from data analysis when sources of household income are disaggregated by technology type, and ranked in order of sample size. Rather than asking the monetary value of a householders’ income, which would have introduced sampling bias to the results, proxy indicators of income levels were used, in this case, the main source (or profession) accounting for household income. By grouping these professions by type, (such as unskilled, semi-skilled and skilled) it is possible to gain an insight into cost, technology choice and income relationships. Intuitively, it might be argued that given the higher capital costs of particular latrines types (i.e., septic tanks and VIP’s), there will be a general trend towards skilled (higher income) sources of employment being associated with those technology types. Conversely, those households without latrines, or latrines with lowest capital costs, would be related to unskilled (lower income) sources of employment.
What the table indicates is that the relationship between these factors is much more complex than anticipated. It is observable that for those households that have no sanitation facility, there is a significant grouping of unskilled sources of employment that form the basis of household income. This tends to support the findings in section 4.2.2 that poverty is one of the key reasons for absence of household sanitation. However, the same cannot be said for lower cost latrine types such as bucket/pan latrines or simple pits, as these have a mix of both unskilled and skilled sources of employment. Although some grouping of employment types can be identified for septic tanks and VIP latrines, the mix of sources is clearly apparent.

This analysis tends to suggest that the relationship between cost, technology choice and income is not a strong one and that household’s decisions regarding technology choice are influenced significantly by other factors, such as socio-cultural issues. Furthermore, it raises an important point regarding the relationship between information and choice. It is assumed that householders exercise choices about sanitation based on a complete knowledge of options and their relative merits. This is rarely the case, as information flows in low-income communities are far from systematic, leaving many to act on partial or patchy information, obtained in an ad hoc manner.

| Table 25: Rank order of main household source of income, by technology type |
|-------------------------------------------------|----------------|----------------|----------------|----------------|----------------|
| Rank order, by source of income (% of cases)    | 1              | 2              | 3              | 4              | 5              |
| **High cost**                                  |                |                |                |                |                |
| Septic tank                                    | Trader (21.2)  | Retired (12.2) | Labourer (10.9)| Civil servant (5.8) | Unemployed (5.1) |
| VIP                                            | Trader (44.2)  | Clerk (19.2)   | Retired (7.6)  | Civil servant (3.8)| Student (3.8)    | Bar owner (1.9) | Landlord (1.9) | Labourer (1.9)| Teacher (1.9) |
| **Low cost**                                   | Labourer (48.9)| Mechanic (7.8) | Trader (6.5)   | Civil servant (5.8)| Rail employee (3.8)|                |                |                |                |                |
| Pour flush                                     | Labourer (33.3)| Trader (29.0)  | Clerk (4.7)   | Civil servant (2.2)| Mechanic (1.5)   |                |                |                |                |                |
| Simple pit                                     | Trader (37.0)  | Unemployed (9.2)| Retired (8.8) | Clerk (6.9)    | Seamstress (5.0) |                |                |                |                |                |
| Bucket                                         | Trader (33.8)  | Labourer (16.3)| Fisherman (6.9)| Unemployed (4.3)| Mechanic (3.4)  |                |                |                |                |                |
| Absent                                         |                |                |                |                |                |                |                |                |                |                |
Absence of household latrines: key points

- A key reason for the lack of household latrines is poverty, rather than lack of available space on-plot. Poverty, indebtedness and/or inability to save funds to invest in longer term sanitation facilities are key constraints;

- The relationship between cost, technology choice and income level is a complex one, which defies simple categorisation. There is some evidence to suggest grouping of unskilled employment with those households without sanitation, although this does not remain consistent for lower cost latrine types. Similarly, skilled sources of employment are not solely related to choice of higher cost latrine types. Choices about sanitary technology are based on a variety of factors, of which cost is just one (important) consideration.

4.3 User satisfaction

4.3.1 Background

There is little available literature on user perceptions of latrines, their operation in urban areas, or on changes in householder attitudes caused by the incidence of problems with operation and maintenance. Commonly held, although untested, professional assumptions are that users will be dissatisfied with lower cost latrine types in the urban context.

4.3.2 Perceived user benefits of sanitation

As a proxy indicator of perceived user benefits of sanitation, the household survey asked each family, ‘Why did you build a toilet on your plot?’ The results tend to reinforce previously documented findings that socio-cultural, rather than health factors dominate user decisions to invest in household sanitation facilities. Significantly, socio-culturally defined motivational factors such as ‘comfort and convenience’ and ‘privacy’ accounted for just under half of all responses to this question (48%), a figure that rises to 53% when a combination of the two factors is included. Although ‘health’ accounts for the third most numerous response (11%) it is cumulatively surpassed by other significant minorities (totalling 20%) including ‘government sponsored’, ‘no/poor public (sanitary) facilities’, ‘required’, ‘built with house’ and ‘space available’. Table 26 below provides a detailed breakdown to these figures.
### Table 26: Expressed motivating factors for construction of household latrine

<table>
<thead>
<tr>
<th>Factor</th>
<th>Number</th>
<th>%</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Comfort and convenience</td>
<td>428</td>
<td>33.1</td>
<td>33.1</td>
</tr>
<tr>
<td>2 Privacy</td>
<td>200</td>
<td>15.5</td>
<td>48.6</td>
</tr>
<tr>
<td>3 Health</td>
<td>146</td>
<td>11.3</td>
<td>59.9</td>
</tr>
<tr>
<td>4 Government sponsored</td>
<td>103</td>
<td>8.0</td>
<td>67.9</td>
</tr>
<tr>
<td>5 No/poor facilities</td>
<td>61</td>
<td>4.7</td>
<td>72.6</td>
</tr>
<tr>
<td>6 Required</td>
<td>44</td>
<td>3.4</td>
<td>76.0</td>
</tr>
<tr>
<td>7 Built with house</td>
<td>28</td>
<td>2.2</td>
<td>78.2</td>
</tr>
<tr>
<td>8 Space available</td>
<td>21</td>
<td>1.6</td>
<td>79.8</td>
</tr>
</tbody>
</table>

**Combined**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Number</th>
<th>%</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>60</td>
<td>4.6</td>
<td>84.4</td>
</tr>
<tr>
<td>1 &amp; 3</td>
<td>54</td>
<td>4.2</td>
<td>88.6</td>
</tr>
<tr>
<td>2 &amp; 3</td>
<td>46</td>
<td>3.6</td>
<td>92.2</td>
</tr>
<tr>
<td>Other</td>
<td>102</td>
<td>7.8</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>1293</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

#### 4.3.3 Expressed levels of user satisfaction.

Table 27 below shows the aggregated responses to the question, 'How satisfied are you with your toilet?'. The results indicate high levels of expressed satisfaction (76% or more)

### Table 27: Levels of expressed user satisfaction by selected technology type

<table>
<thead>
<tr>
<th>Levels of user satisfaction</th>
<th>Count</th>
<th>Very satisfied</th>
<th>Satisfied</th>
<th>Neither satisfied nor dissatisfied</th>
<th>Unsatisfied</th>
<th>Very unsatisfied</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Row</td>
<td>% Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bucket/pan</td>
<td></td>
<td>11</td>
<td>77</td>
<td>49</td>
<td>113</td>
<td>10</td>
<td>260</td>
</tr>
<tr>
<td>4.2</td>
<td>100</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>0.0</td>
<td>20.4</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td>86</td>
<td>262</td>
<td>12</td>
<td>22</td>
<td>4</td>
<td>387</td>
</tr>
<tr>
<td>22.2</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>6.7</td>
<td>30.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIP</td>
<td></td>
<td>8</td>
<td>32</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>48</td>
</tr>
<tr>
<td>16.6</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>3.7</td>
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<td>Pour-flush</td>
<td></td>
<td>37</td>
<td>284</td>
<td>17</td>
<td>32</td>
<td>18</td>
<td>388</td>
</tr>
<tr>
<td>9.5</td>
<td>100</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.9</td>
<td>30.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>WC septic tank</td>
<td></td>
<td>26</td>
<td>99</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>154</td>
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<tr>
<td>18.8</td>
<td>100</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WC septic tank</td>
<td></td>
<td>2.3</td>
<td>8.8</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>12.0</td>
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<tr>
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<td></td>
<td>190</td>
<td>780</td>
<td>88</td>
<td>178</td>
<td>38</td>
<td>1274</td>
</tr>
<tr>
<td>14.9</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>14.9</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.

Cramer's V (value) = .318

IV: Analysis of finding

102
recording 'very satisfied' or 'satisfied') for four of the five latrine types listed. Only bucket/pan latrines show significant levels of dissatisfaction, with just under half of all cases listed as 'unsatisfied' or 'very unsatisfied'.

4.3.4 Problems with operation and maintenance of latrines

Further insight into satisfaction levels can be gained, indirectly, from identification of operation and maintenance related problems with household latrines. In response to the question, 'What problems do you have with your toilet?', it was significant that in over half of all cases (54%) there were 'no' problems identified by users. Where problems were recorded, difficulties with 'emptying' was the most commonly noted factor (12%), followed by 'smell' and 'insects', recording 7% and 4% respectively (see Table 28 below).

More detailed analysis comes from the crosstabulations of most commonly noted problem by technology type. Table 28 below reflects the overall picture noted above. Important

<table>
<thead>
<tr>
<th>Table 28: Most commonly noted problems with latrine by technology type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problems with latrine</strong></td>
</tr>
<tr>
<td>Count</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td><strong>% Row Total</strong></td>
</tr>
<tr>
<td><strong>% Total</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>Bucket/pan</td>
</tr>
<tr>
<td>20.0</td>
</tr>
<tr>
<td>4.0</td>
</tr>
<tr>
<td>Simple pit</td>
</tr>
<tr>
<td>72.1</td>
</tr>
<tr>
<td>21.9</td>
</tr>
<tr>
<td>VIP</td>
</tr>
<tr>
<td>51.9</td>
</tr>
<tr>
<td>2.0</td>
</tr>
<tr>
<td>Pour-flush</td>
</tr>
<tr>
<td>59.1</td>
</tr>
<tr>
<td>17.9</td>
</tr>
<tr>
<td>WC septic tank</td>
</tr>
<tr>
<td>53.8</td>
</tr>
<tr>
<td>6.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>54.3</td>
</tr>
<tr>
<td>54.3</td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.

Cramer's V (value) = .305

aspects to highlight are the large percentages recorded under the 'none' category for four of the five latrine types tested. Only bucket/pan latrine types recorded less than 50% in
this category. Additionally, the percentages recorded for smell and insects are relatively small, as compared against those recorded for emptying.

When examining individual technology types several points of interest can be observed:

- Simple pit latrines record the highest percentage figures of all types under the ‘none’ category; while VIP latrines record the second lowest;
- That pour-flush latrines, even with their waterseal, record insects and odours as amongst the most commonly noted problems. However, it is notable that in only 36% of cases did users perceive this odour nuisance to be greater than ‘slight’;
- Bucket/pan latrines frequently record ‘emptying’ problems by users;
- ‘Lack of water’ is mentioned mainly in relation to WC to septic tanks.

What the above comparison does provide is an indication of the relative problems

| Table 29: Crosstabulations: selected problems and user satisfaction |
|----------------------|-------------------------------|-----------------------------|-----------------|---------------------|-------------------|-----------------|----------------|
|                      | (Cases)                                      |
| % Count             | Very unsatisfied | Unsatisfied | Neither satisfied nor dissatisfied | Satisfied | Very satisfied | Total |
| % Row              |                        |             |                                        |           |                |       |
| % Total            |                        |             |                                        |           |                |       |
| Smell              | 4                        | 20           | 8                                        | 57        | 3               | 92    |
|                    | 4.3                      | 21.7         | 8.7                                      | 62.0      | 3.3             | 100   |
|                    | 0.3                      | 1.6          | 0.6                                      | 4.5       | 0.2             | 7.2   |
| Insects            | 1                        | 1            | 1                                        | 47        | 4               | 54    |
|                    | 1.9                      | 1.9          | 1.9                                      | 87.0      | 7.4             | 100   |
|                    | 0.1                      | 0.1          | 0.1                                      | 3.7       | 0.3             | 4.3   |
| Emptying           | 1                        | 59           | 27                                       | 59        | 8               | 154   |
|                    | 0.6                      | 38.3         | 17.5                                     | 38.3      | 5.2             | 100   |
|                    | 0.1                      | 4.6          | 2.1                                      | 4.6       | 0.6             | 12.1  |
| Repairs            | 1                        | 4            | 1                                        | 23        | 6               | 35    |
|                    | 2.9                      | 11.4         | 2.9                                      | 65.7      | 17.1            | 100   |
|                    | 0.1                      | 0.3          | 0.1                                      | 1.8       | 0.5             | 2.8   |
| Blockage           | 1                        | 5            | 5                                        | 19        | 4               | 34    |
|                    | 2.9                      | 14.7         | 14.7                                     | 55.9      | 11.8            | 100   |
|                    | 0.1                      | 0.4          | 0.4                                      | 1.5       | 0.3             | 2.7   |
| Lack water         | 3                        | 6            | 0                                        | 12        | 4               | 25    |
|                    | 12.0                     | 24.0         | 0                                        | 48.0      | 16.0            | 100   |
|                    | 0.2                      | 0.5          | 0                                        | 0.9       | 0.3             | 2.0   |
| Total              | 38                       | 178          | 88                                       | 780       | 186             | 1270  |
|                    | 100                      | 100          | 100                                      | 100       | 100             | 100   |
|                    | 3.0                      | 14.0         | 6.9                                      | 61.4      | 14.6            | 100   |

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.

Cramer’s V (value) = .367

IV: Analysis of finding
experienced by users of individual technology types, but what is not clear is the relative impact that these problems have on the user's satisfaction rating for their latrines.

Crosstabulations between these two variables are informative in that they indicate which of the above problems have the strongest impact on satisfaction levels. Examining the percentage of cases that fall in the two most dissatisfied categories (see Table 29) indicates that of the six most important problems listed above, only 'emptying' and 'smell' impact significantly on dissatisfaction levels (defined here as larger than 1.0% of total cases). Crosstabulations between recorded problems and their perceived impact on continued use of the household latrine reinforce the points made in table 28 above. Of the problems identified, only 'emptying' and 'smell' account for a cumulative figure of more than 1.0% of total cases in the three categories indicating more than a moderate impact on continued use of the latrine, as table 30 below illustrates.

<table>
<thead>
<tr>
<th>Table 30: Crosstabulations: selected problems and perceived impact on latrine use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count on use of latrine</td>
</tr>
<tr>
<td>% Row</td>
</tr>
<tr>
<td>Problem</td>
</tr>
<tr>
<td>Smell</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Insects</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Emptying</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Repairs</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Blockage</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Lack water</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.
Cramer's V (value) = 430

IV: Analysis of finding
Householders decisions to invest in domestic sanitation are typically driven by socio-cultural rather than health factors;

In all but one case, users express high degrees of satisfaction with their latrine (in excess of 80% recording 'satisfied' or 'very satisfied'). Bucket/pan latrines record by far the highest levels of dissatisfaction;

Many users do not perceive there to be a problem with their latrine. Where problems are recorded, the most common include 'emptying', 'smell' and 'insects', although absolute figures are low;

Of these three problems, 'emptying' and 'smell' have the greatest impact on satisfaction levels and ability for the user to use the latrine.

### 4.4 Plot size

#### 4.4.1 On-plot sanitation unsuitable for small plot sizes?

The literature review in chapter 2 illustrated examples of professional perspectives regarding the suitability of on-plot sanitation on small plot sizes, many of which were not based on empirical evidence. Part of the fieldwork associated with this research focused on collecting data based on surveyed plot areas as a mechanism to test the impact of plot size.

From analysis of these data sets, significant proportions of sample households with operational sanitation facilities were found on relatively small plot sizes: 29% of all such cases were measured with plot areas of up to 124m²; just over 10% on plots with an area not greater than 54m². Although this indicates the occurrence of domestic sanitation on relatively small plots, it fails to comment on the operation or perceived suitability of these facilities. Although not a perfect measure of 'suitability', levels of user satisfaction are indicative. When asked to express degrees of (dis) satisfaction with their facility, those households with the smallest plot sizes (defined here as the first quartile, in the range 1-124m²) expressed high levels of satisfaction with their facility, 76% being either 'satisfied' or 'very satisfied'. A relatively small minority of households, 17%, recorded either 'unsatisfied' or 'very unsatisfied' responses. More generally, levels of dissatisfaction are spread equally.
across all plot size categories, contradicting any assumed relationship between dissatisfaction and small plot size.

<table>
<thead>
<tr>
<th>Count</th>
<th>Very unsatisfied</th>
<th>Unsatisfied</th>
<th>Neither satisfied nor unsatisfied</th>
<th>Satisfied</th>
<th>Very satisfied</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Row</td>
<td>% Total</td>
<td>% Row</td>
<td>% Total</td>
<td>% Row</td>
<td>% Total</td>
<td>% Row</td>
</tr>
<tr>
<td>1-124 m²</td>
<td>16</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>44.4</td>
<td>13.9</td>
<td>13.9</td>
<td>27.8</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td>0.4</td>
<td>0.8</td>
<td>2.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125-326 m²</td>
<td>29</td>
<td>17</td>
<td>52</td>
<td>76</td>
<td>174</td>
<td></td>
</tr>
<tr>
<td>16.7</td>
<td>9.8</td>
<td>29.9</td>
<td>43.7</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>1.4</td>
<td>4.2</td>
<td>6.2</td>
<td>14.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>327-625 m²</td>
<td>16</td>
<td>16</td>
<td>22</td>
<td>32</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>18.6</td>
<td>18.6</td>
<td>25.6</td>
<td>37.2</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>1.3</td>
<td>1.8</td>
<td>2.6</td>
<td>7.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>626 m²-highest</td>
<td>257</td>
<td>193</td>
<td>178</td>
<td>128</td>
<td>756</td>
<td></td>
</tr>
<tr>
<td>34.0</td>
<td>25.5</td>
<td>23.5</td>
<td>16.9</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.8</td>
<td>15.6</td>
<td>14.4</td>
<td>10.4</td>
<td>61.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>57</td>
<td>44</td>
<td>42</td>
<td>182</td>
<td></td>
</tr>
<tr>
<td>21.4</td>
<td>31.3</td>
<td>24.2</td>
<td>23.1</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>4.6</td>
<td>3.6</td>
<td>3.4</td>
<td>14.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pearson's Chi-square: Value = 103.498. 0 cells have expected count less than 5. Asymptotic significance – 0.000 (null hypothesis rejected). Cramer's V value = 0.67. Plot size category defined in quartiles.

Importantly, in crosstabulations between satisfaction levels and recorded problems with latrines, 'lack of space' does not feature amongst the most commonly noted problems (see table 28, section 4.3.4). If users themselves had perceived space to be a factor affecting suitability, it might be expected to emerge in such an analysis.

4.4.2 Plot size determines technology choice?

A further criticism of on-plot sanitation is that as plot sizes in low-income communities tend to be small and constrained, technology choice will be similarly restricted. Section 4.2.3 above argues that decision-making about choice of sanitary technology defies simple cause-effect analysis. Choice is a complex issue to unravel and is affected by a multitude of factors. Table 32 below supports this assertion by showing the incidence of selected technology types against their respective plot size categories. Critically, it indicates that technology choice is not exclusively related to a single plot size category (the proportion of all cases by category demonstrates relatively equal distribution). Particular
technology types display higher concentrations within specific plot size ranges (i.e., pour-flush latrines and the 1-124m² range; bucket/pan latrines in the 625 m² to highest range). However, it should be noted that this reflects inter-country variations in the sampling of latrine types, rather than specific household decisions regarding technology choice. Furthermore, the analysis indicates that significant proportions of cases for these latrine types are located within other size categories.

<table>
<thead>
<tr>
<th>Count</th>
<th>1-124m²</th>
<th>125-326m²</th>
<th>327-625m²</th>
<th>625m²-highest</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucket / pan</td>
<td>2</td>
<td>27</td>
<td>106</td>
<td>124</td>
<td>259</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
<td>10.4</td>
<td>40.9</td>
<td>47.9</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>2.1</td>
<td>8.4</td>
<td>9.9</td>
<td>20.6</td>
</tr>
<tr>
<td>Simple pit</td>
<td>13</td>
<td>186</td>
<td>136</td>
<td>43</td>
<td>378</td>
</tr>
<tr>
<td></td>
<td>3.4</td>
<td>49.2</td>
<td>35.9</td>
<td>11.3</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>14.7</td>
<td>10.8</td>
<td>3.4</td>
<td>30.0</td>
</tr>
<tr>
<td>VIP</td>
<td>1</td>
<td>1</td>
<td>13</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>4.0</td>
<td>26.0</td>
<td>70.0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>0.1</td>
<td>0.1</td>
<td>1.0</td>
<td>2.7</td>
<td>3.9</td>
</tr>
<tr>
<td>Pour-flush</td>
<td>301</td>
<td>58</td>
<td>6</td>
<td>13</td>
<td>378</td>
</tr>
<tr>
<td></td>
<td>79.6</td>
<td>46.5</td>
<td>1.5</td>
<td>3.4</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>23.9</td>
<td>11.6</td>
<td>0.4</td>
<td>1.0</td>
<td>30.0</td>
</tr>
<tr>
<td>WC – septic tank</td>
<td>22</td>
<td>18</td>
<td>40</td>
<td>75</td>
<td>155</td>
</tr>
<tr>
<td></td>
<td>14.2</td>
<td>11.6</td>
<td>25.8</td>
<td>48.4</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>1.8</td>
<td>1.4</td>
<td>3.2</td>
<td>6.0</td>
<td>12.3</td>
</tr>
<tr>
<td>Total</td>
<td>357</td>
<td>288</td>
<td>301</td>
<td>288</td>
<td>1257</td>
</tr>
<tr>
<td></td>
<td>28.9</td>
<td>23.3</td>
<td>24.4</td>
<td>23.3</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>28.9</td>
<td>23.3</td>
<td>24.4</td>
<td>23.3</td>
<td>100</td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals. Pearson's Chi-square: Value = 1151701.8 cells (16.7%) have expected count less than 5; Asymptotic significance = 0.000 (null hypothesis rejected). Cramer's V (value) = .553. Plot size category defined in quartiles.

4.4.3 Operational problems associated with small plot sizes?

With regard to this question, the analysis highlights an interesting point. Although the incidence of all problems reported by householders is equally distributed across all plot size categories, this fails to point towards significant variation by selected problem (see table 33 below). In particular, of the three most commonly reported problems (‘emptying’, ‘smell’ and ‘insects’) both insect and smell nuisance were specific to small plot size. Insect nuisance was strongly related to the smallest plot size (1-124m² range) with 65.5% of cases located in this category. The significance of this finding is to underline the importance of appreciating user perceptions. Although insect and odour nuisance are specific to the smallest plot size category, this does not appear to have impacted on levels.
of user satisfaction when disaggregated by plot size, or on ability to use the latrine, as demonstrated from tables 28 and 31 above in sections 4.3.4 and 4.4.1.

<table>
<thead>
<tr>
<th>Plot size category</th>
<th>Count</th>
<th>% Row</th>
<th>% Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-124m²</td>
<td>125-326m²</td>
<td>327-625m²</td>
<td>625m²-highest</td>
</tr>
<tr>
<td>Smell</td>
<td>37</td>
<td>24</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>41.6</td>
<td>27.0</td>
<td>18.0</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>3.0</td>
<td>1.9</td>
<td>1.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Insects</td>
<td>36</td>
<td>9</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>65.5</td>
<td>16.4</td>
<td>5.5</td>
<td>12.7</td>
</tr>
<tr>
<td></td>
<td>2.9</td>
<td>0.7</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Emptying</td>
<td>17</td>
<td>15</td>
<td>49</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>11.1</td>
<td>9.8</td>
<td>32.0</td>
<td>47.1</td>
</tr>
<tr>
<td></td>
<td>1.4</td>
<td>1.2</td>
<td>3.9</td>
<td>5.7</td>
</tr>
<tr>
<td>Repairs</td>
<td>8</td>
<td>14</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>22.9</td>
<td>40.0</td>
<td>28.6</td>
<td>8.6</td>
</tr>
<tr>
<td></td>
<td>0.6</td>
<td>1.1</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>Blockage</td>
<td>24</td>
<td>4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>68.6</td>
<td>11.4</td>
<td>5.7</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>1.9</td>
<td>0.3</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Lack water</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>8.3</td>
<td>16.7</td>
<td>20.8</td>
<td>54.2</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
<td>1.0</td>
</tr>
<tr>
<td>None</td>
<td>196</td>
<td>202</td>
<td>167</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>28.9</td>
<td>29.7</td>
<td>24.6</td>
<td>16.8</td>
</tr>
<tr>
<td></td>
<td>15.6</td>
<td>16.1</td>
<td>13.3</td>
<td>9.1</td>
</tr>
<tr>
<td>Total</td>
<td>359</td>
<td>297</td>
<td>304</td>
<td>293</td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.
Cramer's V (value) = .297. Plot size category defined in quartiles.

4.4.4 Absence of household latrines a function of small plot sizes?

Households without sanitation facilities are not exclusively concentrated on the smallest plot sizes. A median plot size figure of 432m² (table 34 below) indicates that 50 per cent of these cases are found above this mid-point in plot size categories (up to a maximum of 2700m²). Furthermore, the distribution of plot sizes for households without sanitation tends to be skewed towards larger plot categories, as the mode figure of 630m² indicates. Mean, median and modal plot sizes for households without sanitation are larger than in cases where either a simple pit or pour-flush latrine is in use. This point is further referenced in section 4.2.2 above.
### Table 34: Distribution of selected technology types across different plot sizes

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pour flush</td>
<td>146</td>
<td>90</td>
<td>54</td>
<td>14</td>
<td>3374</td>
</tr>
<tr>
<td>Simple pit</td>
<td>403</td>
<td>306</td>
<td>375</td>
<td>28</td>
<td>3300</td>
</tr>
<tr>
<td>Absent</td>
<td>466</td>
<td>432</td>
<td>630</td>
<td>11</td>
<td>2700</td>
</tr>
<tr>
<td>WC septic tank</td>
<td>650</td>
<td>576</td>
<td>900</td>
<td>27</td>
<td>4500</td>
</tr>
<tr>
<td>Bucket</td>
<td>695</td>
<td>600</td>
<td>630</td>
<td>70</td>
<td>5772</td>
</tr>
<tr>
<td>VIP</td>
<td>825</td>
<td>630</td>
<td>630</td>
<td>60</td>
<td>4500</td>
</tr>
</tbody>
</table>

4.4.5 **Role of planning regulations and minimum plot size.**

Planning regulations are designed to set norms and standards in the design and construction of settlements which, in theory, allow for coherent urban development. The literature review in chapter 2 pointed to examples from developing countries where these regulations had been applied in the form of quantitative indicators governing plot size thresholds for choice of latrine types. It is not clear on what basis these thresholds are established.

The research sampled sector professional's knowledge of minimum plot sizes specified for on-plot sanitation in planning regulations, and contrasted them to professional's perceptions of average plot sizes in informally planned urban districts. The intention here was two fold: to highlight the fact that on-plot sanitation systems are being built and operated on plot sizes in contravention of planning regulations, and to indicate the scale of discrepancy between the two. The responses obtained confirm these assertions. In particular, table 35 below indicates that mean average plot sizes are 16% smaller and median average plot sizes 43% smaller than the minimum laid down in planning regulations.

### Table 35: Comparison between minimum – average plot (from postal survey)

<table>
<thead>
<tr>
<th>District</th>
<th>Cases</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum plot size *</td>
<td>44</td>
<td>500</td>
<td>387</td>
<td>150</td>
<td>36</td>
<td>2500</td>
</tr>
<tr>
<td>Average plot size</td>
<td>36</td>
<td>419</td>
<td>220</td>
<td>150</td>
<td>35</td>
<td>3600</td>
</tr>
</tbody>
</table>

* As laid down in planning regulations

4.4.6 **Variations in systems used according to formal/informal development.**

Comparisons between technology types most commonly used in planned and unplanned urban areas confirm what is previously known. In more formally planned and better
serviced districts there is a tendency towards use of WC toilets (either to sewers or septic tanks), whilst in more informally and haphazardly planned districts, non-flush systems such as simple pit latrines, VIP’s, or no facility are common. For both formally and informally planned districts however, a diversity of technology types in use was noted.

### Plot size: Key points

- Operational sanitation facilities were found to be commonplace in the smallest plot size category (1-124m²);
- Levels of user satisfaction were not significantly affected by the incidence of small plot size;
- There is little indication that plot size determines technology choice. No definitive grouping or concentration of technology types was observed by recorded size categories;
- There is limited evidence to suggest that plot size is associated with particular operational problems. Of the most commonly noted problems with latrines, insect and odour nuisance were strongly related to plot size category. However, this does not appear to impact on levels of user satisfaction or householder’s ability to use latrines;
- The absence of household sanitation is not exclusive to the smallest plot sizes.

#### 4.5 Twin and double pit latrines

**4.5.1 Background**

There are occasions when two shallow pits may be more appropriate than a single deep pit, such as in cases where the underlying geology of an area is difficult to excavate, or where groundwater levels are within one or two metres of the surface. In alternating double pits, accumulated solids in one pit are left for a ‘safe’ period until the excreta has decomposed and can be handled without risk to health. During the resting period, the household uses the alternative pit. Where separate twin pits are used as with pour-flush latrines, a Y-junction and access chamber are constructed to allow the users to direct excreta from one pit to another.

Concern about twin and double pits has focused on construction related and operational problems. For correct operation of double pit offset pour-flush latrines, for example,
particular care has to be taken with the construction of the Y-junction, and the user must be made aware of how the latrine should be operated. Longer term support facilities, training and demonstration of operation are key elements to operational success.

4.5.2 Construction related problems
Analysis of fieldwork data indicates the primacy of operation and maintenance, over construction related problems with this latrine type. The household survey found that users of twin or double pit latrines did not rank construction related problems as a key concern. The most relevant construction related problem, ‘blockages’, accounted for only a minority of cases for both pour-flush twin pit latrines (5%) and double VIP latrines (4%).

Although drawn from an admittedly small sample (n=57), postal survey results tend to confirm this point, showing that ‘construction related’ problems accounted for only 3% of all problems found amongst twin/double pit latrines. Of much greater significance were factors relating to the correct operation and maintenance of twin/double pit latrines, including both pits being used at the same time / pits not rested (28% of all problems).

Some anecdotal evidence during fieldwork indicated that the blockages recorded in some twin/double pit latrines were attributable to the use of high-density plastic (HDP) pans that were not as efficient at transporting flushed excreta as ceramic pans (see Part B, section 4.8.2, case history 4).

4.5.3 Inadequacy of education and support for users
The key position of operation and maintenance related problems points to the need for a more effective and sustained procedure of user education and support. In the sanitation programmes studied for this research, householders were given a practical demonstration of how the twin/double pour-flush latrine works, how to recognise when a pit was full and the method for alternating from one pit to another. However, the programmes failed to address a wider problem, which was that the existing procedure of demonstrating latrine operation had been tied to the masons who originally constructed the latrines. When new owners or tenants moved onto the plot, no framework for provision of guidance was available.
4.6 Latrine emptying

4.6.1 Background
When pit latrines or septic tanks become full, they must be either taken out of use or a
new pit dug, or the pit/tank emptied. One of the commonly held assumptions regarding
latrine emptying in urban communities states that densely crowded urban areas and poor
access to plots prevents regular emptying. Where access is not restricted, it is assumed
that pit contents need frequent emptying, at considerable expense to householders, with
potential health hazards for those emptying the latrines manually. The literature on the
topic, although significantly added to by Muller (1998) in relation to technical, institutional
and some socio-cultural issues, fails to adequately address user perspectives on latrine
emptying services, and published information on this subject remains poorly documented.

4.6.2 How latrines are emptied
Analyses of the household survey results indicate that where latrines are emptied, the
most common practice is for manual pit emptying either by hand or with handtools. In
response to the question, 'How is the pit / tank emptied?', just over one third (37\%) of all
households employed manual forms of emptying, with only 9\% favouring vacuum tankers.
Significantly, just over half of all responses (53\%) replied that the household latrine had
never been emptied.

Crosstabulations between emptying method and plot size category are informative
because they offer a potential indicator of whether method of emptying is specific to plot
size. Analysis of results indicates:

- 67\% of all cases emptied by vacuum tanker occur on the largest plot size category
  (625m²-highest plot size);
53% of all emptying manually with handtools occurs on the smallest plot size category (1-124m²);

63% of all emptying manually (by hand or with handtools) occurs on plot sizes ranging between 327m² – highest.

The picture that emerges from this crosstabulation is mixed. There are no definitive concentrations of emptying method by plot size, other than that for vacuum tanker. This is consistent with observations made during fieldwork, where WC to septic tanks are generally found with higher income households, on larger plot sizes.

4.6.3 Which types of latrines are emptied by what method?

Table 36 below compares latrine type and emptying method. The results confirm that for bucket/pan, simple pit and pour-flush latrine types manual emptying methods dominate (accounting for 39% of all cases). The large percentage figure recorded for vacuum tankers under WC to septic tanks is to be expected, as this toilet type is typically associated with higher income urban dwellers able to afford these emptying costs.

<table>
<thead>
<tr>
<th>Type</th>
<th>Manually by hand</th>
<th>Manually with handtools</th>
<th>Vacuum tanker</th>
<th>Other methods</th>
<th>Not emptied</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucket/pan</td>
<td>259</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>262</td>
</tr>
<tr>
<td></td>
<td>98.9</td>
<td>0.8</td>
<td>0</td>
<td>0</td>
<td>0.4</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>21.0</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
<td>0.08</td>
<td>21.3</td>
</tr>
<tr>
<td>Simple pit</td>
<td>8</td>
<td>5</td>
<td>14</td>
<td>2</td>
<td>307</td>
<td>357</td>
</tr>
<tr>
<td></td>
<td>2.2</td>
<td>1.4</td>
<td>3.9</td>
<td>0.5</td>
<td>85.9</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>0.4</td>
<td>1.1</td>
<td>0.1</td>
<td>24.9</td>
<td>29.0</td>
</tr>
<tr>
<td>VIP</td>
<td>1</td>
<td>12</td>
<td>17</td>
<td>2</td>
<td>17</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>24.4</td>
<td>34.6</td>
<td>4.0</td>
<td>34.6</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>0.08</td>
<td>0.9</td>
<td>1.3</td>
<td>0.1</td>
<td>1.3</td>
<td>3.9</td>
</tr>
<tr>
<td>Pour-flush</td>
<td>55</td>
<td>79</td>
<td>0</td>
<td>0</td>
<td>247</td>
<td>385</td>
</tr>
<tr>
<td></td>
<td>14.2</td>
<td>20.5</td>
<td>0</td>
<td>0</td>
<td>64.1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>4.4</td>
<td>6.4</td>
<td>0</td>
<td>0</td>
<td>20.8</td>
<td>31.3</td>
</tr>
<tr>
<td>WC septic tank</td>
<td>11</td>
<td>8</td>
<td>78</td>
<td>0</td>
<td>57</td>
<td>155</td>
</tr>
<tr>
<td></td>
<td>7.1</td>
<td>5.1</td>
<td>50.3</td>
<td>0</td>
<td>36.6</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
<td>0.6</td>
<td>6.3</td>
<td>0</td>
<td>0.4</td>
<td>12.6</td>
</tr>
<tr>
<td>Total</td>
<td>349</td>
<td>106</td>
<td>109</td>
<td>4</td>
<td>654</td>
<td>1230</td>
</tr>
<tr>
<td></td>
<td>28.4</td>
<td>8.6</td>
<td>8.9</td>
<td>0.3</td>
<td>53.2</td>
<td>100</td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.

Cramer’s V (value) = 425.
Interestingly, the relatively low percentage figures for VIP latrines and WC to septic tanks under the ‘not emptied’ category implies more frequent emptying rates as compared to other latrine types, a fact borne out in the analysis of re-emptying rates.

4.6.4 Who does the emptying?

If manual methods tend to dominate latrine emptying, it is important to gain clarification on which party actually empties the pit/tank, and who pays for the service. The household survey sought to address this issue by asking, ‘Who is responsible for emptying the pit/tank?’ The general findings demonstrate that users were normally those responsible for this process (45% of all cases), with contractors and the municipality recording 35% and 18% respectively.

There is significant variation by latrine type however, as table 37 below illustrates. Unsurprisingly, the bucket/pan system records the highest figures for the use of a private contractor, normally an individual drawn from the informal sector. The use of private contractors for emptying in this case may be a legacy of the era in which a formalised system of emptying was in place with conservancy labourers removing nightsoil daily. VIP latrines register high percentages for ‘municipality’ responsibility, and simple pit and pour-flush latrine types are dominated by ‘user’ responses to emptying responsibility.

However, two points of clarification are required in further explaining table 37. Although a high percentage figure was recorded for ‘user’ in relation to emptying of pour-flush latrines, experience from India suggests that given the prevailing cultural taboo associated with handling faecal matter, almost all responsibility for emptying is undertaken by private contractors, typically ‘scavengers’ (see Part B, section 4.8.3 below). Such a discrepancy may have arisen from the local translation of ‘responsibility’ into the regional language used in Vijayawada (Telegu). Secondly, to some extent this table may reflect the perceptions of householders as to who is responsible, rather than who actually performs the task of emptying. For instance, the responses for ‘municipality’ in relation to simple pit latrines and pour-flush latrines are not consistent with actual recorded practice.
### Table 37: Responsibility for emptying by selected latrine type

<table>
<thead>
<tr>
<th>Counts</th>
<th>User</th>
<th>Private contractor</th>
<th>Municipality</th>
<th>Scavengers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Row</td>
<td>% Total</td>
<td>% Row</td>
<td>% Total</td>
<td>% Total</td>
<td>% Total</td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bucket/pan</td>
<td>74</td>
<td>163</td>
<td>20</td>
<td>0</td>
<td>257</td>
</tr>
<tr>
<td></td>
<td>28.8</td>
<td>63.4</td>
<td>7.7</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>12.3</td>
<td>27.2</td>
<td>3.3</td>
<td>0</td>
<td>42.9</td>
</tr>
<tr>
<td>Simple pit</td>
<td>39</td>
<td>11</td>
<td>8</td>
<td>0</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>67.2</td>
<td>18.9</td>
<td>13.7</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>1.8</td>
<td>1.3</td>
<td>0</td>
<td>9.6</td>
</tr>
<tr>
<td>VIP</td>
<td>7</td>
<td>9</td>
<td>19</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>20.0</td>
<td>25.7</td>
<td>54.2</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>1.1</td>
<td>1.5</td>
<td>3.1</td>
<td>0</td>
<td>5.8</td>
</tr>
<tr>
<td>Pour-flush</td>
<td>119</td>
<td>7</td>
<td>11</td>
<td>10</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>80.9</td>
<td>4.7</td>
<td>7.4</td>
<td>6.8</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>19.8</td>
<td>1.1</td>
<td>1.8</td>
<td>1.6</td>
<td>24.5</td>
</tr>
<tr>
<td>WC septic tank</td>
<td>29</td>
<td>19</td>
<td>51</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>29.0</td>
<td>19.0</td>
<td>51.0</td>
<td>1.0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>4.8</td>
<td>3.2</td>
<td>8.5</td>
<td>0.2</td>
<td>16.7</td>
</tr>
<tr>
<td>Total</td>
<td>268</td>
<td>209</td>
<td>110</td>
<td>11</td>
<td>598</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>44.8</td>
<td>34.9</td>
<td>18.4</td>
<td>1.8</td>
<td>100</td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.
Cramer's V (value) = .444

#### 4.6.5 Length of time latrine in use

The length of time a latrine has been used by a household and the frequency with which it has been emptied are important indicators of its relative performance and sustainability. For those latrines which were recorded as ‘not emptied’ from the household survey, the classification of figures on years in use reveals that just under 80% had been used for between 1-10 years (with 53% falling in the 1-5 year category; and 25% in the 6-10 year category).

### Table 38: Breakdown of number of years latrine in use recorded as ‘not emptied’ (selected years: 1-10; excluding bucket/pan latrine)

<table>
<thead>
<tr>
<th>Years in use</th>
<th>0 years</th>
<th>1-5 years</th>
<th>6-10 years</th>
<th>11-20 years</th>
<th>21+ years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Row</td>
<td>Not emptied</td>
<td>84</td>
<td>307</td>
<td>141</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>% Total</td>
<td>14.6</td>
<td>53.5</td>
<td>24.6</td>
<td>7.0</td>
<td>0.3</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>14.6</td>
<td>53.5</td>
<td>24.6</td>
<td>7.0</td>
<td>0.3</td>
<td>100</td>
</tr>
</tbody>
</table>

In those cases where latrines had been emptied, the majority (88%) were emptied between 1-6 times. In this range, 63% latrines had been emptied only once or twice, and

IV: Analysis of finding

116
31% used between 6-8 years (see table 39 below). These figures (table 38 and 39) question the assumptions made about the high frequency of latrine emptying in low-income urban areas and the short time period between initial use and first emptying.

### Table 39: Breakdown of years latrines used by number of times emptied (selected years: 1-10; excluding bucket/pan latrines)

<table>
<thead>
<tr>
<th>Years in use</th>
<th>Count</th>
<th>% Row</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times emptied</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>3.6%</td>
<td>3.6%</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The rate of solids accumulation and indirectly the rate of pit emptying is clearly influenced by several factors, including number of users and shape and volume of pit, amongst others (see chapter 2, section 2.5.4 for further details). Further questions that emerge at this stage of the analysis relate to whether pit depth impacts on the number of times that a latrine is emptied or length of time that a latrine has been in use. In an attempt to examine this question in more detail, the following crosstabulation of variables was analysed (see table 40). Pit depth levels are based on a combination of primary source (responses from householders) and secondary source data (notes from programme coordinators). Data is presented by ‘not emptied’ (i.e., 0) and latrines emptied once (i.e., 1) in this table as these categories account for the largest percentages of cases. This table points to three key conclusions:
Table 40: Breakdown of years latrines used by number of times emptied by pit depth (excluding bucket/pan latrines)

<table>
<thead>
<tr>
<th>Count</th>
<th>% Total</th>
<th>1-5 years</th>
<th>6-10 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pit depth (feet)</td>
<td>Times emptied</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>22</td>
<td>.28</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25.0</td>
<td>31.8</td>
<td>65.9</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.3</td>
<td>10.2</td>
<td>19.3</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.4</td>
<td>2.3</td>
<td>8.0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>13</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38.2</td>
<td>29.4</td>
<td>85.3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>2.9</td>
<td>5.9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>151</td>
<td>53</td>
<td>263</td>
</tr>
<tr>
<td></td>
<td></td>
<td>49.7</td>
<td>17.4</td>
<td>86.5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>8</td>
<td>15</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.6</td>
<td>4.9</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3</td>
<td>1.0</td>
<td>2.6</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>14</td>
<td>7</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>37.8</td>
<td>18.9</td>
<td>78.4</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.7</td>
<td>10.8</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>4</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16.0</td>
<td>28.0</td>
<td>68.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.0</td>
<td>4.0</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>15</td>
<td>10</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38.5</td>
<td>25.6</td>
<td>66.7</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.1</td>
<td>7.7</td>
<td>12.8</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.6</td>
<td>5.1</td>
<td>10.3</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>7</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>43.8</td>
<td>6.3</td>
<td>56.3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.3</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>6.3</td>
<td>18.8</td>
</tr>
</tbody>
</table>

IV: Analysis of finding
- Very high percentages of total cases, across all pit depths, are recorded as 'not emptied' (the average figure in this table is 74%);
- The percentages for 'not emptied', across all pit depths, is higher in the 1-5, than 6-10 years in use category (as expected);
- There are no significant data trends emerging by increased pit depth. This may be a function of limited sample size and that many pits were not emptied in the first five years of use.

4.6.6 Re-emptying periods

Householders were asked, 'How long does it take for the pit/tank to require emptying again?'. The responses are indicative of the rate at which a recently emptied pit/tank re-fills. Professional's assumptions on this topic tend towards short re-emptying periods. However, this research indicates that for both simple pit and pour-flush latrine types longer refilling periods (typically 3-4 and 5-6 years) are commonplace, whereas VIP and WC to septic tank types record larger percentages in the 6 months, 1 and 2 year categories (see table 41 below).

### Table 41: Breakdown of re-emptying period by latrine type (excluding bucket/pan latrines)

<table>
<thead>
<tr>
<th>Count % Row</th>
<th>Time taken for pit to refill</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 months</td>
<td>4 months</td>
</tr>
<tr>
<td>Simple pit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>2.9</td>
<td>5.9</td>
<td>11.8</td>
</tr>
<tr>
<td>0.5</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>VIP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>37.0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1.7</td>
</tr>
<tr>
<td>Pour flush</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>7.3</td>
<td>0</td>
<td>1.2</td>
</tr>
<tr>
<td>1.0</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>WC septic tank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>7.4</td>
<td>2.5</td>
<td>19.8</td>
</tr>
<tr>
<td>1.0</td>
<td>0.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>9</td>
<td>39</td>
</tr>
<tr>
<td>2.6</td>
<td>1.6</td>
<td>6.8</td>
</tr>
<tr>
<td>2.6</td>
<td>1.6</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.  
Cramer's V (value) = .412  
Key: (m=months/yr. = years)
When examining the combined figures for all latrines, there are two points to note: that 20.2% of all latrines refilled over a period of between 3-6 years, and the relatively high proportion of all latrines with refill rates of every 6 months, 1 or 2 years (20.6%). These latter figures are skewed by the impact of both VIP and WC to septic tank latrine types recording relatively large percentages between the 6 months and 2 years categories.

4.6.7 Problems with emptying

An earlier section of this chapter mentioned that ‘emptying’ constituted the single most common problem noted with all latrine types (4.3.4 and table 28) and was one issue which significantly affected user satisfaction of latrines (4.3.4 and table 29). Paradoxically, when householders were specifically asked, 'What problems do you have with pit/tank emptying?', 45% of all cases recorded ‘none’. Where problems were noted, the most significant issues included ‘frequency’, ‘high cost’ and ‘hygiene’. Other factors that might have been assumed to be of importance, such as ‘access to plot’ or ‘odour’, recorded only 3% and 0.5% of all cases respectively.

<table>
<thead>
<tr>
<th>Table 42: Type of emptying problem by selected latrine type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emptying problem (cases)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Count % Row</td>
</tr>
<tr>
<td>% Total</td>
</tr>
<tr>
<td>Bucket/pan</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Simple pit</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>VIP</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Pour flush</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>WC septic tank</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.
Cramer’s V (value) = .270
A clearer picture of why 'frequency' heads this list is seen in the table above, comparing latrine type with emptying problem. The frequency of emptying for bucket/pan latrines is clearly the most significant factor for this type and skews the overall figures as a result. It is clear that the cost of emptying is a key problem more consistently noted by all latrine types, particularly with regard to the VIP, pour-flush and simple pit latrines.

4.6.8 Disposal of pit contents following emptying
The final destination of emptied pit excreta and its disposal method is critical to maintenance of wider community health. As a means to establishing the outcome of pit emptying events, the household survey asked, 'What happens to the contents of the pit/tank after emptying?'. The figures indicate that in the majority of cases the final destination for pit excreta is indiscriminate dumping (possibly at some distance from the household plot itself but within the general neighbourhood) or unknown. These two variables account for 34% and 33% of all cases respectively. A significant minority (24%) reported that pit contents were disposed of hygienically off-site, although under further probing few householders could say where these site were. Only 8% of respondents stated that contents were buried on-plot. Further analysis in relation to latrine emptying is located in part B, section 4.10.

**Latrine emptying: key points**

- Manual methods of emptying dominate (either by hand or with handtools), and are especially commonplace for bucket/pan, simple pit, pour-flush and VIP latrines. Mechanical emptying with vacuum tankers tends to be associated with septic tank and VIP latrines;

- The responsibility for emptying latrines is normally either that of the users, or private contractors. Contractors are of particular importance in the emptying of bucket/pan, pour-flush and WC to septic tank latrines;

- For those latrines which had been emptied, most had been used for 6, 7, or 8 years. Typically, these latrines had been emptied either once or twice. Pit depth did not appear to influence the number of times a pit had been emptied;

- Rates for re-filling of previously emptied latrines indicate that a significant minority (20%) fill over 3-6 years;
4.7 Odour and insect nuisance

4.7.1 General incidence of insects and odour nuisance

Complaints about pit latrines frequently mention insect and odour nuisance. It is not clear, however, whether users themselves or sector professionals identify these problems. Although there is some published literature on insect and odour nuisance, it tends to be patchy or anecdotal in relation to the urban context.

From the household survey conducted for this research, odour and insect nuisance, on first analysis, appear significant variables being ranked as the second and third most commonly noted problems mentioned by users of latrines. However, the absolute number and percentages in both cases are small (accounting for only 7% and 4% of cases for ‘smell’ and ‘insects’ respectively). Interestingly, an early section of this chapter (4.3.4) highlighted that even at these low percentage levels, smell had a disproportionately large impact on user satisfaction levels and ability/willingness of householders to continue to use latrines.

4.7.2 Incidence of odour nuisance by latrine type.

Table 43 below compares householder responses by latrine type for the question ‘Does the toilet smell? How bad is this smell?’ Important general points relate to how many responses are found within the ‘no smell’ category (50% of all cases) and how many within the ‘strong smell’ category (9% of all cases). At a further level of analysis, the disaggregated figures for specific latrine types are of particular interest. An unusual finding emerges from a comparison of the responses for both simple pits and VIP latrines; the former registering larger percentages under ‘no smell’ and smaller percentages under the ‘slight smell’ categories than the VIP latrine type. Previous assumptions about simple pit vis-à-vis VIP latrines would tend to question such a finding especially given that VIP
latrines had been designed specifically to address the problem of odour nuisance. One possible, but unsubstantiated, explanation may be that increased fouling around the squat hole due to the dark interior of the latrine and ineffective vent pipes due to improper pipe siting or construction exacerbates the odour problems in VIP latrines.

### Table 43: User perception of the incidence of odour nuisance, by latrine type

<table>
<thead>
<tr>
<th>Count % Row</th>
<th>Odour nuisance (cases)</th>
<th>No smell</th>
<th>Slight smell</th>
<th>Strong smell</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latrine type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bucket/pan</td>
<td></td>
<td>26</td>
<td>178</td>
<td>50</td>
<td>254</td>
</tr>
<tr>
<td></td>
<td>% Total</td>
<td>10.2</td>
<td>70.1</td>
<td>19.7</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>14.0</td>
<td>3.9</td>
<td>20.0</td>
</tr>
<tr>
<td>Simple pits</td>
<td></td>
<td>209</td>
<td>144</td>
<td>35</td>
<td>388</td>
</tr>
<tr>
<td></td>
<td>% Total</td>
<td>53.8</td>
<td>37.1</td>
<td>9.0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16.4</td>
<td>11.3</td>
<td>2.7</td>
<td>30.5</td>
</tr>
<tr>
<td>VIP</td>
<td></td>
<td>19</td>
<td>26</td>
<td>3</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>% Total</td>
<td>39.5</td>
<td>54.1</td>
<td>6.2</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1</td>
<td>2.0</td>
<td>0.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Pour-flush</td>
<td></td>
<td>247</td>
<td>119</td>
<td>25</td>
<td>391</td>
</tr>
<tr>
<td></td>
<td>% Total</td>
<td>63.1</td>
<td>30.4</td>
<td>6.3</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19.4</td>
<td>9.3</td>
<td>1.9</td>
<td>30.8</td>
</tr>
<tr>
<td>WC to septic tank</td>
<td></td>
<td>102</td>
<td>48</td>
<td>2</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>% Total</td>
<td>67.1</td>
<td>31.6</td>
<td>1.3</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.0</td>
<td>3.8</td>
<td>0.2</td>
<td>12.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>628</td>
<td>526</td>
<td>115</td>
<td>1269</td>
</tr>
<tr>
<td></td>
<td>% Total</td>
<td>49.5</td>
<td>41.4</td>
<td>9.1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>49.5</td>
<td>41.4</td>
<td>9.1</td>
<td>100</td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals.

Cramer's V (value) = .349

4.7.3 Tight fitting lids covering squat holes

It is difficult to suggest a causal link between the presence of lids and insect/odour nuisance given the multitude of variables that may affect user perception of nuisance. For example, in Mozambique there is no containment of insects / odours within an enclosed superstructure as latrine structures are typically roofless. However, where lids were recorded (in 588 cases), the trend is towards few cases of either 'strong' smell (7%) or large numbers of insects being reported (7% for both 'hundreds' or 'thousands' categories). By contrast, where lids were absent (n=64) it was found that 42% of all latrine users recorded 'strong smell', and 23% recorded 'hundreds' of insects.

Of all latrines with lids, 74% of all cases reported lids 'not damaged'; 25% 'partly chipped' and 1% 'badly broken'. In cases where lids were described as 'not damaged' or 'partly
chipped’, the largest percentages were found amongst those categories indicating no or low insect and odour nuisance levels (for example, ‘no’ or ‘slight’ smell, ‘none’ or ‘tens’ of insects).

4.7.4 Incidence of insect nuisance by latrine type

The figures for insect nuisance largely mirror those for odour. Householders were asked ‘Do you find a problem with flies? How many?’. Again, the majority of responses are registered within the ‘none’ or ‘tens’ categories (92% of all cases); bucket/pan latrines show the highest, while water seal latrine types show the lowest nuisance scores (see table 44 below). VIP latrines record the highest rating of all latrine types in the ‘thousands’ category, an interesting point given the design specification for the VIP. Householder changes to VIP latrines that lead to increased light levels within the superstructure, such as making small windows, may help to explain this poor rating.

The findings from field observation tests for numbers of insects contained with latrine superstructures tend to triangulate and reinforce the results from the household survey in relation to insect numbers.

<table>
<thead>
<tr>
<th>Latrine type</th>
<th>Count</th>
<th>None</th>
<th>Tens</th>
<th>Hundreds</th>
<th>Thousands</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucket/pan</td>
<td>39</td>
<td>131</td>
<td>20</td>
<td>5</td>
<td>195</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>20.0</td>
<td>67.2</td>
<td>10.3</td>
<td>1.7</td>
<td>3.4</td>
<td>16.9</td>
</tr>
<tr>
<td></td>
<td>3.4</td>
<td>11.4</td>
<td>1.7</td>
<td>0.4</td>
<td>0.4</td>
<td>16.9</td>
</tr>
<tr>
<td>Simple pits</td>
<td>173</td>
<td>172</td>
<td>27</td>
<td>4</td>
<td>378</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>45.7</td>
<td>45.6</td>
<td>7.1</td>
<td>1.0</td>
<td>32.8</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td>14.9</td>
<td>2.3</td>
<td>0.3</td>
<td>13.9</td>
<td>32.8</td>
</tr>
<tr>
<td>VIP</td>
<td>12</td>
<td>15</td>
<td>1</td>
<td>2</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>40.0</td>
<td>50.0</td>
<td>3.3</td>
<td>6.6</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>1.3</td>
<td>0.08</td>
<td>0.1</td>
<td>2.6</td>
<td>132</td>
</tr>
<tr>
<td>Pour-flush</td>
<td>274</td>
<td>91</td>
<td>21</td>
<td>0</td>
<td>386</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>70.9</td>
<td>23.5</td>
<td>5.4</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>23.8</td>
<td>7.9</td>
<td>1.8</td>
<td>0</td>
<td>33.5</td>
<td>100</td>
</tr>
<tr>
<td>WC to septic tank</td>
<td>100</td>
<td>27</td>
<td>0</td>
<td>0</td>
<td>127</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>78.7</td>
<td>21.3</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>8.7</td>
<td>2.3</td>
<td>0</td>
<td>0</td>
<td>11.0</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>625</td>
<td>441</td>
<td>72</td>
<td>11</td>
<td>1149</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>54.4</td>
<td>38.4</td>
<td>6.3</td>
<td>1.0</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Crosstabulation represents sub-set of total data, therefore some total figures do not correspond to cell totals. Cramer’s V (value) = .287

IV: Analysis of finding
Quantitative tests involved suspending standard flypapers within latrine superstructures over a specified test period. The intention was not to measure absolute flying insect numbers, but to gain a measure of relative flying insect density. 66% of all cases sampled (n=71) recorded 0-5 insects, a further 27% cases recorded 6-50 flies, and only 7% recorded 51-100+ insects.

Measures of crawling insect nuisance, primarily from cockroaches, were only sampled in one country, Mozambique. Of the total number of householders responding to the question, 'Do you have a problem with cockroaches? How many?' (n=224), 53% replied that there was no cockroach problem, and 45% replied that they experienced cockroaches in 'tens' of numbers. It should be noted that no inter latrine analysis can be provided for this variable, as all householders sampled possessed simple pit latrines.

4.7.5 Latrines the primary source of insect nuisance on the household plot?
Anecdotal evidence from interviews with householders about the source of insect nuisance, especially with regard to flies, indicates that the latrine structure is not necessarily the primary source of insect nuisance on the plot. Other important sources include solid waste pits and lane side drains which when full or blocked, quickly attract flies (see part B, section 4.11 below).

<table>
<thead>
<tr>
<th>Odour and insect nuisance: Key points</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Only small percentages of households perceive odour and insect nuisance to be a common problem with their latrine (although odour nuisance does have a significant impact on satisfaction levels);</td>
</tr>
<tr>
<td>- Bucket/pan latrines register the highest odour and insect nuisance levels of all latrine types;</td>
</tr>
<tr>
<td>- Relative to other latrine types VIP's record higher than anticipated levels of odour and insect nuisance. However, there is no conclusive evidence to suggest a link between odour and insect nuisance and height of vent above roof line, presence of fly screens, vent pipe colour and diameter of pipe;</td>
</tr>
<tr>
<td>- Quantitative test results for insect nuisance indicate low absolute numbers;</td>
</tr>
<tr>
<td>- Limited qualitative evidence raises doubts about domestic latrines as the primary source of insect nuisance on-plot.</td>
</tr>
</tbody>
</table>
Part B: Qualitative analysis

Sections 4.8 – 4.8.4 present a series of case histories, field insights and key points based on interviews with householders and key informant interviewees. The purpose of presenting data in this format is to provide actual examples from communities and key organisational personnel that cross-reference with the quantitative analysis made in Part A. Part B is separated into two sections. First, case histories and field insights derived from interviews with householders are presented in a series of short boxes. The case histories begin with a short biographical note of the householder, detailing location, family size, number of income earners and occupation. This is followed by the presentation of data relating to key informant interviews.

Brief bullet point commentaries highlighting key issues conclude each of the following sub and main sections.

4.8 Case histories/field insights

4.8.1 Absence of household latrines

<table>
<thead>
<tr>
<th>Case history: Absence of household latrine</th>
</tr>
</thead>
<tbody>
<tr>
<td>District: Readhe Nagar</td>
</tr>
<tr>
<td>City: Vijayawada, India</td>
</tr>
<tr>
<td>Family size: 1</td>
</tr>
<tr>
<td>Income earners: 1 (Rs. 20- per day; 600-700 pcm)</td>
</tr>
<tr>
<td>Occupation: Coir production worker</td>
</tr>
</tbody>
</table>

Notes:
The household consisted of a single woman who had moved to Vijayawada from elsewhere in Tamil Nadu twenty years previously. During the first 12 years at this site, there had been no household sanitation provision available. When a facility was built, it soon collapsed and since that time, the householder had resorted to open defecation. The householder had not used the [pour flush] latrine when it had been built on the plot because of operational problems ('the water did not flow'). She was not aware that a low cost sanitation scheme was at work in the slum, and expressed a desire to build a latrine if the government was prepared to help finance it. She reported that it was inconvenient to continue to defecate in the open because of the increased number of plots in the slum and the reduced number of [nearby] locations for open defecation [privacy problem]. The majority of her [monthly] income was spent on repaying the loan which was taken on buying the house; on the upkeep of her livelihood as a coir production worker and on the flooring for the house [flagstones]. The householder was currently unable to afford a share in the cost of a low cost toilet.
District: Maputo, Mozambique
City: Maputo, Mozambique
Family size: 10
Income earners: 1 (350,000MT pcm (US$30)
Occupation: Not recorded

Notes:
The householder knew about the activities of PNSBC through sanitation animators activities (such as household visit to discuss health/hygiene/sanitation issues). Could not afford to buy improved latrine because there were 10 members in household but only one income earner at 350,000MT per month (US$30)

Key points:
- Poor reputation of previous latrine programmes impacted on decision to invest in sanitation (India case history);
- Inability to pay for household level latrine. Income prioritised on livelihood maintenance and shelter provision;
- Lack of privacy was a notable issue;

4.8.1.1 Unsupported initiatives
Examples of households that have provided sanitation facilities outside of existing latrine building programmes are informative in that they may indicate reasons for failure to adopt the programme or highlight particular constraints to potential users of those systems. Householder's perceptions about sanitation programmes are critical factors to note. Case study work points to the importance that householders attach to maintaining choice and quality of the latrine type they use (see case history below), despite additional cost considerations to the householder.

Case history: Example of unsupported initiative for sanitation provision

District: Ranigarathoth
City: Vijayawada, India
Family size: 4 adults, 2 children
Income earners: 3 (Husband Rs. 50- per day)
Occupation: Labourer / vegetable vendor

Notes:
This family had been previously relocated from an old bustan site to this district. They had built their own home and provided many of their own services with only limited government assistance. They decided to construct their own latrine (outside of the Municipality's low cost sanitation programme) because they
perceived problems with the programme’s toilets, and did not want to wait for a new latrine construction programme before being able to use their own facility.

The family perceived that the key disadvantage with the programme’s toilets was the need for regular pit emptying, so they constructed a [deep] pour-flush single pit. This facility was built at a time when other construction work on the house was on-going, so exact costs were unavailable - however, in conversation with the householders it was estimated that the total cost, including labour, was Rs 5000. A small contractor was employed to build the latrine, and the family saved money from their joint incomes to build the facility. For ten years prior to having a household toilet, the family had resorted to open defecation at a point approximately 200 metres distant. The principal catalyst for latrine construction had been the comfort and convenience it would provide for the users.

Key points:
- Poor perceived reputation of government led latrine programme (quality, operation and maintenance) affected decision to invest in sanitation (leading temporarily to absence of latrine for the household);
- Socio-cultural factors (comfort, convenience) were principal determinants in latrine construction.

4.8.2 Twin and double pit latrines

**Case history: Experiences with pour-flush double pit latrines**

<table>
<thead>
<tr>
<th>Case</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>District:</td>
<td>Readhe Nagar</td>
</tr>
<tr>
<td>City:</td>
<td>Vijayawada, India</td>
</tr>
<tr>
<td>Family size:</td>
<td>3 adults, 1 child</td>
</tr>
<tr>
<td>Income earners:</td>
<td>2 (Rs. 60 per day, per person)</td>
</tr>
<tr>
<td>Occupation:</td>
<td>Agricultural labourer / coir production worker</td>
</tr>
</tbody>
</table>

**Notes:**
This family was using a pour flush twin pit system that had been incorrectly constructed with a connection between pits, instead of the normal Y-junction. The toilet had been used in this fashion for eight years, and because the pit required such frequent emptying, some members of the family had decided to resort to open defecation in order to reduce maintenance costs. The householders considered this situation highly unsatisfactory because of the lack of privacy afforded.

**Key points:**
- Capacity to use the household latrine had been compromised by inappropriate construction and the cost and inconvenience of frequent emptying
This family had been using the same latrine for the last 5 years (a pour-flush twin pit). The pits were alternated in 1995, and prior to this it had taken three years for a single pit to fill. In conversation with the householders, it became clear that they were aware of how to alternate the pits (demonstrating how to block the Y-junction, and being able to identify the signs of a full pit), and that the twin pit system was designed to facilitate and improve the pit emptying process.

The household did not report any problems with the operation and maintenance of their latrine. They had applied for a latrine under the programme because it would provide 'comfort and convenience' (the family had resorted to open defecation prior to using this system). No significant odour problem or insect nuisance was reported. Where insect nuisance was noted, the householders believed its source was primarily from [blocked] lane side drains, not the latrine itself. Plot size estimated at 112m².

Key points:
- Socio-cultural factors (comfort, convenience) a motivating factor in latrine construction;
- Anecdotal indication that insect nuisance is not strongly linked to presence of latrine on-plot but to incidence of poor solid waste disposal and/or surface drainage problems.

The pour-flush twin pit system had been in use for 1.5 years without any need for emptying. At the time of the completion of the latrine, no instructions or demonstration had been given to the householders on how to use the latrine or what to do when one pit became full. The family had applied to build a latrine under the existing sanitation programme because of (a) the lack of privacy with open defecation, and (b) the flooding of the Krishna river reduced places for open defecation during the rainy season.

Despite the lack of support, the family reported that they were highly satisfied with the operation and maintenance of their latrine. Mosquitoes were a nuisance at night but the householders felt they were derived from the drain that was present at the back of the plot, not the toilet itself. Two adults from this family had stopped using the latrine because they preferred open defecation. Plot size 27m².
Key points:
- No user education provided on operation and maintenance of latrine Y-junction and alternating principle;
- Socio-cultural factor (privacy) a motivating factor for latrine construction;
- Anecdotal indication that source of insect nuisance on-plot attributed to lane side drains, not latrine.

Case: 4
District: Ranader Nagar
City: Vijayawada, India
Family size: 4 adults, 1 child
Income earners: 1 (Rs. 600 pcm)
Occupation: Labourer

Notes:
This family had used their latrine for a total of eighteen months. Some members of the family continued with open defecation outside of the rainy season. When the latrine was first constructed, the users were given a demonstration by the masons as to how to operate and maintain the toilet, including the correct operation of the Y-junction. The family had experienced problems with blockages (thought to be attributable to the high-density plastic pans) though these were infrequent. They had decided to pay a ‘scavenger’ to clean and maintain the latrine each week (at a cost of Rs 2 per week).

The reason for applying for, and constructing the latrine, was the ‘difficulty’ of going to the banks of the Krishna to defecate (‘difficulty’ implying problems of convenience and privacy).

Key point:
- Socio-cultural factor (privacy, convenience) a motivating factor in latrine construction.

4.8.3 Latrine emptying

Field insight: Pit emptying of pour-flush latrines

District: Pakeer gudem
City: Vijayawada, India
Family size: 10; (5 adults - 5 children)
Income earners: 1
Occupation: Mason

Notes:
Resident in this slum for 20 years, the family had constructed a low cost sanitation toilet in 1987/88 (a pour flush twin pit system of 6ft depth in each pit). Prior to this the family had used public latrines. The households were given instructions and a demonstration on use at the time of construction. In conversation with the family they knew and understood that when ‘water did not flow’ it was necessary to alternate pit use. The pits had been emptied only once and municipal ‘scavengers’ had been contacted for this purpose. Emptying took two nights work, cost Rs 400 (US$ 11) for both pits, and was completed by hand using buckets, hand
tools and handcart. The pit contents were disposed off-site (in a designated place to receive faecal matter).

The householders reported that the content of the first pit was hard and black on sight, indicating it had been rested for its specified 'safe' period.

**District:** Bhinana Vari Peta  
**City:** Vijayawada, India  
**Family size:** 8; (5 adults -3 children)  
**Income earners:** 1 (Rs. 3000 (US$ 83) pcm)  
**Occupation:** Milk project worker

**Notes:**  
This pour-flush twin pit system had been in use for seven years with eight users, and had been emptied twice (with a three year re-emptying period). Scavengers were employed to empty the pits, at a cost of Rs 800 (US$22) per pit (this figure was higher than normal due to the difficult local terrain). The hilly nature of the slum meant that a cart and drum could not be positioned next to the plot for emptying, as in the normal manner. Thus, pit contents were diluted with water prior to emptying and removed by hand with buckets. The contents were dumped into lane-side drains that were then flushed with water. These drains were later ‘disinfected’. The householder did not report any significant problems with the latrine other than with emptying, which the householder felt was expensive and was inconvenient to neighbours.

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**Field Insight: Emptying pour-flush latrines by scavengers**

**District:** Scavengers’ Colony  
**City:** Vijayawada, India  
**Occupation:** Scavengers

**Notes:**  
'Scavengers' (the local terms applied to individuals emptying pits) are generally self employed, although some do work as Municipal road sweepers. While some empty pits on a full time basis, others work as scavengers only part time. In order to qualify as a scavenger, an individual must apply for and be granted a collectors certificate by the Municipality and work in the same community for a minimum of six months. Indian scheduled caste status tends to constrain scavengers' ability to work in other forms of employment.

Scavengers hear about full pits that need emptying either by householders coming directly to the scavengers' communities or through their work as road sweepers. The average workload for a scavenger is one house every 10-15 days. It normally takes 3-4 hours to empty both pits, using buckets, water drums and transport using a rickshaw. On arriving at the household, the procedure is to open the slab cover, empty with buckets into drums and dispose of the contents away from the site. In hill terrain slums, scavengers were placing the pit contents in lane drains and flushing the contents to the ground level with water. Generally, pit contents are disposed of in major outfall pipes or on surrounding fields.

When asked about the condition of the excreta removed from pits, the scavengers did not have a
common experience with regard to the texture and colour of pit contents. Some found that the faeces in both pits were fresh and soft (indicating incorrect operation), whilst others found the contents to be hard and innocuous (indicating adequate resting period). Costs for emptying were set at Rs 50 for each pit ring of each pit emptied (6 rings to a pit) though it was claimed that in hill slums charges for pit emptying could rise to as much as Rs 2000.

The overheads involved in emptying included rent for rickshaw and drums, but this tended to vary from case to case depending on the distance travelled to the plot. For a fee of Rs 300, overheads may account for between Rs 50-100. The remainder was split between the scavengers (normally three persons for each pit emptying).

Key points:
- Condition of faeces on emptying indicates incorrect operation of twin pit system by householders;

4.8.4 Odour and insect nuisance

Field insight: bucket/pan latrine use

| District:      | Nima          |
| City:          | Accra, Ghana  |
| Family size:   | 30; (20 adults - 10 children) |
| Income earners:| 15            |
| Occupation:    | Petty traders / drivers |
| Consumer items:| Television; radio |
| Plot size:     | 1120m²        |

Notes:
The motivating factors for these compound housing families to build a household toilet was primarily social: comfort & convenience and privacy. The decision to build a bucket/pan latrine instead of other toilet types was a function of the bucket/pan’s low cost. The latrine had been constructed with the house in 1960 and was paid for at the time through the landlady’s own financial resources. Amongst the range of problems identified about the latrine, ‘smell’ and ‘emptying’ were most significant. Emptying was undertaken every three days by a private contractor at a price of 800 cedis (US$ 0.4) per visit. The householders believed that the bucket’s contents were disposed of hygienically off-site. Emptying was very irregular and this had led some of the household to resort to open defecation. In general, the household were ‘satisfied’ with their bucket latrine, but felt that the problem with flies, insects and emptying was significant enough to have a ‘strong impact’ and made its use ‘a constant problem’. Easier operation and maintenance was seen as the key to relieving these difficulties.

Key point:
- Impact of flying and crawling insect nuisance had significant perceived impact on sustained operation of the latrine
Field insight: Insect nuisance on-plot

District: Jorge Dimitrov
City: Maputo, Mozambique

Multiple responses from various households.

Notes:
- Bought latrine because they were aware of the link between poor sanitation and poor health, and because it would reduce fly nuisance. Heard about PNSBC by word of mouth. All in the household were currently using the latrine, and the householders like the facility because for most of the year there was no smell or flies. During very hot spells there was some fly nuisance but this was controlled with ash or an unidentified chemical product.
- Not able to say where heard about PNSBC. Decided to buy a latrine to remove insect and odour nuisance and from hygiene concerns. The householders were satisfied with latrine because it was possible to use it regularly and it was easy to keep it clean.
- Heard about latrine when passing a production unit in Maputo. Bought latrine because they reduced odour and insect nuisance.

District: Mearuthi Nagar Canal Huttings
City: Vijayawada, India
Family size: 2 adults, 3 children
Income earners: 1 (Rs. 4000 pcm)
Occupation: Clerk, Medical college

Notes:
This household had been using a pour-flush latrine with a sewer connection since 1994. The latrine was built entirely from family resources, and the household expressed a high degree of satisfaction with their facility. The household head reported that the family felt that the main source of insect nuisance was that arising from the drains which ran adjacent to the household plot, not from latrine superstructure itself.

Key point:
- Anecdotal indication that insect nuisance a function of poor lane side drainage.

4.9 Key informant interviews

Additionally, fieldwork involved a series of semi-structured interviews with a variety of key informants in the countries in question. These interviews were designed to uncover sector professionals' perceptions regarding on-plot sanitation and to provide greater detail on the five key research questions underpinning the thesis. Interviews were tape recorded and transcribed later, normally within a week of the interview.
NUDIST qualitative data software was employed to organise a structure to the data, and to examine content for key references and text passages of relevance. As each transcript was entered into NUDIST, codes were assigned to those passages and paragraphs that illustrated critical points in relation to on-plot sanitation. In turn, these codes were categorised according to significant points of commonality, or nodes. In this way, a tree type structure to the data was revealed, beginning with issues of significant interest and spreading in branches to secondary issues.

Analysis of the structure of the data gathered in this thesis is presented in Figures 11 – 14 on the following pages. Figure 11 indicates the root of the data, which divides into two key strands, namely technical and programme related issues. The visual maps for these individual branches are referenced in figures 12, 13 and 14. Figure 12 illustrates the main nodes and branches emerging from the technical root. Figures 13 and 14 illustrate the nodes and branches that are revealed from the programme root.

The purpose of presenting the data in this manner is more than simple clarity of visual representation. Each node and branch represents references to passages in one or more of the transcribed interviews. As such the tree structures are proxy indicators of the relative frequency and importance that was assigned to these issues by the sector professionals sampled. Although it cannot be suggested that this analysis represent a comprehensive overview of issues and concerns, it is nevertheless indicative of the types of issues that sector professionals themselves perceive to be of importance.

The following table aggregates those issues that were most frequently referenced and cross-referenced during interviews. The table shows the subject of reference (highlighted in bold), and its derivation within the tree structure for the data.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Number references</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8 references</td>
<td>• Plot size &gt; Design &gt; Technical &gt; Technical related</td>
</tr>
</tbody>
</table>
| 2    | 7 references      | • Agency roles > Implementation > Programme related  
• Key actors > Promotion > Implementation > Programme related |
The following pages illustrate figures 11 – 14. Key issues emerging from the data are highlighted in the following sections. The interview from which the issue was primarily recorded appears in italics after each item. Full text transcripts of these interviews can be found in Appendix 8.

**Plot size > Design > Technical > Technical related**
- Shortage of land for building latrine on plot *(Awindaogo)*;
- Subdivision of family land constrains plot size *(Ayivie)*;
- Standard and norms for plot size specified in planning regulations *(Ayivie)*;
- Difficulty in quantifying whether size was a decision by householders not to construct latrine *(Doe)*;
- Pour-flush latrines with twin pits presented difficulties for construction in low-income communities *(Donkor)*.

**Agency roles > Implementation > Programme related**
- Breakdown in communication between different agencies commonplace *(Adombire)*;
- Limited resource capacity of some agencies to fulfil their remit *(Dos Anjos)*;
- Establishment of co-ordinating unit to oversee collaboration between agencies *(Elias)*.
Figure 11: Initial division of interview data into key strands

- All interviews
  - Technical related
    - See Figure 12
  - Programme related
    - See Figure 13
Figure 12: Technical related branch of qualitative data interviews
Figure 13: Programme related branch of qualitative data interviews
Figure 14: Implementation stem of qualitative data interviews

IV: Analysis of finding
Key actors > Promotion > Implementation > Programme related

- Role of local intermediaries in advocating sanitation at community level (Arko; Arma);
- Opinion leaders as pioneers for construction and use of on-plot facilities (Arma);
- Training of small scale private entrepreneurs to market sanitation locally (Awindaogo);
- School sanitation and children as an entry point to wider community awareness on sanitation (Bawa);
- Masons act as indirect promoters of sanitation when constructing latrines in communities (Prasad).

Repayment > User contribution > Economic > Technical related

- Failure of repayment schedules over longer term (Arma);
- Cost of collecting arrears to implementing agencies high (Arma);
- Failure to keep proper account of money repaid (Donkor);
- Need for flexible repayment schedules for householders in times of financial stress (Donkor).

Physical conditions > Technical > Technical related

- Soil conditions (Arma; Prasad);
- Relationship between site of latrine and water sources (Ayivie).

Conflicts > Agency roles > Implementation > Programme related

- Co-ordination only on paper, not effective in practice. Lack of staff capacity or lack of authority to take decisions impacts on relationship between co-ordinating agencies (Adombire);
- Political conflict between government departments leads to poor co-ordination (Dos Anjos);
- Inter-agency rivalry and demarcation of responsibilities (Awindaogo).

Affordability > Economic > Technical related

- Limited experience of assessing willingness or ability to pay before project implementation (Arko; Arma).
VIP > On-plot > Technology > Technical related
- Poor image of household VIP attributed to poor performance of public VIP latrines (Arma);
- Design infringement through overuse and location of buildings close to latrine superstructures (Arma);
- Example of planning committee assumption that VIP not appropriate for urban areas (Ayivie);
- Planning norms affect introduction of VIP in urban communities (Doe);
- Cost of VIP impacts on ability of householders to repay monthly loan on facility (Donkor);
- Example of limited user understanding of VIP functioning (Donkor).

On-plot > Technology > Technical
- Preference of on-plot systems over communal latrine types (i.e., cleanliness, O&M) (Awindaogo).

Participation > Community > Programme related
- Participation stimulated by demand, which is triggered by intermediaries (Arma);
- Formation of water and sanitation committees (Awindaogo);
- Bottom up approach, with comprehensive involvement of community in planning and decision-making process (Bawa);
- Lack of fora for community consultations (Bawa);
- Impact of tenurial status on cleanliness of communal latrines (Donkor);
- Community involvement from beginning of process (Donkor).

Lessons > Outcomes > Programme related
- Fatigue in health promotion campaigns (Dos Anjos);
- Lack of access to capital in urban communities (Bawa);
- Flexible repayment schedules for loans on latrines (Donkor);
- Community involvement in design and planning of community structures (Donkor);
- Repayment schedule implemented immediately following facility construction (Prasad);
- Maintain public service ethos and motto to improve effectiveness of service delivery (Prasad);
- Implementing agencies must act in multidisciplinary fashion (Prasad).
Education > Promotion > Implementation > Programme related

- Education has role in shifting mind set of expecting free service delivery (Arko);
- Public education programme needed to establish context to city sanitation plans (Bawa);
- Continued education programme necessary to convince community members of benefit of latrine programme (Prasad);
- In large slums, advocate use of mass media communication strategy as entry point for sanitation/hygiene promotion and education (Prasad).

Tenure status > Socio-cultural > Technical related

- Landlords unwilling to provide a toilet to tenants (Arma);
- Landlords use construction of improved toilet to increase rents (Arma);
- Lack of tenurial security a disincentive to maintain and improve latrines (Donkor).

Groundwater > Physical conditions > Technical > Technical related

- Rule of thumb criteria applied to siting of latrines to reduce groundwater pollution (Adombire);
- Closing of latrine if groundwater pollution attributed to toilet (Adombire);
- By-laws in relation to groundwater pollution not applied (Doe).

Pan latrine > On-plot > Technology > Technical related

- Focus on nature of latrine type (malodorous and emptying risk) (Arma; Doe; Donkor);
- Sanitary inspectors find pan latrines in households where WC's submitted on plans (Ayivie).

Use > Technology > Technical related

- Lack of user education attributed to non-use of facilities (Awindaogo; Ayivie);
- Use a function of hardware and software issues (Ayivie);
- Public latrine use low because of user charge (Tamale sanitation committee);
- Examples of latrines abandoned when full due to inadequate latrine emptying provision, and user education regarding responsibility for emptying (Tamale sanitation committee).

IV: Analysis of finding
**Constraints** > Participation > Community > Programme related

- Most notices for planning schemes are written, reducing participation of illiterate community members (Ayivie);
- Poverty and indebtedness restrict ability of community members to participate in sanitation projects (Meka; Rao).

**User roles** > Participation > Community > Programme related

- Boundaries of user responsibility for service provision and O&M (Arko);
- Difficulty of overcoming perception that government should provide services for free (Tamale sanitation committee).

The key informant interviews provided a picture of the perceptions of sector professionals involved in service delivery to low-income urban communities. As such, they provide an interesting contrast to the concerns and priorities of users that have emerged through the analysis of household survey data.

A general point to raise is that the most frequently referenced issues tend to reflect the day to day concerns and priorities of sector professionals, hence the emphasis on agency roles, repayment rates, institutional conflicts, lessons learned and education issues. This broad based, strategic concern is to be expected given the responsibilities of the informants, and contrast markedly to the narrower, locally focused perceptions of users.

Notable specific points from the analysis of this data include:

- Assumptions about plot size are typically based on norms and standards. There is little apparent triangulation of experiences with users;
- The interface between implementing agencies is commonly a source of tension and conflict. Capacity issues and political rivalry between government departments were found to further complicate the relationship between different agencies;
- Priority is given to finding an entry point to trigger sanitation promotion activities within urban communities (i.e., masons, school children, opinion leaders and entrepreneurs). This may reflect the strategic concern of how to stimulate demand for sanitation services;

IV: Analysis of finding
Greater realism in repayment of loans on latrines, and the need to secure wider access to credit for low-income urban householders;

There are few well-documented examples of effective consultation between users and sector professionals;

Groundwater is generally regarded as a sacrosanct resource.

4.10 Summary

The purpose of this chapter was to present the data collected during the thesis against the key research questions outlined in chapter 3. Formatting the chapter into sections on quantitative and qualitative analysis facilitated the process of explaining the key findings from the fieldwork, and underlined the mix of methodologies employed in the study.

On a general level, the following key points emerge from the chapter:

- The analysis of the data reflects the specific concerns that users possess with regard to on-plot sanitation systems. The accumulation of findings helps to provide a more coherent view of on-plot sanitation use than appears in the prevailing literature;
- The findings advance understanding of the types of issues that are integral to users;
- Qualitative data (i.e., householder case histories) reinforce the findings from quantitative data analysis;
- Key informant interviews provided a wider, strategic perspective on on-plot sanitation provision in low-income urban communities.

More specifically, the following detailed findings can be summarised:

- A key reason for the lack of household latrines is poverty, rather than lack of available space on-plot. Poverty, indebtedness and/or inability to save funds to invest in longer term sanitation facilities are key constraints;
- The relationship between cost, technology choice and income level is a complex one, which defies simple categorisation. There is some evidence to suggest grouping of unskilled employment with those households without sanitation, although this does not remain consistent for lower cost latrine types. Similarly, skilled sources of employment are not solely related to choice of higher cost latrine types. Choices about sanitary
technology are based on a variety of factors, of which cost is just one (important) consideration;

- Householders decisions to invest in domestic sanitation are typically driven by socio-cultural rather than health factors;
- In all but one case, users express high degrees of satisfaction with their latrine (in excess of 80% recording ‘satisfied’ or ‘very satisfied’). Bucket/pan latrines record by far the highest levels of dissatisfaction;
- Many users do not perceive there to be a problem with their latrine. Where problems are recorded, the most common include ‘emptying’, ‘smell’ and ‘insects’, although absolute figures are low;
- Of these three problems, ‘emptying’ and ‘smell’ have the greatest impact on satisfaction levels and ability for the user to use the latrine;
- Operational sanitation facilities were found to be commonplace in the smallest plot size category (1-124m²);
- Levels of user satisfaction were not significantly affected by the incidence of small plot size;
- There is little indication that plot size determines technology choice. No definitive grouping or concentration of technology types was observed by recorded size categories;
- There is limited evidence to suggest that plot size is associated with particular operational problems. Of the most commonly noted problems with latrines, insect and odour nuisance were strongly related to plot size category. However, this does not appear to impact on levels of user satisfaction or householder’s ability to use latrines;
- The absence of household sanitation is not exclusive to the smallest plot sizes;
- Need for more frequent user support and education activities to be made available;
- Users infrequently noted construction related problems. Of greater importance was correct operation and maintenance of twin and double pit latrines;
- Manual methods of emptying dominate (either by hand or with handtools), and are especially commonplace for bucket/pan, simple pit, pour-flush and VIP latrines;
- Mechanical emptying with vacuum tankers tends to be associated with septic tank and VIP latrines;
The responsibility for emptying latrines is normally either that of the users, or private contractors. Contractors are of particular importance in the emptying of bucket/pan, pour-flush and WC to septic tank latrines;

For those latrines which had been emptied, most had been used for 6, 7, or 8 years. Typically, these latrines had been emptied either once or twice. Pit depth did not appear to influence the number of times a pit had been emptied;

Rates for re-filling of previously emptied latrines indicate that a significant minority (20%) fill over 3-6 years;

Where users expressed a problem with emptying, frequency, cost and hygiene were ranked as the three most important issues;

In the majority of cases, the final disposal site for collected excreta was either unknown or indiscriminate dumping;

Only small percentages of households perceive odour and insect nuisance to be a common problem with their latrine (although odour nuisance does have a significant impact on satisfaction levels);

Bucket/pan latrines register the highest odour and insect nuisance levels of all latrine types;

Relative to other latrine types VIP's record higher than anticipated levels of odour and insect nuisance. However, there is no conclusive evidence to suggest a link between odour and insect nuisance and height of vent above roof line, presence of fly screens, vent pipe colour and diameter of pipe;

Quantitative test results for insect nuisance indicate low absolute numbers;

Limited qualitative evidence raises doubts about domestic latrines as the primary source of insect nuisance on-plot.
Chapter V: Discussion and implications of findings

5.1 Chapter outline

5.2 Response to research questions and hypothesis testing

5.3 Implications of findings
   5.3.1 Guidelines in relation to latrine types
   5.3.2 Guidelines in relation to crosscutting issues
      5.3.2.1 Socio-cultural issues
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5.4 User based criteria for decision-making systems
   5.4.1 Contrasts to existing decision-making algorithms

5.5 Missing links: demand and sanitation promotion
   5.5.1 Demand for sanitation
      5.5.1.1 Background
      5.5.1.2 Sanitation services and demand
      5.5.1.3 Mediating between users and professionals over options
   5.5.2 Sanitation promotion
      5.5.2.1 Background
      5.5.2.2 Common aspects of effective sanitation promotion
      5.5.2.3 Sustaining promotion

5.6 Summary

V: Implications of findings
Discussion and Implications of findings

5.1 Chapter outline

This chapter considers the analysed data within a broader framework. Initially, the thesis' key research questions and hypothesis are revisited with a view to testing their validity following the presentation of data analysis in chapter 4 (5.2). Secondly, the findings from the household and postal questionnaires, key informant interviews and fieldwork observations are distilled into a discussion of the implications of the findings (5.3). Guidelines are presented which are disaggregated in relation to two critical elements (latrine type; and crosscutting issues of relevance). The chapter then proceeds to present user based criteria for decision-making systems (5.4) and contrasts these findings to existing decision-making algorithms in the sector (5.4.1). This chapter concludes with identification of missing links with regard to on-plot sanitation, user perceptions and wider sanitation projects and programmes (5.5).

5.2 Response to research questions and hypothesis testing

This section presents the implications of the findings in relation to the primary and secondary research questions that were identified in chapter 3 (section 3.4). It ends with an examination of the thesis' hypothesis in relation to data analysis.

Primary research question

What factors affect the acceptability of on-plot sanitation systems in low-income urban communities, and how?

The data from the thesis points to two significant domains that impact on acceptability to the user:

- Socio-economic/socio-cultural domain (including for example, level of household income, indebtedness, capacity to save, prevailing cultural norms with regard to privacy during defecation, convenience);
• Operation and maintenance domain (including for example, operation of systems, presence/absence and condition of latrine components, incidence of odour/insect nuisance, and emptying procedure).

Significantly, local site conditions, in particular physical area of household plot, do not impact on user acceptability other than where they overlap with O&M factors. These issues are explored in more detail in the examination of the secondary research questions below.

Key research question 1
What factors account for the absence of household sanitation? Objective: to investigate the range of reasons contributing to the success or failure of on-plot sanitation programmes, and to the absence of more widespread latrine construction outside of specific programmes.

The data indicates three key points:
• Reinforces the importance of socio-economic constraints to householder’s decisions to invest in on-plot sanitation;
• Rejects the notion that small plot size is a significant constraining factor to householder’s decision-making with regard to sanitation;
• That demand for particular sanitation systems is frequently based on incomplete, or possibly incorrect, information.

The implications of these findings are manifested in several ways:
• Underlines the importance of developing locally affordable latrine types, coupled with the need to initiate innovative micro-financing schemes for sanitation and/or more flexible means for repayment (and enforcement) of loans;
• The physical size of the plot should not be used by implementing agencies as a primary determinant of the potential operational viability of on-plot sanitation systems. Planning norms and regulations need to be revised in the light of practice on the ground in low income communities;
• Sanitation promotion campaigns need to be more effective in reaching a wider target audience. Existing communication methods may not be penetrating to those groups most in need of the information;
• Demand for sanitation may be latent or only partially expressed. Sanitation promotion campaigns are critical steps in triggering demand. Importantly, demand needs to be negotiated between users and sector professionals.

**Key research question 2**
What levels of dis/satisfaction do users express about different latrines? Objective: to investigate parameters of performance in relation to the perceptions of the users, which may impact on expansion of sanitation programmes.

The data indicates two key points:
• Very high levels of positive expressions of satisfaction for all latrine types (except bucket/pan);
• Users note ‘latrine emptying’ as a significant operational problem, which along with ‘smell’ has the greatest impact on satisfaction levels and operability of latrine types.

The implications of these findings are:
• Where present, bucket/pan latrine operation needs to be phased out;
• Rejection of the assumption that users are generally dissatisfied with lower cost latrine types. Insect nuisance is not widely perceived as a problem by users;
• Project planners need to give greater attention to emptying methods and processes when designing latrine programmes in low-income urban areas. Better user education with regard to mitigating odour nuisance is a concern.

**Key research question 3**
Does plot size constrain the use of on-plot sanitation systems? Objective: to determine what on-plot sanitation systems have been used on small plots, and how plot size has affected operation and maintenance.

The data indicates two key points:
Plot size is a weak determining factor in constraining the use of on-plot systems. There is no apparent relationship between small plot size and absence of latrine; user dissatisfaction; or latrine type;

Plot size and operational problems do coincide, in particular in relation to insect nuisance. This did not impact on levels of user satisfaction or ability to use the latrine, however.

The implications of these findings are:

Project implementers need to reassess the low-income areas in which sanitation projects are located, irrespective of planning norms and regulations in relation to 'acceptable' plot size;

Decision-making algorithms that use plot size as a filtering step are unrealistic given the evidence presented.

**Key research question 4**

*Do maintenance problems arise when pits and tanks fill up? Objective: to identify what user problems are associated with pit emptying and to determine satisfactory systems for the desludging of pits and tanks and the hygienic disposal of sludge.*

The data indicates three key points:

- Latrine emptying is considered a key operational problem by users;
- Frequency, cost and hygiene issues are most commonly noted as problems with emptying;
- It is apparent that what happens to the contents of latrines after emptying is poorly documented.

The implications of these findings are:

- Householders are advised that the filling/emptying cycle for their latrine is likely to be between 3-6 years. They will typically need to make their own arrangements for desludging;
- Emptying cost is strongly location specific. Emptying costs need to be explored and discussed with local contractors (formal and informal) during sanitation programme
Key research question 5
Do operational problems arise with on-plot sanitation systems, and why do they occur?
Objective: to investigate the extent of, and reasons for, incorrect operation of on-plot systems. An understanding of the extent of odour and insect nuisance is considered in this sub-question.

The data indicates two key points:
- Latrine use is not free from operational difficulty. The most commonly noted problems relate to emptying, insect and odour nuisance;
- Incorrect operation of on-plot systems relates primarily to alternating twin pit latrine systems where both pits are in use simultaneously. Anecdotally, VIP latrines built outside of sanitation projects may not observe strict design features such as extending vent pipes above rooftop.

The implications of these findings are:
- Project planners need to give greater attention to emptying methods and processes when designing latrine programmes in low-income urban areas;
- Projects need to give more attention to the incidence of on-plot insect and odour nuisance, determining the source of this nuisance and methods to mitigate its impact;
- Mechanisms need to be in place for ensuring that correct operation of all latrine types is explained at both the planning and post construction stages.

Hypothesis testing
The guiding hypothesis for the study is ‘On-plot sanitation is an acceptable’ sanitary technology option for users in low-income urban communities, not only technically, but also from socio-cultural perspectives’.

The hypothesis directs the thesis towards an examination of the two key tenets of critics of on-plot sanitation systems; that on-plot systems lack technical suitability for urban environments, and that users of on-plot systems will be dissatisfied with the systems. On

1 'Acceptable' is defined in the thesis as meaning 'adequate, satisfactory' and is used as a proxy measure of satisfaction
reviewing the data gathered and analysed for the thesis in the three study locations it is clear that the hypothesis is proven.

The findings that emerge provide a strong evidence base that both technical and socio-cultural acceptability is demonstrated by the principal on-plot sanitation systems sampled during the research. Key indicators for technical and socio-cultural acceptability are abstracted from the findings and are summarised in the following table:

<table>
<thead>
<tr>
<th>Technical acceptability</th>
<th>Socio-cultural acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustained latrine use (number of years)</td>
<td>Sustained latrine use (number of years)</td>
</tr>
<tr>
<td>Sustained latrine use (small plot sizes)</td>
<td>Incidence of user satisfaction</td>
</tr>
<tr>
<td>Number of operational problems identified</td>
<td>Impact of operational problems on ability to use latrine</td>
</tr>
<tr>
<td>Frequency of latrine emptying and refilling rates</td>
<td>Ability of systems to meet prevailing socio-cultural norms (i.e., privacy)</td>
</tr>
<tr>
<td>Incidence of insect nuisance</td>
<td>Incidence of insect nuisance</td>
</tr>
<tr>
<td>Incidence of odour nuisance</td>
<td>Incidence of odour nuisance</td>
</tr>
<tr>
<td>Affordability</td>
<td></td>
</tr>
</tbody>
</table>

These indicators represent user perspectives based on evidence gathered during the fieldwork stage of the research. It is interesting to note that some indicators appear in both categories, namely ‘sustained latrine use’; ‘incidence of insect nuisance’ and ‘incidence of odour nuisance’. These measures are evenly applied but relate to different issues. For example, sustained latrine use is clearly a measure of the technical functioning of the latrine over a number of years, but equally an indicator of householder’s willingness to use the latrine system on a continuous basis.

5.3 Implications of findings

5.3.1 Guidelines in relation to latrine types

It is not possible to prescribe precise routes for selecting a particular type of on-plot latrine, because it is always difficult to allow for local contextual factors that influence the type of latrine householders obtain. For example, an important but unstated assumption of most decision algorithms (particularly those with a technological bent) is that consumers have a completely free choice over the range of options. This is not necessarily the case, for example, where programmes choose to promote or subsidise particular technologies.
Another situation which defies the rather technocratic approach of deducing the best type of latrine via a series of checklists is where there exists social pressure to acquire a latrine built to a certain design and specification.

The following section presents a series of selected guidance points, which are based on the findings from the data disaggregated by particular sanitary technology. Project/programme implementers can use these points to gain a better indication of the problems that might arise when advocating these technology types, and the conditions in which their use might be appropriate.

Cost to the householder is the overwhelmingly important factor; different types of latrine clearly have different costs, added to which subsidies may be available for certain target groups to use a particular design of latrine. There is also a trade-off between capital and operation and maintenance costs in relation to the size of the pit. Deep pits, whilst more expensive to construct, have a longer life cycle and therefore incur less cost with regard to pit emptying. This applies to all types of pit latrine with the possible exception of twin/double pit systems that are usually constructed because there is an express reason for requiring shallow rather than deep pits.

The simple improved pit latrine is the lowest cost option.

**Guidance points: Unimproved simple pit latrine**

Based on 39 cases (2% of full sample): Mozambique 60%, Ghana 40%

- 66% level of overall user satisfaction;
- User satisfaction levels most significantly affected by smell and smell and insects;
- 80% of users felt the problems they had identified had no or slight impact on its use. Users perceived lower cost (39%) and easier operation and maintenance as ways to alleviate identified problems with their latrine;
- Insect and odour nuisances were relatively high. 51% recorded a ‘strong’ smell from their latrine, 25% recorded ‘hundreds’ of flies;
- Mean construction cost: Ghana (US$ 26), Mozambique (US$ 9);
- 24% of all latrines had been in use for more than 5 years;
- The majority of pit latrines (84%) had not been emptied. When they had, most were on one occasion only. 58% of all cases recorded re-emptying periods greater than 3 years.

At marginally increased cost, the hole in the latrine slab can be sealed by a tight fitting lid, which in theory reduces insect and odour nuisance.

**Guidance points: Lid-covered latrine**

Based on 357 cases (19% of full sample): Mozambique 92%, Ghana 8%.

- Few cases of problems with simple pit latrines recorded, reinforced by a 93% level of overall user satisfaction;
- Most significant problems affecting user satisfaction were smell and insects (8% of respondents) and frequent repairs (6%);
- 25% of all simple pit latrines had been in use for more than five years;
- Only 6% of pit latrines been emptied, most on one occasion only. Re-emptying periods were greater than three years in most cases; only 1% of the sample regarded pit emptying as an operational problem;

NB: In Mozambique the convention for latrine superstructures is a privacy screen with no roof. It was observed that this aided reduction of odour and insect nuisance since there was no containment of foul smells or flies within the superstructure.

Ventilation of the latrine pit also has been advocated as a means of reducing fly and insect nuisance; this adds to the cost of the latrine, being more expensive than providing a sealed lid.
Guidance points: Ventilated Improved Pit (VIP) latrines

52 cases (3% of full sample) all drawn from Ghana.

- 83% level of overall user satisfaction expressed;

- User satisfaction levels are most significantly affected by smell, insects and emptying problems;

- 61% of users believed that the problems they had identified with their latrines had no impact on its use. Users perceived easier operation and maintenance and less regular need for emptying (9%), and lower cost (36%) as ways to alleviate identified problems;

- 10% of users recorded high incidences of insect nuisance, and 60% noted slight or strong smells;

- Mean construction cost 313,000 cedis (US$156), mean emptying cost 30,000 cedis (US$15);

- 42% of VIP latrines required emptying every six months, with 53% being emptied by vacuum tanker;

- 33% of VIP latrines had been in use for more than five years;

- 46% of all latrines had not been emptied; 6% of these had been in use for more than 5 years;

If water is used for anal cleansing, it is possible to use a pour-flush latrine. The data only reflected the situation with regard to the twin/double pit pour-flush latrine, and no detailed information on either single pit direct, or single pit offset latrines is available since these latrine types did not exist in substantial numbers in the study areas.

Guidance points: Pour-flush latrine

394 cases (21% of full sample) all drawn from India.

- 83% level of overall user satisfaction expressed;

- User satisfaction levels are most significantly affected by smell, blockage and frequent repairs;

- 69% believed that the problems were minor and of little impact; of the remainder, users perceived these problems could be alleviated by easier operation and maintenance and less regular emptying (60%), and lower cost (27%);
• 5% of users recorded moderate incidences of insect nuisance, and 36% noted slight or strong smells;

• Mean construction cost Rs2866 (US$78), mean monthly O&M cost Rs33 (US$0.9)

• For 59% of all latrines, the period between being emptied exceeded three years. In 27% of cases, this period lasted for five years or more;

• Pour-flush latrines have been constructed and operated on plots as small as 14m²;

• 62% of pour-flush latrines had been in use for more than five years;

• 66% of all latrines had not been emptied; of these, 47% had been in use for between 6-10 years.

The addition of the pour-flush bowl and connecting sewer add significantly to the cost.

**Guidance points: WC to septic tank**

159 cases (9% of full sample); 82% from Ghana, 18% from India.

• 90% level of overall user satisfaction expressed;

• User satisfaction levels most commonly affected by lack of water and tank emptying;

• 86% believed that the problems were minor and of little impact; of the remainder, problems could be alleviated by easier operation and maintenance and less regular emptying (55%), more regular water supply (13%) and lower cost (10%);

• No significant incidences of insect nuisance, and 33% noted slight or strong smells;

• Monthly O&M cost (US$0.3 - US$5);

• In 34% of cases, the period between emptying the tanks exceeded three years. 23% required emptying every six months;

• 58% of all households had used septic tanks for more than three years. 36% of these had used the facility for more than 11 years;
48% of septic tanks had not been emptied during their lifetime; 

Finally, the study examined the cases of households served by bucket/pan latrines. The generally unhygienic and hazardous operation of this system means that this option should not be adopted for on-plot sanitation. Bucket or pan latrines are amongst the oldest forms of organised sanitation, and are still used extensively throughout the cities and towns of Africa, Asia and Latin America. Although the numbers of bucket latrines are declining rapidly, this type of system remains attractive because of its low capital cost. The normal format for this system involves a container made of (non-corrosive) material which is placed beneath a squatting slab or seat in a chamber, with rear doors which are kept shut except during removal and replacement of the bucket.

**Guidance points: Bucket/pan latrines**

264 cases (14% of full sample) all drawn from Ghana.

- Only 33% of overall user satisfaction expressed;
- User satisfaction is most affected by the frequency and cost of emptying, associated smells and insect nuisance;
- Of those who expressed problems, 84% believed that they had a significant impact; of the remainder, users felt problems could be alleviated by easier operation and maintenance and not requiring regular emptying (49%), simpler toilet design (26%) and lower cost (9%);
- 13% of users recorded high incidences of (flying) ‘insect’ nuisance and 60% presence of cockroaches. 90% noted slight or strong smells;
- Mean construction cost (US$24), monthly O&M cost 5346 cedis (US$3);
- 25% of bucket/pan latrines have been in use for between 21-30 years.

5.3.2 Implications in relation to crosscutting issues

In this section, three important crosscutting issues that emerged during the course of the research are addressed and guidance points on each are provided. These issues are
typical of the development of any sanitation programme whether on-plot or off-plot, but the following sections deal with them from the perspective of on-plot programmes:

- Role of socio-cultural factors in user choice;
- Costs;
- Institutional issues;

5.3.2.1 Socio-cultural issues

<table>
<thead>
<tr>
<th>Guidance points: socio-cultural issues</th>
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<tbody>
<tr>
<td>In planning sanitation interventions, programme staff need to be sensitive to the social and cultural context in which decisions about sanitation facilities are made, if there is to be widespread adoption of the programme;</td>
</tr>
<tr>
<td>There is a potentially wide differential in understanding of key concepts about hygiene, health and sanitation between users and programme implementers. Interventions should seek to look at their activities from the user’s perspectives, knowledge and understanding;</td>
</tr>
<tr>
<td>Communities are rarely uniform. Different groups have specific needs with regard to sanitation;</td>
</tr>
<tr>
<td>Different groups exercise different levels of authority over the community and act as a constraint or aid to promotion and change;</td>
</tr>
<tr>
<td>Individual users decide whether to accept or reject new sanitation facilities. Sanitation interventions depend on the consent of the individual - they need to be convinced of the need for the improvement and that any benefits will outweigh any costs.</td>
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</tbody>
</table>

Background
Sanitation programmes involve much more than simply designing a particular engineering solution to fit a particular problem. As important as an appropriate technological option is an understanding of the social context and the complex relationship of beliefs, traditions and social structures that are common to a given community. By ensuring that any engineering intervention is acceptable to its intended user group(s), the chances of implementing a programme that is sustainable over the longer term are significantly increased. It is therefore necessary to understand at the design and planning stage of a
sanitation intervention what the critical factors are which determine how a community operates.

Cultural beliefs
Attitudes and behaviours that are derived from a combination of tradition, religion, and moral standards can have a powerful influence on the use and acceptability of on-plot sanitation systems. Understanding what these influences are will help to inform the process of selecting technology and improve the acceptability of sanitation improvements. For example, culture may determine the technical parameters that are set for a given technology: the type of anal cleansing material used (typically determined by custom or tradition rather than notions of hygiene and health) will have implications for the technical design of a sanitation system.

Culturally derived ideas of what constitutes improper or taboo practices affects the use of sanitary facilities by particular social groups. In peri-urban Mozambique, fieldwork observations indicated that mother and sons-in-law should not use the same latrine (justified on the grounds of ‘maintaining respect’) and women were frequently forbidden from using the on-plot latrine during menstruation because the men of the household feared ‘catching diseases’. Likewise, the need for privacy during defecation (particularly for women) is a critical factor affecting both the use of a latrine and the design of the superstructure.

Communities typically have well-developed ideas about what constitutes hygiene, disease and sanitation. Concepts of what is ‘dirty’ and ‘clean’ will vary markedly between traditional and Western perspectives, and between programme promoters and users. Careful appreciation of these concepts will be a key element in designing successful sanitation promotion campaigns where users are encouraged to accept an intervention based of new standards of cleanliness. Additionally, judgements between those beliefs that are beneficial to improved sanitation interventions, and those which are not need to be made.

An example of the impact of cultural beliefs on household sanitation is highlighted in the field insight below.
Field insight: Influence of belief systems on siting of household latrines

A slum area in Vijayawada, Andhra Pradesh, India had been upgraded but the community was not using the new toilets provided on their plots. The reason for this was not immediately apparent, but when a local woman resident was asked if there had been any problems with the recent development, she explained that most of the households had not been using the toilets provided. The reason for this was that the toilets were located in the Northeast corner of the plot, which according to the Hindi belief system 'Vastu' was an inauspicious place to locate a toilet. The Northeast corner of the plot is preferential for items such as a water source, the prayer room and the main door to the house. Toilets should be located at the south of the plot. As a result, many residents did not use the toilets provided, and had resorted to open defecation in fields adjacent to the slum.

Social structure

Communities are rarely homogenous, but are formed from a diverse number of ethnic, political, age and gender groups. Each of these groups will have specific roles and patterns of behaviour within a community that will affect their needs vis-à-vis sanitation. Consider for example the different needs that women and men have with regard to sanitation: with the former a high premium is placed on the need for privacy during defecation, and the inaccessibility of public latrines after dark (from fear of harassment) are key concerns which are gender specific.

Key change agents

Communities often develop informal and indigenous organisational forms that have evolved over time to assist in the functioning and operation of a society (for example, chiefs, elders). These different groups exercise different levels of authority and power within a community and have the potential to influence community decision-making and the process of change in both a positive and negative manner. Identification of who the key change agents are is a critical element for effective sanitation promotion and implementation. In the Kumasi Sanitation Project (KSP), Ghana, the role of area chiefs in the sanitation programme was of key importance. These chiefs acted as the main link between the metropolitan assembly and the community, and their overall task was to keep the community informed, develop a dialogue with the people and encourage participation in sanitation related activities.
Furthermore, understanding why certain groups are open or resistant to change helps to determine how promotional activities should be conducted and what strategy for implementation should be adopted. Change agents may be resistant to an intervention for various reasons, including factors such as resentment towards outsiders and experts and the fear of loss of authority over the community through community development programmes. An NGO working in Accra, Ghana on the implementation of a ventilated improved latrine programme in low-income urban districts noted a series of problems with community 'assemblymen' (the representatives of the municipal assembly at the local level). Assemblymen had responsibility for promoting and developing sanitation programmes at the local level (in consultation with the community) and in this case were a focus of the repayment process. Semi-structured interviews showed that in some cases:

- Assemblymen would agree to policy decisions during sanitary committee meetings when implementing agencies were present, but the moment the NGO withdrew from the district, the assemblyman would change procedure and practices to suit their own agenda;
- Money was collected from the community for repayment purposes (via the assemblymen) but not paid back into the revolving fund scheme.

5.3.2.2 Cost issues

**Guidelines**

- The views of sector professionals regarding the affordability to the user of a particular latrine type may be at variance to the householder's idea of what is and is not affordable;

**Background**

Although different sanitation interventions may exhibit a range of social, cultural, institutional, technical and health related features which make them more or less desirable for implementation, the choice of one option over another is frequently based on the cost of the technology and its affordability to potential beneficiaries. It should not be assumed that because a sanitation technology is marketed as being 'low(er)-cost', that low income urban households perceive it to be so, or can actually afford it. If they cannot pay, then the options are typically to either provide a subsidy, or to arrange for a loan.
The recent shift in development thinking away from supply-led financing strategies to those that are demand-based implies that if the financial element of a sanitation programme is to be sustainable, considerable information about the financial context in which communities operate will be required. This includes information relating to the availability of credit facilities, the willingness of the household to pay for sanitation, government attitudes towards cost recovery, and the role of the private sector.

Costs
Beyond methods of comparing costs, which was addressed in Chapter 2 (section 2.7.2), user perceptions of the relative affordability of a sanitation option are critical for programme sustainability. If costs are perceived to be too high by users, then householders will be unwilling to invest in sanitation. It is important to note that there can be large differentials between what professionals and beneficiaries accept as a ‘lower’ cost technology.

In Mozambique, the national low cost sanitation programme has introduced unreinforced domed concrete slabs, which are targeted at the poorest sections of peri-urban communities, who typically earn less than 217,000 Meticals (MT), (US$22) per month. The total cost of producing a simple slab in 1995 was 105,200 MT (US$10.99), and with subsidies from government and donor agencies, user contributions were reduced to 11,100 MT (US$1.16). Additional costs were borne by the users through transportation of slabs from production units, and from the construction of the latrine superstructure.

During research fieldwork in Mozambique, household surveys asked users to describe the total cost of their latrine as ‘low’, ‘medium’, or ‘high’ (n=347). The table below indicates results for those latrines built most recently in 1996 (the mean price for a simple pit latrine at this time was 120,787 MT (US$13).

<table>
<thead>
<tr>
<th>Year</th>
<th>User perception of total cost of latrine (% of cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>22.8</td>
</tr>
</tbody>
</table>

The key point is that despite the subsidy provided, this relatively simple technology type was still perceived by a large proportion of users to be of ‘medium’ cost. This reinforces
the difficulties of providing comparable sanitation costings - in many other parts of the
globe, the total cost figure used here might be considered very low, but it is the local
context and the particular demands that householders have on their income which
complicates such comparisons.

5.3.2.3 Institutional issues

<table>
<thead>
<tr>
<th>Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Maintain clear lines of responsibility between participating agencies in sanitation projects;</td>
</tr>
<tr>
<td>- Effective co-ordination of different agencies may produce better conceived and more acceptable sanitation options for communities.</td>
</tr>
</tbody>
</table>

Background

Any sanitation intervention takes place against a background of complex relationships
between different stakeholders, including the household, community, and government.
The nature of these relationships inevitably affects the way in which a programme is
planned, implemented and managed. Institutions or organisations which play a key part
in this relationship include those bodies outside the local community which are
responsible for initiating, promoting, supervising and supporting a sanitation intervention.

Institutional responsibility

Many institutions have a stake in sanitation in the urban context, from central government
ministries, through local authorities, and non-governmental organisations. The provision
of services to urban communities involves many providers working on connected tasks. In
such an operating environment, problems such as poor co-ordination of programme
activities, duplication of efforts, and institutional conflicts can arise, all of which weaken the
attainment of the projects goals. A key factor in achieving and sustaining programme
success is the creation of a clear institutional structure with a lead agency to take overall
control of the intervention, to establish clear areas of responsibility, goals and objectives,
and a time frame and schedule to achieve these goals. Designated officers and advisory
committees working within the lead agency can make the task of executing the
programme or project easier.
In Kumasi, Ghana, the Strategic Sanitation Plan (SSP) brought about significant changes to the existing institutional arrangements in order to introduce greater transparency and clarity to infrastructure provision in the city. Prior to the SSP, the management of sanitation services and the institutional roles of the Kumasi Metropolitan Authority were fragmentary and unclear. The Medical Officer of Health, Mechanical Engineer's Department and the Metropolitan Engineer's Department were jointly responsible for planning, development, operation and maintenance of household sanitation, public latrines and solid waste collection and disposal. The divisions of responsibilities between the three were fraught with duplications and inefficiencies. Following implementation of the Plan, the KMA were stripped of responsibility for direct delivery of waste management services, and instead wide partnerships between the communities and private sector were encouraged. An independent waste management department (WMD) was created to oversee this transition and to plan and supervise waste collection and disposal undertaken by different participating agencies. The department was headed by a Director of Waste Management who was directly accountable to the metropolitan chief executive via the director of administration. Furthermore, clear division of responsibilities was brought about through the creation of four sections within the WMD: contract management, administration, pollution control and planning.

**Institutional co-ordination and co-operation**

Identifying a lead agency does not mean that an intersectoral approach cannot be pursued. Other organisations have specialist skills and knowledge that would prove invaluable in deciding which technology to apply and how to implement such a programme. Semi-structured interviews with key informants during this research indicated that cross-sectoral co-ordination and co-operation was frequently lacking or poorly developed in programmes. To achieve a greater degree of dialogue between key sector agencies, a series of components to reinforce partnership arrangements were identified:

- Specialised teams or working groups to deliberate on specific issues of relevance (i.e., sanitary codes and regulations);
- Steering committees comprising representatives from the range of cross-sectoral institutions working on a particular intervention (see field insight below);
- Regular meetings and reports circulated to all partners;
- A formalised contractual arrangement outlining the responsibilities of all partners.
However, establishing effective dialogue and co-operation between sector agencies remains the critical issue. The points listed above will only work if all participating agencies are committed to working together.

Field Insight: Urban Sanitation Improvement Team, Ghana

In Accra, Ghana, the Waste Management Department of Accra Metropolitan Assembly wanted to introduce a programme of construction of domestic KVIP latrines in low-income districts. At the executive level, an Urban Sanitation Improvement Team was established with the intention of bringing together representatives from the planning department, the Ministry of Health, the Ministry of Public Works as well as the Waste Management Department to co-ordinate activities and inputs from the respective agencies.

The key lessons which had been learnt from the creation of such specialised teams was that they need to be given a clear remit, their role in existing organisational structures needs to be clarified and their staff should be given designated duties, rather than incorporating team activities within existing workloads.

Such specialised teams frequently offer opportunities to overcome the bureaucratic procedures and delays that can beset the institutional aspects of sanitation interventions.

Lead agencies must decide how most effectively to use the experience of multilateral and NGO support for sanitation programmes, and to try and incorporate their efforts appropriately into the overall scheme. Tendencies for NGO's to promote one-off projects that fulfil their own objectives can be damaging to the overall programme goals. In Mozambique, the National Low Cost Sanitation Programme had found that the reputation of their programme had to some extent suffered through poorly developed and ill-advised NGO sanitation interventions which failed soon after implementation. The Programme has begun the process of lobbying central government to issue guidelines to NGO's that will allow wider monitoring of their work programmes.

Institutional - householder roles: catalysts

When a project is implemented, it is valuable for the implementing agency to have contacts with the community, as a means for stimulating participation, assessing need and co-ordinating implementation. For example, in Mozambique, local community members, or animators, are used by the national programme to promote the programme
in the local area, help assess the individual needs of those without sanitation, to monitor and evaluate the performance of the system and to reinforce hygiene behaviour practices.

Particular elements of the community may be more effective in communicating messages than others. For instance, women have a special role in running the home, collecting water and managing the sanitation system, thus, female animators, or talking to female heads of households about sanitation are important considerations.

<table>
<thead>
<tr>
<th>Field insight: Institutional framework for PNSBC, Mozambique</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational organisation</strong></td>
</tr>
<tr>
<td>This is structured around a single central management unit located in the capital, Maputo, and a series of improved latrine projects (PLM’s) at the provincial level.</td>
</tr>
<tr>
<td><strong>Responsibilities</strong></td>
</tr>
<tr>
<td>The Programme is managed nationally by a central management unit (CMU) which has responsibility for overall policy, planning, co-ordination, training, resource mobilisation, procurement and financial management. The CMU maintains supervisory visits to each of the provincial units as a means of ensuring quality control in the programme: each unit is visited at least once every two months. There are currently 8 Improved Latrine Projects (PLM’s) at provincial level. Each unit has responsibility for planning, budgeting and projecting annual production targets.</td>
</tr>
<tr>
<td><strong>Institutional framework</strong></td>
</tr>
<tr>
<td>The PNSBC emerged out of the initiatives of the National Directorate of Housing and National Directorate for Preventative Medicine in the 1970’s. It was subsequently absorbed into the Institute of Physical Planning (INPF) which was suitable institutional location at the time given the complementary roles with urban and rural contexts. Since the dismantling of the INPF and the creation of the Institute of Rural Development, there have been concerns about the logic of the institutional framework.</td>
</tr>
</tbody>
</table>

The water supply and sanitation sector as a whole in Mozambique has suffered from institutional confusion and tensions in the recent past, which are in part attributed to:

1. Political instability and blight before major elections;
2. Reluctance to give a commitment to new structures in the sector, and a legacy of poor inter-agency co-ordination leading to a policy vacuum in the sector;
3. No consensus about institutional divisions of responsibilities in the sector and no clearly defined responsibilities for leadership and co-ordination;
4. Uncertainty caused by relocating PNSBC from its current home in INDER, and fear of disrupting the
established pace of implementation have limited decision making about PNSBC's future institutional location;

The location of PNSBC within INDER has weakened links with the urban sector and led to problems regarding acceptance of institutional responsibilities - informal links with only the water and health sectors has made it difficult to develop long-term plans and commitments to establish sustainable co-ordination mechanisms.

Co-ordination

Intersectoral co-ordination is largely informal, and the lack of an integrated, formalised and consistent co-ordination places serious constraints on the programme, namely:

- it may lead to duplication of activities and or contradictory activities;
- it places extensive demands on the community in terms of participation.

Clearly a need for some restructuring of the sector institutionally is required. Particular significance has been placed on the creation of the Basic Services Section in the Department of Water and Sanitation within the National Directorate for Water. A Co-ordination and Planning Nucleus has been created within DNA/DAS to permit better intersectoral co-ordination and planning for specific low cost sanitation activities with the participation of key agencies (health, physical planning, social action co-ordination, low cost sanitation etc.). Its objectives are to promote and co-ordinate activities for provision of adequate and affordable water and sanitation facilities for low-income groups.

Recent developments have placed emphasis on the need to decentralise the operations of the PNSBC. This will involve delegating powers to local municipalities to manage the provincial units, and through greater integration of the private sector in the construction of latrine parts.

5.4 User based criteria for decision-making systems

This chapter has addressed the findings from the data in a logical manner. Initially, the results were compared to the guiding hypothesis and research questions with a view to testing their validity. Secondly, implications were drawn on the basis of findings. In this section, a further analytical step is taken by applying the findings to existing practice.
The focus of this thesis has been on appreciating the perspective of the user, valuing their knowledge and integrating it with knowledge more conventionally gained (i.e., technical knowledge gained through study and examination).

Fieldwork findings from this study have uncovered many issues and factors perceived to be of importance by users of systems which require more careful consideration by sector professionals. Section 5.2 concluded with a table of indicators pointing to technical and socio-cultural acceptability of on-plot system. By combining them with key points abstracted elsewhere within the thesis, a checklist of user based criteria emerges. These criteria are important indicators of community perceptions in relation to on-plot sanitation systems. The following table aggregates the user-based criteria contained within this thesis.

### Table 48: User based criteria abstracted from thesis

<table>
<thead>
<tr>
<th>Technical</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Sustained latrine use (number of years)</td>
</tr>
<tr>
<td>- Sustained latrine use (small plot sizes)</td>
</tr>
<tr>
<td>- Number of operational problems identified</td>
</tr>
<tr>
<td>- Frequency of latrine emptying and re-emptying rates</td>
</tr>
<tr>
<td>- Pit refilling rates</td>
</tr>
<tr>
<td>- Cost of latrine emptying</td>
</tr>
<tr>
<td>- Hygienic disposal of latrine contents</td>
</tr>
<tr>
<td>- Incidence of insect nuisance (flying and crawling)</td>
</tr>
<tr>
<td>- Incidence of odour nuisance</td>
</tr>
<tr>
<td>- Improved user education regarding longer term O&amp;M of latrine system</td>
</tr>
<tr>
<td>- Structural integrity of latrine components (lids, vent pipes, fly mesh)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Socio-cultural</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Sustained latrine use (number of years)</td>
</tr>
<tr>
<td>- Incidence of user satisfaction</td>
</tr>
<tr>
<td>- Impact of operational problems on ability to use latrine</td>
</tr>
<tr>
<td>- Ability of systems to meet prevailing socio-cultural norms (i.e., privacy, convenience, cultural beliefs)</td>
</tr>
<tr>
<td>- Incidence of insect nuisance (flying and crawling)</td>
</tr>
<tr>
<td>- Incidence of odour nuisance</td>
</tr>
<tr>
<td>- Different community members respond to different motivations to invest in sanitation</td>
</tr>
<tr>
<td>- Is demand based on complete information?</td>
</tr>
<tr>
<td>- Does community know sanitation animators?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financial</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Affordability as defined by users</td>
</tr>
<tr>
<td>- Level of household indebtedness</td>
</tr>
<tr>
<td>- Availability of micro-finance/credit initiatives</td>
</tr>
<tr>
<td>- Flexible methods of repaying loans for latrines</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Location of solid waste pits on-plot; condition of surface drainage channels</td>
</tr>
</tbody>
</table>

V: Implications of findings
It was not possible to assign a relative ranking to these points, as they were implications that emerged from the analysis of the data, rather than a known factor that could be treated during fieldwork. Nevertheless, these points are important measures by which project/programme implementers can narrow their decision-making framework in a way that will enable more sustainable sanitation selection processes. By introducing these criteria as a checklist during sanitation selection, user concerns are placed more centrally in the decision-making process. Additionally, such a checklist facilitates a shift in thinking away from purely supply-led approaches to strategies that need to respond to demand.

Figure 15 below illustrates the proposed positioning of this checklist within a stylised representation of the steps involved in project/programme implementer’s decision-making process regarding sanitation selection. In this schematic overview, there are three key filters applied to the selection of sanitation options:

- Technical feasibility (A), referring to factors such as site conditions, design, O&M issues;
- Crosscutting factors (B), referring to socio-cultural issues, social structure, costs; and
- User based criteria (C), referring to those factors of perceived importance as identified by community members (and listed in table 48 above).

The numbers of possible technologies diminish with progress through the flow chart. At each filter, certain technology types will be removed from those that might be potentially applied to the local area (these are removed from the decision-making process because they are inappropriate to the local context). Importantly, local context has a role in determining both technical feasibility and crosscutting issues. The household (E) will influence the character of the local context by helping to define the type of social structure, ethnic grouping, religious affiliations, and cultural beliefs that are prevalent in the community.

The composition of the filter at C is directly affected by households (E), since it is their perceptions and priorities with regard to sanitary technologies that are captured in user based criteria. After the application of filter C, there are two probable outcomes (C1 and C2). C1 indicates direct adoption of latrine types applicable to the local area. C2 illustrates the steps involved when demand for latrines is incorporated into the sanitation selection process.
process. Sanitation promotion campaigns have a critical role in triggering demand for latrine types. When households express a demand for latrines (E2), the conditions are right for assessing, informing and negotiating demand (C3), a process that ultimately leads in the adoption and use of latrine types at D.

5.4.1 Contrasts to existing decision-making systems

Section 5.4 summarises the indicators of user based criteria critical to acceptability of on-plot systems, and positions these criteria within a framework for decision-making with regard to the selection of on-plot sanitation systems. How does this approach to sanitation selection differ to the existing decision-making systems already known? Four points help to address this question:

- This approach moves away from the ‘blueprint’ method of decision-making algorithms and accepts that sanitation selection in an urban low-income community cannot be prescribed in minute detail. The optimum outcome from this approach is the narrowing of decision-making. Final selection then depends on the negotiation of options between sector professionals and users;
- It places user perceptions centrally within the decision-making process;
- It recognises the need for other factors normally missing from selection systems, notably demand and sanitation promotion;
- The starting point is the assumption that neither the sector professional nor the user has complete information on which to make informed choices about sanitation options. Critically, the partial knowledge of implementers and users needs to be combined to ensure that sanitation selection is acceptable to users and sustainable over the long term.

As a system for addressing decision-making, this approach implies profound changes to the working practices of sector professionals. Most notably it places an emphasis on subjectivity and individual judgement, rather than adherence to prescribed standards and norms in design and practice. Additionally, it necessitates significant interaction with users of services. With some organisations involved in sanitation service provision,
these factors will pose significant challenges to personnel in terms of capacity and incentives to change working practice. For example, non-governmental organisations, many of which have a stronger tradition of, or willingness to accept, participatory working practices, may cope better with the adoption of this approach to sanitation selection. By contrast, it may be unrealistic to think that municipal level staff will adapt to these changed
circumstances, particularly as municipality working environments are bound by procedures indicating what staff should do and how it should be done.

5.5 Missing links: demand and sanitation promotion

Figure 15 and section 5.4.1 identify two key areas not normally considered in decision-making regarding sanitation options, notably demand for sanitation and sanitation promotion. Both are central to a comprehensive understanding of how sanitation systems are selected.

5.5.1 Demand for sanitation
5.5.1.1 Background

'Demand' is a commonly used term in the water and sanitation sector that conceals a complex background of meanings and issues. Literature on the topic points to a growing recognition that misjudgements by planners about consumer demand are important contributing factors to the poor performance of public water and sanitation systems in developing countries (Altaf and Hughes, 1994). More recently, there has been a shift in the thinking of many development agencies away from supply-led schemes to those that are demand responsive (Parry-Jones, 1999). To some extent, demand and demand responsive has become one of the favoured current development concepts. Although Garn (1998) concisely describes the main factors affecting demand, including socio-economic issues, option based issues and perception issues, there has been relatively few works which ask the question, what is demand? Parry-Jones (1999) attempts to illustrate the complexity of the nature of demand in the following table:

<table>
<thead>
<tr>
<th>Demand may be:</th>
<th>Demand is always:</th>
<th>Demand is not always:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Expressed</td>
<td>• Unique to each project</td>
<td>• Equivalent to choice</td>
</tr>
<tr>
<td>• Effective</td>
<td>• Dependent on existing</td>
<td>• Satisfied by the 'best' solutions</td>
</tr>
<tr>
<td>• Latent</td>
<td>alternatives</td>
<td>proposed by professionals</td>
</tr>
<tr>
<td>• Uninformed</td>
<td>• Dynamic (changes with time)</td>
<td>• The same as what people say they</td>
</tr>
<tr>
<td>• Unrealistic</td>
<td>• Different for water and</td>
<td>&quot;want&quot;</td>
</tr>
<tr>
<td>• Biased</td>
<td>sanitation</td>
<td>• Taken into account</td>
</tr>
<tr>
<td>• Created</td>
<td>• Dependent on willingness to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pay</td>
<td></td>
</tr>
</tbody>
</table>

V. Implications of findings 173
However well documented ‘demand’ has become, there remains little consensus on what the term means for different professionals working in the water and sanitation sector. For engineers, demand is related to quantitative issues about supply to a population; for economists it implies willingness to pay for different levels of service, while for social scientists it is related to human needs or rights which have to be addressed. This divergence of opinion partially explains why several demand assessment techniques are commonplace.

5.5.1.2 Sanitation services and demand
Whilst demand in relation to water supply benefits from a stronger tradition of academic study and endeavour, demand for sanitation services is more difficult to assess and is less well studied. The reason for this is that sanitation is a generally more complex issue, with components of both public and private ‘good’ which complicates the process of valuing sanitation in the same way as water. Additionally, sanitation cannot be measured in quantities in the same way that water can; it is essentially a ‘have or have not facility’.

In many circumstances there is little explicit demand for sanitation. In such cases, a primary task for project implementers is to actually create and stimulate demand, a point that has clear implications for sanitation promotion campaigns.

5.5.1.3 Mediating between users and professionals over options
There are two extremes to sanitation service provision – one approach is to focus entirely on supply led issues, whilst the other focuses on demand for services. Supply-led approaches emphasise the knowledge of experts or those professionals external to the community. This approach gives little credence to user needs, priorities or willingness to pay for services. There are well-documented examples of supply-led schemes that have failed because services provided are not what users want.

By contrast, demand based approaches focus on what people want, but are limited by what people know. Purely demand-led approaches may fail to appreciate wider environmental concerns over technology choice that may not be appreciated by community members. For example, the option being demanded may be unsustainable.
technically or financially. Furthermore, the approach denies the capacity of service
providers to respond to demand.

A third way is required between these two extremes. One approach is to establish a
process of mediation between users and professionals where demand is established, and
then informed. This two-stage process involves:

- **Establishing demand**: assessments need to be made to see whether community
  members want improved sanitation. Where people do not show through their actions
  or words that they want sanitation, it will be necessary to stimulate demand through
  sanitation promotion campaigns;

- **Informing demand**: demand may not be realistic once it has been established.
  Potential users may have an incomplete understanding of options open to them, costs
  of options and their benefits. Additionally, unrealistic expectations about who pays for
  the services desired will need to be addressed.

The thesis has not specifically examined demand for sanitation. It has however, focused
on householder's motivation for improved sanitation, which indirectly feeds into an
understanding of demand for on-plot sanitation. Chapter 4 (section 4.3.2) deals
specifically with analysis of user perceptions of benefits from household level sanitation.
The critical finding was the importance of socio-cultural factors such as comfort,
convenience and privacy over health factors when households decided to invest in
sanitation.

5.5.2 Sanitation promotion

5.5.2.1 Background

The development of a sustainable sanitation intervention involves several phases of
development, including surveying, demonstration, consolidation and mobilisation. This
section will focus particularly on the mobilisation phase, on issues relating to effective
communication of key messages during the development of a sanitation intervention.
5.5.2.2 Common aspects of effective sanitation promotion

During the mobilisation phase, promotional activities should be designed and implemented in order to stimulate demand for sanitation facilities, to convince householders that they need to improve their existing facilities, and to demonstrate clearly that they have the skills and means with which to upgrade.

Common elements in effective sanitation promotion initiatives are:

- **Identification of the key target groups to be reached:** For promotional campaigns to be effectively targeted and adapted, it is necessary to develop an understanding of which groups in a community can benefit most from improved sanitation. Women, for instance, have most to do with the operation and maintenance of sanitation, or feel the impact of the lack of sanitation most acutely (i.e., privacy);

- **Identification of the core messages to be communicated:** This needs to be at the heart of any promotional campaign, and should emphasise the interdisciplinary nature of sanitation, stressing not only technology related issues, but socio-cultural and hygiene concerns. Core messages would typically include a health and hygiene behaviour component, information on the technological options available and why the programme is of importance. The way in which core messages are communicated can affect the responsiveness of the community. Excreta disposal is a highly sensitive issue in many cultures, and one in which it is difficult to change behaviour. Communication strategies that are aware of these concerns and adapt to them will reduce the potential for confrontation from the community. Additionally, any communication strategy needs to have a mechanism by which it is possible to judge if core messages have been correctly understood by target groups;

- **Awareness of the prevailing socio-cultural framework:** This is critical to understanding why individuals decide to invest in sanitation and how they might respond to a sanitation programme. The results from this research indicate that the motivation to build facilities on-plot is largely socio-cultural (i.e., status, privacy, or comfort and convenience), rather than from notions of improved health. This does not negate the
need for health and hygiene promotion, but demonstrates the importance of designing a promotion campaign which taps into this socio-cultural framework;

- **Consideration of sanitation as a consumer good:** Sanitation facilities require marketing as with any other consumer product. The concept of ‘social marketing’ offers a comprehensive approach to integrating improvements in water supply and sanitation with the behaviour changes necessary to make these technologies effective in improving public health. In essence, the concept borrows heavily from commercial marketing techniques and applies them to social problems. In relation to sanitation, the social marketing approach implies several key concepts, including: consumer orientation; setting of objectives; the marketing mix (product, place, price and promotion); marketing of environmental influences and exchange theory.

- **Communication methods:** A mixture of techniques and methods which are adaptable, use existing channels of communication, using simple language and expressions, and which attracts the community’s attention are preferable. Findings from Mozambique indicate that those persons charged with communication (animators) were critical factors in the success or otherwise of sanitation promotion campaigns. Common examples of communication methods range from conventional public face-to-face meetings to more innovative campaigns incorporating traditional arts media;

This research has focused on several examples of promotional programmes, and three case studies, with selected comments drawn from semi-structured interviews are reproduced below, illustrating examples of differing approaches and some of the constraints experienced.

**Field insights: sanitation promotion programmes in three countries**

**Case study: Domestic Sanitation Programme, Kumasi, Ghana**

Under the Strategic Sanitation Plan for Kumasi, three pilot projects were established, one each covering public latrines in the central business district; simplified sewerage in a high density tenement area and domestic sanitation programme in three residential districts.
Sanitation committees

Committees were established in these districts to promote the programme and to stimulate demand and interest amongst the local population. The role of the committee was four fold: to explain to householders the disadvantages of poor sanitation and to relative benefits of constructing VIP latrines; to administer loan agreements with beneficiaries; to collect monthly loan repayments from householders and to provide feedback to the SSP project team on activities. The committee reserved 2 per cent of the revenue collected to cover their operational costs.

Committees were chosen by consensus and not by election. Membership was determined by several factors, most important of which was a willingness to serve the wider community, and being recognised as a respected community member.

Animation tools

A variety of graphical and audio-visual aids were employed, in addition to demonstration latrines and opening ceremonies for new latrines. Women in particular were used as catalysts for promotion:

"To facilitate hygiene education, a group composed of 20 very influential women in the area was formed in 1991. It is always difficult to get women involved, especially amongst the Muslims; but in showing films and having theatre performances, we had a good chance of attracting them".

Jemima Denis-Antwi, Head of Health Education Division (MoH), Kumasi, Ghana. (Saidi-Sharouze, M., 1994)

Constraints

In Kumasi, one of the main limitations with the use of sanitation committees was that members were frequently too preoccupied with other community based tasks to maintain the levels of commitment that were required for the committee. Additionally, committee member’s roles as financial mediators created tension within the community and complicated the tasks of the member in other community-based activities.

Case study: Programme promotion in Maputo, Mozambique

The National Low Cost Sanitation Programme in Mozambique is a peri-urban programme designed to improve the sanitary conditions of low income urban communities through the promotion of an unreinforced domed slab which covers either a lined or unlined pit.

Animators roles

The programme relies on the activities of sanitary educators, or ‘animators’ to promote the programme at the community level. Animators are typically drawn from the communities in that they work; are men and women with basic training in health and hygiene behaviour; conduct a variety of outreach activities. Jose
Naene, animator for Jorge Dimitrov district in Maputo explains the role of the animator:

“[To] identify the need of the family; the conditions of the family; bring ‘propaganda’ about the programme; explain how improved latrines work; explain the advantages of improved latrines, the price (that it is cheap); that with these latrines you avoid lots of accidents; that small children can use the latrine; and that the latrines help to avoid disease. The main point is to speak to people and try to convince them [about the improved latrine] and to convince them to dig a pit on their plot for rubbish, how to use water from the well, and to use only necessary fuel. …when the animators are organising meetings door to door, people ask us to come more often, people agree that the things that we talk about are important and the perception of the latrines is very positive in the community. It does not matter if a family is rich or poor, they all like the latrines. Sometimes perception can depend on the type of soil…there are cases where a householder should buy a complete latrine but only buys a slab and there are problems. People like the fact that they can upgrade their latrine when they have money”.

**Animation activities**

In addition to the presence of community based animators, the programme uses a variety of promotional ideas to communicate its messages. These include use of indigenous media (such as employing dance/drama troupes to visit a district) in conjunction with more traditional communication channels (lectures, activists at church and voluntary level, poster campaigns, and radio/television broadcasts). One innovative promotional idea was the distribution of T-shirts, caps and other promotional clothing to publicise the programme. Given the high demand that exists for affordable clothing in Mozambique, this method was an effective way of communicating the programmes’ central message (through slogans on the front and rear of the T-shirt).

**Constraints**

There appeared to be considerable variation in the initiative that individual animators took towards their tasks. It was clear that in some cases, animators had identified key methods by which further promotional activities could be fostered (for example, in some low income districts enterprising householders would ferment and sell locally produced beer, using their plot as a meeting place for the community. The animator in this district had identified this informal ‘bar’ as a key place in which to promote the improved latrine, allowing people to use and benefit from it at first hand.

**Case study: Strategic Sanitation Plan, Ouagadougou, Burkina Faso**

The SSP-O was designed to promote on-site sanitation in Ouagadougou by stimulating demand for upgraded sanitation facilities in two sectors of the city. The project relied on a mixture of animation and social marketing tools.
Workplan
A detailed schedule of activities was devised for the programme, broken into four phases, of which the most relevant in promotional terms were phases 1 and 2: 1 - Getting to know the area, 2 - Information campaign. Phase 1 consisted of activities designed to identify key target audiences, leaders and influential persons who would participate in and help advance the programme, whilst Phase 2 focused on presentation of key advocacy messages through public meetings, poster displays and demonstration models.

Animation tools
These relied heavily on a combination of modern communication channels and more indigenous forms of dissemination (ceremonies, district meetings). Radio and television broadcasts were used following survey work to identify when most householders listened to broadcast media, how many listen, and what style of promotional campaign proved most effective. Broadcasts were short in length, avoided a moralistic tone and were timed for peak listening hours.

More unconventional forms of promotion were also adopted. This included dancing troupes performing in dedicated public spaces or the compounds of traditional leaders, competitive football matches organised under the framework of a ‘Sanitation Cup’ and guided tours to households with latrines built under the programme. This last element proved particularly effective. About 100 tours were organised, allowing those who were interested in the programme, but hesitant, to see at first hand the technology being used. Explanations of the different stages of construction and practical information relating to cost, maintenance and performance could also be given by the host household. Direct interaction in this way had a powerful effect on the attitudes of potential beneficiaries, building trust and confidence in the technology, and acting as a strong stimulus for initiating construction. Following these visits, no visiting householder decided not to build their own household latrine.

5.5.2.3 Sustaining promotion
The above case studies highlight different approaches to promotion, with slightly different emphasis between each programme. A critical issue that emerged during key informant interviews was how to maintain enthusiasm for promotion after the initial campaign had run its course (see section 4.9, commentary on ‘key actors’). Potential responses to this problem include:

- Developing school sanitation programmes where children learn about environmental sanitation, new technologies, the benefits of improved sanitation, etc. Emmanual Bawa, WES Officer, UNICEF, Accra, Ghana explains his agency’s approach to sustaining promotional activities, “…we tried to focus on schools because our strategy is that you
can start this whole awareness campaign with schoolchildren, once they get used to using these facilities at least when they go back to their homes they will be able to say, ‘look we have this in school, why can’t we have it in the house?’.

- The private sector can be used to promote sanitation through the training of local artisans or members of the community to construct local latrines. These artisans can then market their skills in the community and have a financial incentive to widely promote the sanitation programme;
- Develop and introduce new ways of reinforcing core promotional messages. Updating promotional literature, or adapting indigenous media to topical issues will sustain interest in a given message;
- Sanitation promotion campaigns may act as a catalyst for wider community based social development programmes, where local community associations take a more prominent role in environmental activities linked to environmental sanitation;
- Measures such as opening local development offices serve as a focal point between participating groups in the community.

5.6 Summary

This chapter is of particular importance because it completes the logical sequence of arguments within the thesis. Implications for practice are developed from the data that has been analysed. In turn, these findings are compared to the original hypothesis and research questions for testing and validation. Furthermore, the significance of the chapter lies in indicating where and how this work relates to existing thinking and practice in the field, especially in relation to approaches to on-plot sanitation selection.

The following key points can be highlighted to provide a coherent overview to the chapter’s narrative.

- **Contrasts to received wisdom**: in the reassessment and testing of the original hypothesis and research questions, a common thread to emerge is how the thesis’ findings contrast and contradict with the ‘received wisdom’ of sector professionals. This
is most evident in the commentaries on plot size, satisfaction levels and absence of household latrines;

- **Guidance points for decision-makers:** both in relation to specific latrine types and crosscutting issues (socio-cultural, cost and institutional), the thesis' findings convey not absolute answers but a spectrum of factors and conditions that require consideration by sector professionals. In essence, the thesis takes a step back from blueprint approaches and advocates broader frameworks within which decision-making has to be made;

- **Decision narrowing:** the implication of the broader framework approach highlighted above is that decision-making can only be narrowed rather than concluded. This leaves scope for negotiation of options between the community and external sector professionals over appropriate choices of sanitation options. To facilitate this process, the thesis presents an array of user based criteria that need to be considered in addition to the existing sanitation selection filter of technical feasibility;

- **Implications of new approaches:** such a process shifts thinking away from mechanistic systems which lead to absolute answers, to situations in which decision-making needs to based more on subjective judgement, use of discretion in relation to the local context and negotiation between stakeholders. In turn, this has implications for the skills and capacity that agency personnel require to manage such a process. The implicit emphasis on participatory techniques, consultation with users and reduced reliance on regulation poses challenges to the working cultures of various organisational types.
## Chapter VI: Conclusions and recommendations

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Conclusions and recommendations

6.1 Chapter outline
This chapter concludes the thesis by reflecting on the salient points to arise from the study in relation to the process and outcomes (section 6.2). Recommendations that emerge from the study are disaggregated into two sub-sections; one aimed at practitioners and one based on requirements for further research (6.3).

6.2 Conclusions
This research has examined the appropriateness and acceptability of on-plot sanitation systems to users in low-income urban communities. In doing so, the thesis identified factors that affect sustainability of systems from a user's perspective, and developed guidance on technology selection for a range of sector stakeholders. The governing hypothesis of the thesis guided the research to investigate technical suitability and user acceptability. Key research questions focused on absence of latrines, levels of satisfaction, plot size, maintenance concerns and operational problems.

A comprehensive literature review facilitated the process of defining gaps in existing knowledge and practice with regard to lower cost urban sanitation systems. The review confirmed that existing knowledge was weakest in relation to sustainability and acceptability issues and that little evidence had been gathered on the relative performance of latrine systems in the urban context or user perspectives on that performance. This contrasted strongly with the existing, and documented, assumptions of sector professionals in relation to on-plot systems.

The findings from the analysis of data can be discussed at both general and specific levels. At its broadest level, the data provides an insight into user perceptions and acceptability of on-plot sanitation systems that contrasts markedly with sector professional's perspectives. This divergence is most notable in relation to the discourse on plot size, user satisfaction, and absence of latrines. The qualitative data in the form of householder case histories reinforces quantitative analysis findings, whilst exploration of
key informant interviews highlights the importance given to broad based sectoral concerns and responsibilities, such as agency roles, institutional conflicts, and repayment rates. Quantitative data findings are based on 1843 household questionnaire surveys in Ghana, India and Mozambique.

The following points are concluded from the fieldwork and analysis:

- The key reason for absence of on-plot latrines is a function of relative household poverty rather than available physical space;
- Motivations to invest in on-plot sanitation are primarily socio-cultural, not health factors;
- Users express strong satisfaction with the latrines they possess. A related point is the very low frequency of reported problems with latrines. Where problems are noted, ‘emptying’ and ‘smell’ have the strongest impact on satisfaction and sustained use of the latrine;
- Plot size is not perceived by users to be a determinant of technology choice, user satisfaction level or successful operation of latrines;
- Manual methods of emptying dominate across latrine types, though vacuum tankers are strongly related to septic tank and VIP latrines. Responsibility for emptying is typically that of the user;
- Where pit latrines had been emptied, the majority had been in use between 6-8 years. Refilling rates following emptying indicate 3-6 year intervals are commonplace;
- Odour and insect nuisance with latrines is not perceived as significant by users, although odour nuisance, where present, does impact on user satisfaction levels. Field tests to measure insect nuisance pointed to low absolute numbers;
- VIP latrines record high levels of odour and insect nuisance in comparison to other latrine types.

Implications from the findings were then applied to both the theoretical framework outlined in the thesis and to practical issues of concern to sector professionals. The thesis’ central hypothesis and key research questions were tested and the following conclusions reached:
• The main on-plot system types demonstrate both technical and socio-cultural acceptability. A series of indicators of acceptability have been developed from the thesis that validate this finding;

• Two key domains impact on user acceptability of urban on-plot systems, namely socio-economic/cultural and O&M domains.

The thesis’ implications for sector professionals with responsibility for service provision are highlighted in three points, as below:

• A shift away from rigid, mechanistic decision-making systems to an appreciation of the range of factors that impact on specific latrine type selection and crosscutting areas of concerns such as socio-cultural, cost and institutional issues;

• Decision-making can only be narrowed, not concluded by sector professionals. This implies the need for intermediation between users and professionals over sanitation selection;

• This approach implies significant changes to the working culture of some organisational types. NGO’s may adapt better to these conditions than government or state related structures because of their tradition and willingness to work in a participatory manner.

6.3 Recommendations

This section proposes two sets of recommendations: some arising from the study are applicable to practitioners, others imply the need for further research work. The discussion of findings in relation to the thesis’ key research questions (chapter 5, section 5.2) provided the main starting point for identifying recommendations arising from the study.

6.3.1 For practitioners

• Sampling user views and perceptions on technology options prior to planning projects must be integrated into the design of urban sanitation projects for low-income communities. This will help agencies develop a listing of critical user based criteria on the performance and potential of latrines in the urban context that can feed into
sanitation promotion campaigns and should enhance project sustainability. Engineers may not be ideally placed or sufficiently skilled to undertake this role, so multi-disciplinary inputs will be required;

- Implementing agencies need to re-consider their use of plot size as a key determinant of the potential operational viability of on-plot systems. This implies that planning norms and regulations in relation to plot size need to be applied more flexibly, and should recognise the practice of users at the local level;
- Project planners need to recognise wider institutional implications following the introduction of particular latrine types. Emptying procedures, costs and user responsibilities in relation to emptying must be communicated more effectively to users;
- User education in relation to the functioning of particular latrine types needs to be enhanced. The operation and maintenance of twin pit and VIP latrines requires the application of stronger support mechanisms both during the planning and post construction stages of projects;
- Decision-making systems as currently conceived tend to reinforce the primacy of technical issues. Project implementers need to adopt systems of decision narrowing that incorporate user based criteria of acceptability and allow for demand stimulation;
- Sanitation options need to be based on what can be realistically and feasibly delivered. Critically, this depends on what exists and the local institutional context. Practitioners need to be more realistic in what can be delivered locally;

6.3.2 For further research

Chapters 4 and 5 provide insights into potential areas of future research.

- Data analysis indicated that users did not perceive plot size to be a significant constraint to investment in on-plot sanitation, or the operation of installed systems. Further investigation into user perception, including ranking of perceptions in relation to key issues of concern will provide insights into relative household priorities;
- The excreta management process, including collection, transfer and disposal of latrine contents is poorly documented and understood. In particular, there is little evidence that points to final disposal of latrine contents following emptying. Research that examined the emptying procedures, livelihood needs and opportunities and the
morbidity status of emptiers would be valuable in determining strategies to support
and enhance these activities;

- The interfaces at which different stakeholders physically interact are critical to
engendering wider participation in service provision to low income urban communities.
Institutional arrangements and the working cultures of local government structures can
conspire against effective communication between stakeholders. Studies that identify
the constraints to establishing and maintaining these user-implementer forums will
provide valuable lessons for other programmes;

- The approach to sanitation selection advocated in this thesis implies negotiation of
decision-making between users and project implementers. In turn, this implies more
participatory ways of working. Research is needed to identify examples where and
how service providers have successfully adapted to these changed working conditions.
This will facilitate this process in similar agencies facing similar challenges.
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## Appendices

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## 1. Household survey proforma

**ON-PLOT SANITATION RESEARCH HOUSEHOLD SURVEY QUESTIONNAIRE**

<table>
<thead>
<tr>
<th>DISTRICT</th>
<th>STREET</th>
<th>HOUSE NUMBER</th>
<th>SOURCE(S) OF INCOME</th>
<th>NUMBER OF INCOME EARNERS</th>
<th>TENURE STATUS</th>
<th>REFERENCE NUMBER</th>
<th>DATE</th>
<th>SURVEYOR'S NAME</th>
<th>NUMBER OF PEOPLE ON-PLOT</th>
<th>NUMBER OF PEOPLE CURRENTLY WITH DIARRHOEA</th>
<th>NUMBER OF PEOPLE USING TOILET ON-PLOT</th>
<th>CONSUMER ITEMS</th>
<th>TELEVISION</th>
<th>RADIO</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ADULTS =</td>
<td>CHILDREN 1-10 YEARS =</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1. IS THERE A TOILET WITHIN THE HOUSEHOLD PLOT?

**NO - Ask question 2 ONLY**

**YES - Go to question 3**

### 2. WHY IS THERE NO HOUSEHOLD TOILET?

<table>
<thead>
<tr>
<th>LACK OF SPACE</th>
<th>TOO EXPENSIVE</th>
<th>DIFFICULT TO OPERATE &amp; MAINTAIN</th>
<th>USE PUBLIC LATRINES</th>
<th>PREFER OPEN DEFECATION</th>
<th>OTHER</th>
</tr>
</thead>
</table>

**IF OTHER, GIVE DETAILS:**

**ARE CURRENT ARRANGEMENTS SATISFACTORY?**

**NO**

**YES**

**IF NO, WHAT IS PREFERRED CHOICE OF TOILET?**

**WHY?**

### 3. INSPECT THE TOILET. WHICH OF THE FOLLOWING TYPES IS IT?

<table>
<thead>
<tr>
<th>BUCKET/P AN LATRINE</th>
<th>SIMPLE PIT LATRINE</th>
<th>VIP LATRINE</th>
<th>DOUBLE PIT LATRINE</th>
<th>WC TO SEWER</th>
<th>WC TO SEPTIC TANK</th>
<th>POUR FLUSH &amp; TWIN SOAKPIT</th>
<th>POUR FLUSH &amp; SINGLE SOAKPIT</th>
<th>OTHER</th>
</tr>
</thead>
</table>

**IF OTHER, GIVE DETAILS:**

**IF A PIT, GIVE APPROXIMATE DEPTH:**

**metres**

**DOES THE TOILET HAVE A LID TO COVER THE SQUAT HOLE?**

**YES**

**NO**

**IF YES, NOTE ITS CONDITION**

**NOT DAMAGED**

**PARTLY CHIPPED**

**BADLY BROKEN**
3.1 WHY DID YOU BUILD A TOILET ON YOUR PLOT?

<table>
<thead>
<tr>
<th>COMFORT &amp; CONVENIENCE</th>
<th>PRIVACY</th>
<th>HEALTH</th>
<th>NO / POOR PUBLIC FACILITIES</th>
<th>SPACE FOR TOILET AVAILABLE</th>
<th>GOVERNMENT SPONSORED</th>
<th>OTHER</th>
</tr>
</thead>
</table>

**IF OTHER, GIVE DETAILS:**

3.2 WHY DID YOU BUILD THE TOILET LIKE THIS?

<table>
<thead>
<tr>
<th>LOW COST</th>
<th>EASY TO CLEAN</th>
<th>COMFORT &amp; CONVENIENCE</th>
<th>SIMPLE TO USE/MAINTAIN</th>
<th>LACK WATER</th>
<th>NO CHOICE</th>
<th>OTHER</th>
</tr>
</thead>
</table>

**IF OTHER, GIVE DETAILS:**

3.3 WHAT PROBLEMS DO YOU HAVE WITH YOUR TOILET?

<table>
<thead>
<tr>
<th>SMELL</th>
<th>INSECTS</th>
<th>EMPTYING THE TOILET</th>
<th>CLEANING</th>
<th>EXPENSE</th>
<th>LACK WATER</th>
<th>BLOCKAGE</th>
<th>FREQUENT REPAIRS</th>
<th>OTHER</th>
<th>NONE</th>
</tr>
</thead>
</table>

**IF OTHER, GIVE DETAILS:**

3.4 WHO REPAIRS YOUR TOILET WHEN MAINTENANCE IS REQUIRED?

<table>
<thead>
<tr>
<th>USERS</th>
<th>MUNICIPALITY OR GOVERNMENT</th>
<th>OTHER AGENCY</th>
<th>CONTRACTOR</th>
<th>OTHER</th>
</tr>
</thead>
</table>

**IF OTHER, GIVE DETAILS:**

3.5 HOW CLEAN IS THE TOILET?

<table>
<thead>
<tr>
<th>VERY CLEAN</th>
<th>CLEAN</th>
<th>NOT CLEAN</th>
<th>VERY UNCLEAN</th>
</tr>
</thead>
</table>

3.6 WHEN WAS THE TOILET LAST CLEANED?

<table>
<thead>
<tr>
<th>TODAY</th>
<th>YESTERDAY</th>
<th>MORE THAN 2 DAYS AGO</th>
</tr>
</thead>
</table>

3.7 SKETCH A PLAN OF THE HOUSEHOLD PLOT INDICATING THE POSITION OF THE TOILET

- **ESTIMATE THE WIDTH OF THE PLOT** m
- **ESTIMATE THE LENGTH OF THE PLOT** m
- **INDICATE POSITION OF OTHER HOUSES, BUILDINGS, TREES AND GROUNDWATER SOURCES (IE., WELLS)**

3.8 WHAT WAS THE TOTAL COST OF YOUR TOILET?

<table>
<thead>
<tr>
<th>SUBSTRUCTURE</th>
<th>SUPERSTRUCTURE</th>
<th>NOT KNOWN</th>
</tr>
</thead>
</table>

3.9 HOW WAS THE TOILET PAID FOR?

<table>
<thead>
<tr>
<th>LOAN</th>
<th>SUBSIDY</th>
<th>LOAN AND SUBSIDY</th>
<th>OTHER</th>
</tr>
</thead>
</table>

**IF OTHER, GIVE DETAILS:**

3.10 IF A LOAN, ASK:

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<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOW MANY MONTHS OF THE LOAN ARE LEFT TO REPAY?</td>
<td>MONTHS = NOT KNOWN</td>
</tr>
<tr>
<td>WHAT ARE THE MONTHLY REPAYMENT COSTS FOR THE TOILET?</td>
<td></td>
</tr>
<tr>
<td>WHAT % OF MONTHLY HOUSEHOLD INCOME DOES THIS REPRESENT?</td>
<td>% =</td>
</tr>
<tr>
<td>HOW MUCH DO YOU SPEND ON LOOKING AFTER YOUR TOILET EACH MONTH?</td>
<td></td>
</tr>
<tr>
<td>EMPTYING PRACTICES</td>
<td></td>
</tr>
<tr>
<td>4. IN WHAT YEAR DID YOU FIRST START USING THE TOILET?</td>
<td>YEAR =</td>
</tr>
<tr>
<td>4.1 IF A PIT/TANK, HOW MANY TIMES HAS IT BEEN EMPTIED SINCE THAT YEAR?</td>
<td>NUMBER OF TIMESemptied = NOT KNOWN</td>
</tr>
<tr>
<td>4.2 IF A PAN/BUCKET, HOW OFTEN IS IT EMPTIED?</td>
<td>NUMBER OF TIMESemptied = EVERY DAYS</td>
</tr>
<tr>
<td>4.3 WHAT TYPE OF ANAL CLEANSING MATERIAL IS USED?</td>
<td>PAPER TOILET PAPER WATER SAND OTHER</td>
</tr>
<tr>
<td>IF OTHER, GIVE DETAILS:</td>
<td></td>
</tr>
<tr>
<td>4.4 WHAT HAPPENS TO IT AFTER DEFECTION?</td>
<td>PLACED IN BIN INSIDE SHELTER PLACED IN BIN OUTSIDE SHELTER DEPOSITED IN PIT FLUSHED OTHER</td>
</tr>
<tr>
<td>IF OTHER, GIVE DETAILS:</td>
<td></td>
</tr>
<tr>
<td>WHAT HAPPENS TO THE MATERIAL IF IT DOES NOT END UP IN THE PIT?</td>
<td></td>
</tr>
<tr>
<td>4.5 WHEN A PIT/TANK IS ON-LOT, HOW MUCH SLUDGE IS REMOVED?</td>
<td>QUARTER HALF THREE-QUARTERS ALL NOT YET FULL NOT KNOWN</td>
</tr>
<tr>
<td>4.6 HOW LONG DOES IT TAKE FOR THE PIT/TANK TO REQUIRE EMPTYING AGAIN?</td>
<td>NOT YET FULL AGAIN 1 YEARS 1 MONTHS 1 WEEKS</td>
</tr>
<tr>
<td>4.7 WHO IS RESPONSIBLE FOR EMPTYING THE PIT/TANK/TOILET?</td>
<td>USER PRIVATE CONTRACTOR MUNICIPALITY / GOVERNMENT OTHER</td>
</tr>
<tr>
<td>IF OTHER, GIVE DETAILS:</td>
<td></td>
</tr>
<tr>
<td>4.8 WHO PAYS FOR EMPTYING?</td>
<td>USER PRIVATE CONTRACTOR MUNICIPALITY / GOVERNMENT OTHER</td>
</tr>
</tbody>
</table>
4.9 How is the Pit/Tank/Toilet emptied?

<table>
<thead>
<tr>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manually by hand</td>
</tr>
<tr>
<td>Manually with machinery</td>
</tr>
<tr>
<td>Vacuum tanker</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

If other, give details:

4.10 What happens to the contents of the Pit/Tank/Toilet after emptying?

<table>
<thead>
<tr>
<th>Disposal Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not known</td>
</tr>
<tr>
<td>Buried on plot</td>
</tr>
<tr>
<td>Composted</td>
</tr>
<tr>
<td>Hygienic disposal off site</td>
</tr>
<tr>
<td>Dumped off site</td>
</tr>
<tr>
<td>Aquaculture</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

If other, give details:

4.11 What problems do you have with Pit/Tank emptying?

<table>
<thead>
<tr>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>High cost</td>
</tr>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Hygiene</td>
</tr>
<tr>
<td>Access to plot</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

If other, give details:

---

Insect and Odour Control

5. Inspect the Toilet Shelter and Record the Following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walls</td>
<td>Bricks</td>
</tr>
<tr>
<td></td>
<td>Blocks</td>
</tr>
<tr>
<td></td>
<td>Metal sheet</td>
</tr>
<tr>
<td></td>
<td>Mud</td>
</tr>
<tr>
<td></td>
<td>Matting</td>
</tr>
<tr>
<td>Roof</td>
<td>Bricks</td>
</tr>
<tr>
<td></td>
<td>Blocks</td>
</tr>
<tr>
<td></td>
<td>Metal sheet</td>
</tr>
<tr>
<td></td>
<td>Mud</td>
</tr>
<tr>
<td>Floor</td>
<td>Concrete</td>
</tr>
<tr>
<td></td>
<td>Metal sheets</td>
</tr>
<tr>
<td>Door</td>
<td>Opens inwards</td>
</tr>
<tr>
<td></td>
<td>Opens outwards</td>
</tr>
<tr>
<td></td>
<td>Self-closing</td>
</tr>
<tr>
<td></td>
<td>No door</td>
</tr>
</tbody>
</table>

5.1 Does the Toilet smell? How bad is this smell?

<table>
<thead>
<tr>
<th>Smell</th>
</tr>
</thead>
<tbody>
<tr>
<td>No smell</td>
</tr>
<tr>
<td>Slight smell</td>
</tr>
<tr>
<td>Strong smell</td>
</tr>
</tbody>
</table>

5.2 Do you find a problem with flies? How many?

<table>
<thead>
<tr>
<th>Number of Flies</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
<tr>
<td>Tens</td>
</tr>
<tr>
<td>Hundreds</td>
</tr>
<tr>
<td>Thousands</td>
</tr>
</tbody>
</table>

5.3 Does your Toilet have a Vent pipe?

If yes - go to question 5.4

5.4 Record the following about the vent pipe

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Plastic</td>
</tr>
<tr>
<td>Colour</td>
<td>White</td>
</tr>
<tr>
<td>Fly Screen</td>
<td>In place</td>
</tr>
<tr>
<td>Size</td>
<td>Inside diameter of pipe</td>
</tr>
</tbody>
</table>
### User Satisfaction

6. **How satisfied are you with your toilet?**

<table>
<thead>
<tr>
<th></th>
<th>Very Unsatisfied</th>
<th>Unsatisfied</th>
<th>Neither Satisfied Nor Unsatisfied</th>
<th>Satisfied</th>
<th>Very Satisfied</th>
</tr>
</thead>
</table>

*(Note: Question 6.1 relates to the problems identified in question 3.3)*

6.1 If you have a problem(s) with the toilet, what impact does it have to its use?

<table>
<thead>
<tr>
<th>Impact Level</th>
<th>No Impact</th>
<th>Light Impact - Use an Occasional Problem</th>
<th>Moderate Impact - Use a Frequent Problem</th>
<th>Strong Impact - Use a Constant Problem</th>
<th>Cannot Continue to Use Toilet</th>
</tr>
</thead>
</table>

6.2 What would help solve the main problems with your toilet?

<table>
<thead>
<tr>
<th>Assistance Needed</th>
<th>Lower Cost</th>
<th>Easier to Operate &amp; Maintain</th>
<th>Simpler Toilet Design</th>
<th>Not Require Regular Emptying</th>
<th>Other</th>
</tr>
</thead>
</table>

If Other, give details:

---

### Miscellaneous Information

If you wish to record any further information, indicate which question(s) the comments relate to:

Thank the householder(s) for their help in answering these questions.
2. Postal survey proforma

ON-PLOT SANITATION POSTAL QUESTIONNAIRE

NOTES

PLEASE TICK BOXES □ AND/OR ADD NUMBERS WHERE APPROPRIATE

The responses to this questionnaire should relate to your knowledge of on-plot sanitation in your area, be it for a town or city.

Wherever possible, accurate figures would be preferred - but if these are unavailable, please give best estimates.

I would like to identify and quantify problems where possible. An example of how you might complete one of the questions is given below:

EXAMPLE:

1.5 What are the most common types of problems with low-cost sanitation in urban areas with small formally developed plots?

Pit emptying □
Pit lining collapse □
Smells and insects □
Groundwater pollution □
Maintenance □
Other □

If other, please give details:
..................................................................................

I would be grateful if you could complete the answers as fully as possible.

The answers given in this questionnaire relate to the situation in:
..................................................................................

Estimated population
..................................................................................

EFFECT OF PLOT SIZE

1.1 What is the minimum household plot size in urban areas as stated in local planning regulations?

............................. Metres

□ No minimum specified
□ Not known

1.2 Estimate the average plot size for households in urban areas that are not formally planned?

............................. Metres

□ Not known

1.3 What are the most common types of low cost sanitation found in urban areas that are formally planned?

None □
Bucket/Pan □
Simple pit □
VIP latrine □
WC to sewer □
WC to septic tank □
Pour flush & soakpit □
Other □

If other, please give details:
..................................................................................

1.4 What are the most common types of low cost sanitation found in urban areas that are not formally planned?

None □
Bucket/Pan □
Simple pit □
VIP latrine □
WC to sewer □
WC to septic tank □
Pour flush & soakpit □
1.5 What are the most common types of problems with low cost sanitation in urban areas with small, formally developed plots?

- Pit emptying
- Pit lining collapse
- Smells and insects
- Groundwater pollution
- Maintenance
- Other

If other, please give details:

- Difficult to operate & maintain
- Poor reputation of existing sanitary technology
- Prefer open defecation
- Other

If other, please give details:

1.6 What are the most common types of problems with low cost sanitation in urban areas with small, informally developed plots?

- Pit emptying
- Pit lining collapse
- Smells and insects
- Groundwater pollution
- Maintenance
- Other

If other, please give details:

2.2 From your experience, the most common reasons why low income householders construct toilets is because of:

- Privacy
- Health and hygiene
- Comfort & convenience
- Low cost
- Other

If other, please give details:

2.3 Are you able to estimate the costs (capital and recurrent) for different low cost toilet types?

- Yes - Go to 2.4
- No - Go to Fly and Odour Control

2.4 For the following, estimate the capital and recurrent costs in local currency at 1996 prices:

<table>
<thead>
<tr>
<th>Toilet Type</th>
<th>Capital</th>
<th>Recurrent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucket/Pan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple pit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIP latrine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WC to sewer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WC to septic tank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PF &amp; soakpit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If other, please give details:

HOUSEHOLD LATRINES

2.1 From your experience, the most common reasons why low-income householders do not have a household toilet is:

- Not enough space on the plot
- Too costly
2.5 Where possible, please estimate the average annual income for a 'typical' low-income urban household

Average income (in local currency) ...............

FLY AND ODOUR CONTROL

WEDC wishes to investigate the incidence of fly and odour control in household toilets.

3.1 From your experience, what are the most common reasons for the failure of VIP vent pipes to operate correctly?

- Poor superstructure design
- Vent pipe below roof level
- Vent pipe blocked by trees
- Vent pipe not straight
- Fly screen broken / missing
- Door not facing prevailing wind
- Other

If other, please give details:

3.2 Are there toilets with tight fitting lids in your area

- Yes - Go to 3.3
- No - Go to Pit Emptying

3.3 From your experience, where toilets use tight fitting lids over squat holes / seats in unventilated latrines, they are effective in controlling odours and flies in:

- 0 % of toilets
- 1-25 % of toilets
- 26-50 % of toilets
- 51-75 % of toilets
- 76-100 % of toilets

3.4 The most common problem associated with tight fitting lids in unventilated latrines are:

- Lid become soiled quickly
- Lid not used
- Lid broken
- Lid thrown into pit
- Other

If other, please give details:

PIT EMPTYING

4.1 What is the most common method used for desludging pits and tanks?

- Manually with hand tools
- Manually without hand tools
- Vacuum tanker
- Other

If other, please give details:

4.2 From your experience, what is the most common method for disposing of sludge after pit/tank emptying?

- Buried within household plot
- Dumped away from the household plot
- Composted
- Disposal at treatment plant
- Aquaculture
- Other

If other, please give details:

4.3 From your experience, what are the most common problems experienced by householders with regard to pit/tank emptying?

- Emptying service is unreliable

Appendices 239
Emptying service is costly ☐
Other ☐

If other, please give details:
........................................................................................................
........................................................................................................

**OPERATION OF DOUBLE PIT LATRINES**

5. Are there households with double pit latrines in your area?
- Yes - Go to 5.1
- No - Go to the next section

5.1 What proportion of households use double pit latrines in low-income urban districts?
- 0% of households
- 1-25% of households
- 26-50% of households
- 51-75% of households
- 76-100% of households

5.2 Where double pit latrines are in use, the most common problems experienced are:
- Both pits in use at the same time ☐
- Construction related problems ☐
- Inadequate user education ☐
- Pits are not rested for specified 'safe' period ☐
- Other ☐

If other, please give details:
........................................................................................................
........................................................................................................

Please give details of any other organisations that are concerned with the provision or management of household latrines

**ORGANISATION**
........................................................................................................

**NAME OF INDIVIDUAL TO CONTACT**
........................................................................................................

POSTAL ADDRESS
........................................................................................................
........................................................................................................

THANK YOU FOR YOUR HELP

Please return to: DARREN SAYWELL, WEDC, LOUGHBOROUGH UNIVERSITY, LEICESTERSHIRE LE 11 3TU. UNITED KINGDOM.

YOUR NAME: ........................................................................................................

ORGANISATION: ........................................................................................................

POSTAL ADDRESS: ........................................................................................................
........................................................................................................

Appendices 240
3. Checklist of rules for designing good survey instruments (Bickman & Rog, 1988)

**Principle 1**
The strength of survey research is asking people about their first hand experiences: what they have done, their current situations, their feelings and perceptions. Yet surprisingly, a good bit of survey research is devoted to asking people questions to which most people do not have informed answers.

**Principle 1a**
Beware of asking about information that is only acquired second-hand

**Principle 1b**
Beware of hypothetical questions

**Principle 1c**
Beware of asking about perceptions of causality

**Principle 1d**
Beware of asking about solutions to complex problems

**Principle 2**
Questions should be asked one at a time

**Principle 2a**
Avoid asking two questions at once

**Principle 2b**
Avoid questions that impose unwarranted assumptions

**Principle 2c**
Beware of questions that include hidden contingencies
Principle 3
A survey question should be worded so that all respondents are answering the same question

Principle 3a
To the greatest extent possible, choose the words in questions so that all respondents understand their meaning and all respondents have the same sense of what the meaning is

Principle 3b
To the extent that words or terms must be used that have meanings that are likely not to be shared, provide definitions to all respondents

Principle 3c
The time period referred to by a question should be unambiguous

Principle 3d
If what is to be covered is too complex to be included in a single question, ask multiple questions

Principle 4
If a survey is to be interviewer administered, wording of the questions must constitute a complete and adequate script such that when the interviewer reads the question as worded, the respondent will be fully prepared to answer the question

Principle 4a
If definitions are to be given, give them before the question itself is asked

Principle 4b
A question should end with the question itself. If there are response alternatives, arrange the question so that they constitute the final part
Principle 5
All respondents should understand the kind of answer that constitutes an adequate answer to a question

Principle 5a
Avoid questions that begin with adverbs: how, when, where, why, to what extent. Such questions do not specify the terms of an adequate answer

Principle 5b
Specify the number of responses to be given to questions for which more than one answer is possible

Principle 5c
Survey instruments should be designed so that the tasks of reading questions, following instructions, and recording answers are as easy as possible for interviewers and respondents
4. **Semi-structured interview respondents**

Key informants are highlighted in **bold**

**Ghana**

1. **Mr Emmanuel Bawa, Watsan officer, UNICEF, Accra, Ghana**
   (Discussion of research)

2. **Mr Nicolas Pron, Urban officer, UNICEF, Accra, Ghana**
   (Discussion of research)

3. **Mr Harry Reynolds, World Vision International, Accra, Ghana**
   (Discussion of research)

4. **Mr Oduroi Donkor, ProNet, Accra, Ghana**
   (Discussion of research and agreement to collaborate)

5. **Mr William Abugre, ProNet, Accra, Ghana**
   (Discussion of research)

6. **Mr N A Armah, Chief Engineer, Wastes Management Department, Accra Metropolitan Assembly, Accra, Ghana**

7. **Mr Ansu-Tutu, Engineer, Waste Management Department, Accra Metropolitan Assembly, Accra, Ghana**

8. **Mr F N Arko, Executive Secretary/Programme Manager, CEDECOM, Cape Coast, Ghana**

9. **Mr Sey-Hazel, Technical Officer, CEDECOM, Cape Coast, Ghana**
   (Fieldwork assistance)

10. **Mr George de Graft-Johnson, Technical Officer, CEDECOM, Cape Coast, Ghana**
11. Mr Soloman Arhinful, Senior Environmental Health Officer, Cape Coast Metropolitan Assembly, Cape Coast, Ghana

12. Mr Eugene Larbi, Manager, Training Network Centre, University of Science and Technology, Kumasi, Ghana

13. Ms Jemima Dennis-Antwi, Head of Kumasi Health Education Unit, Ministry of Health, Kumasi, Ghana

14. Mr Lukman V Salifu, Deputy Director, Waste Management Department, Kumasi Metropolitan Authority, Kumasi, Ghana

15. Mr Charles Mensah, Community Development Officer, Kumasi Sanitation Project/Waste Management Department, Kumasi, Ghana

16. Mr John Addy, Technical Officer, Village Water Reservoirs, Tamale, Ghana

17. Mr Patrick Mwintuur, Project Manager, Village Water Reservoirs, Tamale, Ghana

18. Mr Steve Adongo, Environmental Health Technologist, Tamale Metropolitan Assembly, Tamale, Ghana

19. Mr Matthew Adombire, Acting Director, Ghana Water and Sewerage, Accra Ghana

20. Mr Dan Ayivie, Project Manager, Accra Sustainable Programme, Accra, Ghana

21. Mr Ben Doe, Project Manager, Accra Sustainable Programme, Accra Ghana

22. Tamale sanitary committee members, Tamale, Ghana
23. Mr Francis Awindaogo, Regional Co-ordinator, GWSC, Tamale, Ghana

Mozambique

24. Mr Paulo Oscar Monteiro, National Co-ordinator, Low Cost Sanitation Programme, Maputo, Mozambique

25. Mr Vincente Macambe, Low Cost Sanitation Programme, Maputo, Mozambique

26. Mr Luis Elias, National Co-ordinator of Water Affairs

27. Mr Carlos Noa Laisse, Technical Officer, Low Cost Sanitation Programme, Maputo, Mozambique

28. Dr Evaristo Florentina Baquete, Head of Environmental Department, Ministry of Health, Maputo, Mozambique

29. Ms Alice Santos Silva, Health Specialist, Low Cost Sanitation Programme, Maputo, Mozambique

30. Ms Maria Dos Anjos, Head of WSS Department, Ministry of Health, Maputo, Mozambique

31. Mr Jose Naene, Sanitation Animator, PNSBC, Maputo, Mozambique

32. Ms Helena Covane, Sanitation Animator, PNSBC, Maputo, Mozambique

India

31. Mr Satya Narayan Jha, Sulabh International (Bihar State Branch), Patna, India

32. Mr P Srinivasa Rao, Engineering Consultant, ODA, Hyderabad, India

Appendices 246
33. Mr M Radha Krishna Murthy, Additional Commissioner, Vijayawada Slum Improvement Project, Vijayawada, India

34. Mr K Ranjendra Prasad, Deputy Executive Engineer, Vijayawada SIP, Vijayawada, India

35. Mr Gangadhararao Meka, Assistant City Planner, Vijayawada SIP, Vijayawada, India
## Example of spreadsheet record of insect nuisance tests, Mozambique

<table>
<thead>
<tr>
<th>Insect nuisance record</th>
<th>House 1</th>
<th>House 2</th>
<th>House 3</th>
<th>House 4</th>
<th>House 5</th>
<th>House 6</th>
<th>House 7</th>
<th>House 8</th>
<th>House 9</th>
<th>House 10</th>
<th>House 11</th>
<th>House 12</th>
<th>House 13</th>
<th>House 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>7/11/96</td>
<td>7/11/96</td>
<td>7/11/96</td>
<td>7/11/96</td>
<td>7/11/96</td>
<td>7/12/96</td>
<td>7/12/96</td>
<td>7/12/96</td>
<td>7/12/96</td>
<td>7/15/96</td>
<td>7/15/96</td>
<td>7/15/96</td>
<td>7/15/96</td>
<td>7/15/96</td>
</tr>
<tr>
<td>City</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
<td>Maputo</td>
</tr>
<tr>
<td>Fieldwork survey reference number</td>
<td>1101</td>
<td>1102</td>
<td>1103</td>
<td>1104</td>
<td>1205</td>
<td>1206</td>
<td>1207</td>
<td>1208</td>
<td>1209</td>
<td>1510</td>
<td>1511</td>
<td>1512</td>
<td>1513</td>
<td>1514</td>
</tr>
<tr>
<td>Sample point location</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
<td>Lid/pit</td>
</tr>
<tr>
<td>Weather condition</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
<td>Sunshine</td>
</tr>
<tr>
<td>Test duration</td>
<td>02:45</td>
<td>02:50</td>
<td>02:50</td>
<td>02:55</td>
<td>02:55</td>
<td>02:58</td>
<td>02:52</td>
<td>02:52</td>
<td>02:40</td>
<td>02:32</td>
<td>02:26</td>
<td>02:25</td>
<td>02:19</td>
<td>02:15</td>
</tr>
<tr>
<td>Finish time</td>
<td>14:50</td>
<td>15:00</td>
<td>15:05</td>
<td>15:15</td>
<td>14:40</td>
<td>14:52</td>
<td>14:57</td>
<td>15:03</td>
<td>14:50</td>
<td>14:55</td>
<td>15:02</td>
<td>15:05</td>
<td>15:10</td>
<td></td>
</tr>
<tr>
<td>Insect numbers (in pit)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>M. Domestica</strong></td>
<td>2</td>
<td>0</td>
<td>20</td>
<td>10</td>
<td>80</td>
<td>25</td>
<td>120</td>
<td>0</td>
<td>35</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>20</td>
<td>0</td>
<td>50</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>30</td>
<td>13</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Mosquitoes</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total insect count</td>
<td>22</td>
<td>0</td>
<td>70</td>
<td>10</td>
<td>85</td>
<td>30</td>
<td>125</td>
<td>5</td>
<td>40</td>
<td>36</td>
<td>16</td>
<td>4</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Indication of odour in latrine (0-10)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
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Appendices
6 Notes used during orientation of survey enumerators

General points (for supervisor giving orientation)

- Orientation should be given to all field assistants on the same day. I would suggest that the session need not take more than 1-2 hours, which will include an overview of the purpose of the research and notes on specific parts of the questionnaire;

- Wherever possible, field assistants with experience of survey work and/or knowledge of the district should be engaged;

- If permission is needed from the head of the district (elder, chief, local authority representative) then these arrangements will need to be made prior to the survey commencing;

- The assistants should introduce themselves to the household representative and explain the purpose of their visit; the agency, which is supervising the work; the length of the visit; why the household has been selected; and what the questionnaire entails (brief).

- Ideally, the survey should begin shortly after the orientation to ensure that fieldworkers remember the issues raised in the orientation (I suggest within a few days);

- A mix of male and female field assistants is important. Some householders will feel uncomfortable discussing sanitation issues with male assistants only;

- Field assistants need to be aware that in order to conduct the survey correctly they will need to give adequate time to each household. The average amount of time for each household will of course depend on the individual case, but a guide will be gained from the experiences of the pilot survey. It must be stressed to field assistants that quality rather than quantity is the crucial factor, thus do not overload assistants with too many households to cover on any given day. If one household is taking an hour, then no more than 5 households should be set for each assistant on a given day.
The survey does request assistants to take measurements (of plot size and latrine structures). Where possible, this should be done with appropriate equipment. Where this equipment is not available, best estimates should be given.

A verification survey will be required once the main survey has been completed. This is a device designed to enable WEDC to assess the reliability of the survey. The verification survey should cover 5% of the main survey and will need to be conducted by different assistants to those who interviewed householders originally.

One of the key points during the orientation is to stress the importance of reliability in the research - therefore, a standardised and consistent approach to the questionnaire is a central aim for the field assistants.

**General points (purpose of research)**

- To provide decision-makers, health and development professionals and engineers employed by government and NGO's with information about on-plot sanitation in developing countries. This includes: Technical, social, financial and institutional factors which are necessary for effective on-plot sanitation in low-income urban areas in African and Asian countries.

- To develop an acceptable and appropriate methodology for the selection of on-plot sanitation technology in low-income urban areas in African and Asian countries.

- The output from this study will be used at the policy, planning and management level in order to select, provide and maintain sustainable on-plot sanitation systems.

- There are seven major research themes which, in brief, include: user satisfaction; effect of plot size; emptying of pit latrines; operation of double pits; insect and odour control; groundwater pollution; absence of household toilets
Specific points (relating to questionnaire)

- Assistants must ask the questions in the way they are phrased. Do not paraphrase. Allow householders to give their own answers, do not prompt. If householder appears unsure read out the list of possible options.

- Some questions are to be asked by the assistant to the householder; some rely on the assistants’ observations. All questions are to be asked by the assistant to the householder except for the following:

3 Inspect the toilet. What type is it?
3.5 How clean is the toilet?
3.7 Sketch a plan of the plot including toilet etc
5 Inspect the toilet shelter...
5.4 Record the following about the vent pipe (if appropriate)

Miscellaneous information

- The questionnaire provides guidance notes to answering questions in a certain order if a given answer is recorded. These are clearly explained.

- All sections of the questionnaire need to be completed. Every question has been designed and included for a reason, and assistants should therefore try to complete the questionnaire as fully as possible. If this is not possible, assistants should mark a question with ‘not known’ or ‘no answer given’.

- **Question 3.1** Why did you build a toilet on your plot? The option ‘other’ may include answers such as ‘built by landlord’, or ‘built with house’;

- **Question 3.2** Why did you build the toilet like this? If household representative cannot answer this question use ‘other’ and not known. If the landlord in on-plot, then ask this question of the landlord.
• **Question 3.5 How clean is the toilet?** This is a subjective question, but as a guide, ‘very clean’ would correspond with conditions where there were no faeces on the seat, slab or in the shelter; the toilet was clean or had been cleaned recently; the structure was swept; papers were in bin etc. It can be assumed that option of ‘clean’, ‘not clean’ and ‘very dirty’ correspond with conditions progressively distant for ‘very clean’.

• **Question 3.7 Sketch a plan of the plot etc.** A plan is a view of the plot as if you were looking down from above. A key should be given if abbreviations are used to describe houses, bathrooms, etc.

• **Questions 3–8 – 3.11 Costs etc.** Where possible, accurate figures are preferable. However, if no records are available, ask the household representative to give the best estimates available.

• The Miscellaneous Information section is for additional information that is relevant to any of the questions listed. Please make sure that further information is given a clear reference to a particular question.

Thank the household representative for the time they have taken to answer the questions.
Methodological note: Chi-square, Cramer’s V tests and data analysis

Chi-square
The Chi square test is used to verify whether two variables are independent of each other or not. The result of interest are the levels of significance associated with the Pearson chi-square. This value, which is the probability that our results were produced by random chance, can range from 0.00000 to 1.0000. The lower the significance value, the less likely that the results were produced by random chance.

Chi-square test is generally recommended for categorical data, where frequencies are measured instead of numbers. The procedure tests the fit or match between the theoretically expected and observed frequencies and it is often referred to as a goodness of fit test. The test checks whether the observed frequencies that occur in each category differ significantly from the frequencies you would expect under the null hypothesis.

The value is calculated by summing over all the cells the squared residuals divided by the expected frequencies:

$$\chi^2 = \sum_i \sum_j \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where O and E are observed and expected frequencies respectively.

The calculated chi-square is compared to the critical points of the theoretical chi square distribution to produce an estimate of how likely (or unlikely) this calculated value is if the two variables are in fact independent. If the two variables are independent, the probability that a random sample would result in a chi-square value of at least that magnitude is low. This probability is known as observed level of significance. If the probability is small enough (usually less than 0.05 or 0.01), the hypothesis that the two variables are independent (null hypothesis) is rejected.

The value of chi-square depends on the number of rows and columns in the table being examined. The degree of freedom can be viewed as the number of cells of a table that can be arbitrarily filled when the row and column totals (marginal) are fixed. Thus for a
table containing ‘r’ number of rows and ‘c’ number of columns; r x c table, the degree of freedom is (r-1) x (c-1).

**Cramer’s V**

Besides testing statistical significance, it is of interest to understand the strength of relationship. Measures of association are used to assess this relationship and typically vary between 0.00 and 1.00. The closer to 1.00, the stronger the relationship; the closer to 0.00, the weaker the relationship. Cramer’s V is one test to measure association.

Other than extreme values, there are no agreed on conventions for describing the strength of relationships. In most social science situations, measures of association less than .10 indicate weak and uninteresting relationships between the variables. Values between .10 and .30 would generally be regarded as moderate in strength and worth noting, whereas those over .30 would generally be regarded as interesting and evidence of a strong relationship between the variables.

**Data analysis software used**

The following descriptions of the software systems used during the data analysis stage of the thesis are taken from the manuals supplied with the software.

**SPSS**

Statistics Package for Social Scientists is a commonly used statistical analysis software package that facilitates data entry, coding, analysis and presentation. A range of parametric and non-parametric tests can be applied to data sets entered into SPSS.

**NUD.IST**

*Introduction*

NUD.IST stands for Non-numerical Unstructured Data Indexing Searching and Theorising. It is a computer package designed to aid users in handling non-numerical and unstructured data in qualitative analysis. NUD.IST does this by supporting processes of indexing, searching and theorising.

NUD.IST helps users to:

- manage, explore and search the text of documents;
- manage and explore ideas about the data;
- link ideas and construct theories about the data;
- test theories about the data, and
- generate reports including statistical summaries.

NUD.IST handles data such as:
- text, for example, reports or minutes, transcripts of unstructured conversational interviews, evidence transcripts, historical or literary documents, personnel records, field notes by an anthropologist, newspaper clippings and abstracts, and
- non-textual records, for example, musical scores, photographs, tape recordings, films, maps and plans.

Design Of NUD.IST

NUD.IST is designed to do much more than just cataloguing and finding documents and parts of documents, though it does this very well. It is also designed to assist in shaping understanding of the data, helping researchers to form and test theories.

NUD.IST is designed to embody that emerging understanding in the computer environment. It does this by the processes of 'system closure'. Results are fed back into the system rather than taking them out of the system. The user has control in re-organizing and re-shaping all aspects of the system.
DS  
* Can you describe what your position is within the project and what your responsibilities are?  

RP  
Within the project, my responsibilities are providing infrastructure for the relocation areas and then providing infrastructure for the improvement slums.

DS  
* Can you explain what exactly that means...?  

RP  
I have to provide roads, drains and then my area covers mainly open drainage, not underground and I have to work with the, simultaneously with the other organisations that is water supply, roads, so I am not doing the work, we all work as a unit, the final outcome will be the total infrastructure.

DS  
* So are you producing engineering designs for each of those elements?  

RP  
We go to the area the slum, and then we will take the plan and levels and then we design the roads and drains to suit the topography and then we construct it. The other thing is the actual process that is preparation of the estimates, and then calling for tenders. The calling for tenders and settling of tenders is done by the superintending office actually. The execution of the work, the preparation of bills goes to them.

DS  
With Srinivasa Rao, you had responsibility for the design, construction and implementation of pour flush latrines in Vijayawada as a whole..?  

RP  
Not in the slum programme. Actually when we were posted to the Municipal Corporation, allied to this project, we were posted to low cost sanitation scheme. At that time our target was to construct some 14,000 toilets roughly, and this figure includes 1,000 conversions, and 13,000 new constructions. We are posted to do that job in Vijayawada city and we posted in 1987 and worked on the same scheme until 1991 (March). In those three years, Mr Rao and myself have constructed almost 15,000 toilets in Vijayawada city. For that there is no distinction between a slum area, or high income group or middle income group. If a person is not having a toilet, if he applies we used to go and check the site and then we used to process their application and then construct them or ask them (householders) to construct by some mason.

DS  
So it was quite a distinct project from the SIP one..?
RP
Yes, it is a different project because we constructed the toilets not under this project (SIP), this project has come later (1987-90).

DS
*With regard to user satisfaction, what are your own experiences both in the project that you and Mr Rao worked on but also in the SIP project. For instance, has any work been done on what satisfaction people have with pour flush latrines and what problems you have noticed have been common to the operation of the latrines?*

RP
The problem is firstly, the motivation of the householders is not very satisfactory because they have to know why we are asking them to construct toilets, they have to know the health aspects. At the same time they have to know the operation and maintenance otherwise they cannot maintain the facility actually, because although it is very easy first of all we have to make them to know why we are providing for the two pits. Actually, when we constructed the toilet the thing that happened was that we were having 30-40 masons. By the time we joined here there were nearly about 20 mason doing the same work but the progress is very less because each mason is constructing some 3-5 toilets per month and then the progress is very less.

Mr Rao and I asked them to get some more mason and we conducted some classes for 1.5 hours or so regarding the technique why we need the two pits and how to construct them and after giving them training we have taken to the site and showed how it is to be used. Only to the masons involved in the work.

We asked them to explain in a similar way to the householders that were going to construct the toilets. In that way... when we have given this type of training they started digging up some more applications and the number of masons are also increased. Furthermore, the scheme progress is due to advances given to them. We used to see how many were under construction by a mason (say some 5 or 10 units) then we used to use some 50 per cent of the unit costs as an advance for them when they are in progress because they are very poor and they cannot put so much up for the amounts... and we need the progress actually.

That is what we were doing to improve the number of the toilets, I mean the construction of toilets, and then we have given them encouragement. At the same time, we have curtailed those fellows who were doing something mischievous with their advances or something mischievous with the householders.

We have taken the help of the sanitary inspectors; we talked to the health officers and we have given some applications to the sanitary inspectors and requested them to complete and then to motivate the householders for the construction of the toilet. I remember at certain times that the Commissioner also issued orders to fine the persons who are going for open defecation. With encouragement from those higher up we made it a successful project actually. But the only thing is that here the topography in Vijayawada is a bit different because we are having the hilly areas, we are having the plain areas, even in the plain areas we are having the Black Cotton soils and the sandy soils and we are coming across a quite different nature of soils and there is the water table also which varies from two metres to something like ten or twelve metres. There is a lot difference in the water table. At the same time we require the householders to do the necessary things actually. In one of the cases where we found the water table was just two metres in one area... because we used to know it when we were digging for the pits...the water will come continuously from the pits, at those time we asked the masons to seal the bottoms and then let it be used as some tank and the percolation will take place from the top place only, from the side of the pit rings.

It may not be acting as a leach pit, but the motive is just to provide a toilet for them, to provide a facility for the household but not whether we are providing a leachpit because the water table is more here, otherwise cannot use the toilet. We have taken such types of actions.

In some cases, where there are no spaces [on the plot] we have provided toilets in the bedrooms.

DS
*By subdividing the bedroom...?*
RP
Not by subdividing the bedroom. If they are having just two rooms then a small xxx and that xx may be useful for only one pit and then naturally the second pit will xxx the bedroom also. And they are working, no problem. But the case is, from the householder's point of view, they have to know the necessity of the toilet actually, they have to know why the government or outside organisation are pressing for having toilets and why we are asking them to put an end to the practice of open defecation. If they know the health aspects they realise and they may also ask for the toilets. If they are financially sound they will construct themselves, if they are not financially sound they will apply for the loan.

DS
*From the experience you have had with building so many latrines over the period, have you heard directly from your visits to the slums or from others about the performance of these latrines. You mentioned that Vijayawada suffers from a multitude of conditions, how have those conditions affected the performance of the latrines, and have you heard from householders who use them what they think of the latrines?*

RP
In one of the cases, what I heard was that although the water table was less (at a deeper level), the only problem was that it was very highly expansive soils (Black Cotton soil) and then the permeability is a bit less when compared to all other types of soils. At times, the thing that I heard was that the number of users was more. First of all they are having a feeling that this water will not go down, will not go outside of this soil. They started to use with less number people [to reduce the effect].

DS
*So to summarise, in households where there was a large number of people...*

RP
...they say that the pits will be filled very shortly and quickly and that is why they are using it less number of times.

DS
*What about the actual operation of the twin pit system. Do you have experiences of people not understanding what the second pit is for and incorrectly operating the y-junction?*

RP
This type of problem...when we have constructed we have not found anything. But the thing is when once we have constructed and gone out the householders some of them used to make their own arrangements.

There are cases, but the numbers may be few, where they have changed to a single pit and there are cases where they have joined both the pits with a pipe and then there are some cases where they have actually removed the other pit and have been using a single pit. But the only thing is that though they have been instructed on how to use them...the only thing is...because for the persons who are constructing...the self finance...they used to go for a single pit, there are very few who go for the two pits because the scavengers are also handling it and the householders are not getting any problem with a single pit and that is why they used to do this. But when there are masons himself, if he constructs a single pit then we used to...we never paid them and we asked them to prepare, to go for a second pit. In one case, I found one person providing eight well rings in a single pit, he put the cover slab on this well ring and he put the other cover slab on the ground and he told me that there are two pits. But when I asked him to...because actually while going for the payments we use to check each and every toilet and each and every cover slab and so we asked them to show the two pits. The condition is that they may cover with the soil to some six inches or so, we used to ask them not to cover with soil until the inspection has been done. In the case mentioned, I instructed him that he provide another four rings for the second pit. Actually he provided another four because there is no option for him but repayment. There are certain cases.

DS
*What about instances where both the pits are being used. You have talked about cases of conversion, but are there cases where both pits are being used at the same time?*

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RP
These things are not done in our presence, the only thing is that when we have left they used to call a mason and they used to alter the pits. The thing is it relates to the health problems that they don't bother because they are not handling it and at the same time the scavengers do not know that they are not supposed to handle it when it (the faeces) is green. What some of them say is that in low lying areas when the water table is more even when it is left for one year or so it cannot be dried. They say it is not ready it is that condition.

Even if is in a wet condition it will become soil because with time it will be integrated into the inert material and then it will not pose any problem. This type of knowledge the household does not have. It is a bit difficult to educate each and every household, it can be done only by a mass media, not by a skilled person, it requires mass media communications like papers or some TV so that many people will hear about it and many people will think about it. Because even in the slums you can see that 50 per cent of the people will be having TVs, or if they are not having them they will go to some other TV set and then they will see it and then the usual time to see it is between 7-9 because when they come from work they will take the bus and they will be seeing for one hour, say 8 to 10. At that time if someone sponsors someone's programme ... for one month, two months, three months, it may be possible to educate the public very easily. But it cannot be done for every household, it is a big problem, because if you want to speak ...[to householders] even in the LCS toilets we can speak for one hour, we can speak for days because the subject is xxx.

DP
How do you deal with the issue of groundwater pollution in Vijayawada?

RP
Groundwater pollution. Actually, here the problem is that the person who depends on the groundwater is very less here in Vijayawada because water supply...is in better conditions compared to the other Municipalities and a very few depend on the groundwater and even the groundwater.. from my observation.. the groundwater is actually used for the requirements in the non-supply side. Because we are supplying from 4-8 or 4-9 and in the evening from 3 to something because it will be in shifts. In the meanwhile if they want any water they go for handpumps. Otherwise there is very little demand for the groundwater. The other thing is that when the only source is groundwater for them what we used to do is locate the pits as far as possible from the groundwater supply, that is the handpump or tubewell or whatever. When we feel it will be affecting the water table and handpump when it is very close say some 5 metres or so we used to close the pits. Here for even the groundwater they definitely used to go some 40-ft or so, and our pits will be a something like 4 or 6ft depth. The tubewell is also passing through a number of impervious layers. It will break one impervious layer and then it will go to another impervious layer. It is not having that much affect, the pits. Even then we used to seal them when the distance is less than five metres and when it is not possible to go for the sealing [of pits] we used to tell them to go for septic tanks. That has also been advised, but for very few because when there is no source for them ...where we can find the water table one or two metres depth and when someone has the handpumps and the plot sizes are very less we ask them to go for septic tanks rather than leachpits. We have provided septic tanks with these two pits also. It is just like that [demonstrates] they used to fill with water and they used to seal the sides. They use the same well rings, they ask for the loan and then they told that instead of the pour flush they were going for the tank. It may cost them another Rs100-200 but they used to do it because they used to seal the bottom and drive some nails, put some mesh on the gaps of the two well rings and then they used to seal it with the cement mortar. Of course, it is for very few, like ten or so.

DS
The next section is really to do with some of the background of the SIP project. What was the main purpose?

RP
It is a difficult question because it relates to all departments. The SIP provides infrastructure mainly, roads, drains, street lighting, water supply, sanitation and ...

DS
With regard to low cost sanitation, what is the purpose..?
RP
It is just to provide a healthy atmosphere to the slum areas. The slum areas used to be untidy with katcha roads, roads without any pavements and so we provide the infrastructure so that the people can think that are living in the city area, not the slum area. We are also providing the health services, we are providing the banking loans and educational and services facilities. The only thing is that the slum dweller has to feel that he is no longer living in the slum but he is living in the city, and in some places you can find the slum dweller living in better conditions than in the city.

DS
*How does the project aim to measure whether it has been successful?*

RP
The toilets also come under urban infrastructure as implemented by the project. Then LCS unit also come under one aspect of infrastructure, to provide toilets to all the slum dwellers. There are always problems with persons who are paying rents because in the slums all people are not owners and the owners will be unwilling to provide a toilet for the house but the tenants want it...the person living there wants the toilet.

DS
*How is the project expecting to measure success?*

RP
We have some indicators, and there have been some evaluation studies. But for our project, we have not had any evaluation study...we have to do the evaluation ourselves.

DS
*The target groups are what for the SIP?*

RP
Target groups? In the slums there is no differentiation, we are providing for all, low income and middle income groups. We are providing the toilets to all slum dwellers whether the people belong to LIC or MIC.

DS
*What priority areas are there? Have some been given higher priority than others?*

RP
No, it is equal priority......in the first case, slow progress and in the second case, they may not be having the space because whatever the persons who are having the space...and nowadays the persons left may not be having such a space. This morning after you have seen one case who are not willing to construct a toilet even though they are financially sound, I always say there are a few who even we cannot motivate, even by our efforts. That is the reason for slow progress. But from the project's side all slums are given equal priority and we wish to construct for every person in the slum areas and we don't ask whether they belong to which income group. The progress is also less because of the case of these bathrooms, if we do not insist on the bathrooms the progress might have been very high as compared to the project's progress. But at the same time, water is an essential thing and otherwise some of them are using the toilets as bathrooms. But the way our administration is working is also a problem, they are supposed to pay another Rs 500 or so for the construction of the bathroom. If he wants to construct it himself he has to pay from his pocket, if he engages a mason, he has to pay direct to that mason. Apart from this when you go to the hilly areas, the conveyance problem will always be there - they have to get the materials to their house by engaging a manual labourer. That costs an extra Rs 400-500, in that way it will be Rs 1000 [for the bathroom] and some are willing some are not. That is a major problem and in some cases, when we construct the units we are not having the space for the pits. And we have to motivate them to put pits in the bedrooms and so on.

DS
*When you first start working in slums, what efforts are made to integrate with members of the community who may be able to motivate other householders into applying for low cost sanitation*
The problem was that when we constructed ten toilets for example the others [in the area] seem to get motivated to start construction and they apply for the toilet. Because the person who is living beside them is having a toilet [constructed] with government money, and this fellow is not having [one], it seems to be a bit... so they are interested in starting to apply for the toilet. That way it can be motivated, mainly by the masons. The masons, under our sanitary inspectors, could do a lot, they would go around the areas and get the obligations and they used to tell... While the latrine is under construction we used to go twice or so and we used to [inspect the quality of the work], in that way it has been maintained. Before sanctioning the unit there are cases where the sanitary inspectors themselves have written that there is no site permit for the construction of the toilet in certain areas.

In some programmes, elders within the communities are seen as very important in motivating others. Presumably there are no similar groups or individuals within communities who you felt able to interest in the project.

There are slums which give you that impression.

Have you found that there are cases where those people do get interested and do act as ‘key change agents’. Have you found that?

Actually, all will act simultaneously. If we ask them to complete construction by themselves, they don't construct many, many won't construct, maybe two or three cases only - if we ask them to construct by themselves it becomes very difficult - it will become very costly affair, they will engage a labourer and the other problem is that they have to go to a mason who can construct 5 or 10 units in that area. In such cases, the local leaders play a vital role in motivating the slum dwellers, the neighbours and so on. The masons are also used to motivating the community so that they can get a number of units of single pits. Their personal interest is that they wanted to construct single pits, because they would get the transportation costs.

Was the community consulted about the type of low cost sanitation that was introduced here?

The only aspect is that the community until now have been regarding the type of toilet for what they actually choose, the only thing is that the government is [promoting] this type of toilet and they are constructing this type of toilet, which is suitable for this type of area. Where it is not suitable we have to make a ... which can generally be done by the person in charge of the implementation.

So in the Indian context there tends to be a single technology that is being promoted and advocated and beyond that there is very little community consultation over the choice. Is that the case?

I wouldn't say that the community consultation is less, the only thing is that it has been approved by the indigenous people, this pour flush latrine. Here we are taking the recommendations of the [World Bank] TAG members, these pour flush latrines have come with the advice of the TAG members. But of course, you cannot apply these for each and every part of the country or for Vijayawada because it depends on the conditions. The person who is implementing the programme must have thorough knowledge, because once we are starting the work and sanctioning the procedure for the construction of the toilet itself will be.... at that time, except for the person who is implementing may make a few suggestions if the conditions are not suitable for having a pour flush latrine but generally... and in most cases, it is so. Regarding the community consultation, now I think administrators are developing this kind of policy early on and actually when we are going for these roads and drains we are having certain norms which we have agreed on.
The only thing is that we can make them participate in our programmes regarding the aspects of the designs and policies, it is a bit difficult but for example, since it is an individual toilet that we are asking the community for decisions, suppose I say that there is a water tap, say we have to provide one water tap for 25 persons; if everybody wants a tap for their house, we cannot continue to go on giving.

DS  
So there is a need to strike a balance between the amount of consultation that you can practically achieve?

RP  
The person who is implementing must be having surveys, and at the same time the community must participate and cooperate in it so that they will get their service.

DS  
You mentioned then the importance of enabling the community to participate, do you think there are certain things which have been done here which have been successful in allowing the community to participate?

RP  
You have seen from the construction of the toilets and the roads that it has been a successful project, but the only thing is regarding the estimated rates there will be some problems because are standard rates are lower and the tender rates are rather small and due to community we cannot give one satisfactorily.

DS  
You mentioned that there was only one implementing agency - is that literally the case?

RP  
Within the Municipality we are having the Town Planning [department], revenue (for tax collection), health section and engineering section. The person at the engineering section is implementing agency for the construction, but motivation and all is taken by the health section, engaging the health and sanitary inspectors for getting the motivation of the public and getting them to construct some toilets and to create some awareness or so. Both the health and engineering people work together until their obligations have been completed. After that it is the duty of the engineering people. After the construction is over, we have a loan scheme ... then comes the tax people, tax people collect the loan.

DS  
Do those departments cooperate effectively or are there conflicts?

RP  
No they cooperate because all [the departments] are working under one organisation.

DS  
But there can be internal conflicts..

RP  
But these types of problems are sorted out by the commissioner because he is the head of the organisation and he has to do it.

DS  
Have there been conflicts?

RP  
No, luckily we are not having any problems. In one way the success of the project depends on the cooperation of the sanitary inspectors for getting the applications and the Cupertino of the staff members and mainly the Cupertino of the masons and householders because with their Cupertino we will be successful otherwise it cannot become successful.
DS

Financing of the programme. What I haven’t heard much about are repayment rates...

RP
The repayments rates are that 50 per cent is loan, 50 per cent loan will be paid in 40 monthly instalments and in one of the cases the total unit cost for one of the conversions is Rs 1364, and 50 per cent loan comes to about Rs 682 with 40 monthly instalments with 6 per cent year interest.

DS

You have any figures on recovery rates...

RP
No. About 80 per cent is collected but when there is difficulty with the people paying house tax, then we have engaged our own tax inspectors for the collection of the loan. I think it (repayment) is at more than 70 per cent.

DS

So payment of loan is normally done through those people who collect house tax, but in some cases you employ your own staff.

RP
But this has been done after a period of about 2 years, it had been done directly after the construction of the toilet, if the collection of the repayment is also started immediately, it may have come (been better). There are some people who say they are not going to pay (after construction) any amount since the construction because the water is not flowing, some say they are not using the toilet. If in these cases, the collection had started immediately after construction, these problems may not have arisen. Then everybody knows that you have to repay the amount, and you keep going for 2/3 years. Otherwise they may think it is a free asset.

DS

What do you do if somebody consistently does not pay?

RP
We used to use force for making them pay.

DS

In some countries they would block the toilet up until somebody agrees to start repaying.

RP
We are having certain rules and regulations ...

DS

My last point is to try and encapsulate the factors that have lead to success and failure of the programme. From your own experience, what do you feel are the strengths in the way it has been designed, implemented and managed?

RP
The only thing is that it may be a local body, or government agency but they have to choose the appropriate solution for the problem because always the least cost solutions are not always the most appropriate solutions, not necessarily. Initially, the pour flush latrine we can go for them but it cannot be an appropriate solution. From the point of the engineers and planners they must be very careful in designing the infrastructure, what they are going to provide for the community, they have to ... they must have the knowledge of the various options so they can choose the best options, the required options. By implementation, everywhere one should maintain the quality, when we maintain the quality and we properly design the structure and then maintain the quality. It is not the same for you, the slum people will be taking much interest in us and they will be heading towards whatever we say and then they will get conflicts. If we fail in any case, it will be going into the other direction and they will always put the blame on us. What I would also suggest is that for every person working in this type of services, first of all they must have a service motto, they are doing some service for the public and they must work to the maximum best for the
salary what he has been paid, otherwise [the government will pay for the work and it will not be done], you must have the motive to do the work, to do the service to the people. At the same time, it is important to be having proper guidance otherwise it might lead to some problems. At the higher level, the person must have sufficient experience in this type of services, not only engineering services but in health, social economic development and so on. The person who is going to be the head of the institution must have the experience in all directions so that all sections can be put under one umbrella and then solve problems in all directions. By providing only engineering services, and there are no health services, there is no health education then it will only be partly completed whatever the development has been done, at the same time education is most important because they have to know how to use it and they [the beneficiaries] must know their responsibilities for maintaining their infrastructure.
DS  The first thing I would like you to explain to me is what role the planning department has with regard to the slum improvement project (SIP).

GM  Actually, the SIP will find some space and the pit also belongs to the government, then we are allowing them to construct latrines. Some of the slum dwellers have constructed latrines on their own long back. [Those] who do not have these facilities - now we are giving them under the low cost sanitation scheme. Here, space is not so much, in some of the areas they don't have the space even to construct a small latrine. This LCS approach requires two leach pits which requires a larger space. Somehow we are managing them to make available some space and constructing these latrines.

DS  Your primary role is in granting permissions...?

GM  No, we are not giving any permissions. It is a government project, no permission is being given. If they [slum dwellers] can find space, straight away they can go for construction. We are not giving any permission. But in other areas of the town if anybody wants to construct a latrine, they have to apply for permission; giving a drawing, location, size of latrine. Everything they have to do and submit to the Municipal Corporation along with the requisite license fees.

DS  Only in areas outside the slums...?

GM  Yes, outside the slums. [Pause] In fact for any type of construction, not only latrines. They have to approach the Municipal Corporation in order to obtain permission. But in some areas we are not insisting on this permission.

DS  And what is the reason...?

GM  The reason is that it is an aided project first of all, and they don't have space. If we do some calculations they are not able to construct even the small latrines and we are not able to support the target area. Even to construct latrines there are certain rules; legal space from sidewall and things like that. You see it is in such conditions that they [Municipality] cannot construct even very less number of latrines. So that is why we are not xxx at all, actually it is not the xx at all, we are simply allowing them to construct. Wherever possible they will find [space to do so]. You have to xx the area, otherwise these people will go outside wherever to defecate. Moreover, they are very poor people living in the slum areas.

DS  What you seem to be suggesting is that it's important to remove barriers for slum communities to build their own latrines. It is a way of enabling the process, the fact that you do not have any planning regulations in these areas.
GM
Even then if we don’t have any regulation or even if we are not insisting on the permission, the slum people will not come forward to construct unless we give them some financial aid. They don’t have money. Even if the permission is not required, even if they need not pay any license fee and all these things they are not able to construct their own because they don’t have money, they are very poor people. So because of the opportunity they are given under this LCS scheme, they are coming forward and we are activating them, we are educating them and making them construct these things in the project.

DS
*It seems that there is little planning regulation for people in slums. In what other ways does the planning department have an impact on the project? For instance, in slum areas are there specific minimum plot sizes specified by the department?*

GM
Actually, it is the people themselves who get into xxx areas, they have no planning laws, or nothing. Whatever space they have they will simply occupy and develop it by erecting [a temporary structure], in that case no one is observing any rules, but in the case when we relocate them from a congested area or objectionable area then we are planning the area with planning principals and other norms. Then we are specifying minimum plot size

DS
*And what are the minimum plot sizes...?*

GM
Actually, in 1960’s we have planned for a presumed area of 111m2, subsequently this reduced to 60m2 in 1980’s, and afterwards it is reduced to 41m2. Presently, the minimum plot size is 33m2 - so it varies from time to time because of land availability.

DS
*And in each of those cases, do the plot sizes assume the provision of a latrine.*

GM
Yes. Whatever the size of the plot there must be provision for a lavatory.

DS
*What is the basis for the specification of those plot sizes...?*

GM
Mainly because of the unavailability of land. You see land has to be purchased by the Municipality. Depending of the people we have to help and the land we have we will go for the change of site.

DS
*Were they [minimum plot sizes] developed at all in relation to the performance of latrines within specific plot sizes. In some countries minimum plot sizes are specified because there is a feeling that if they are on smaller plots there will be a great danger to groundwater pollution etc.*

GM
The groundwater table is very high - it is not suitable for leach pit latrines. The water table is very high, not only here but throughout the country and where groundwater is high you cannot go for leach pits. What of the size of the plot, it is immaterial, is it not? Plot size is more than that of groundwater table? Plot size will not solve the problem of high water tables.

DS
*No but if you have more plots because of smaller plot size you have greater pollution load on your groundwater supplies and that is why in the past certain plot sizes have been specified. I was wondering whether that was the case here, whether it was the primary cause for specification of minimum plot sizes.*

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GM
Actually, in our regulations it is given like this. Suppose a drinking water well is there, there must be some
distance to be maintained between the leach pit and the well so that the pollution will not travel. But
nowadays nobody is using wells, everything is piped water supply. Most of the areas are covered by piped
water supply - in a few places only wells are being used. In urban areas, most people are using piped
water supply.

DS
They are the main points I wish to raise - are there any other matters you wish to discuss?

GM
I tell you we have xxx slums in Vijayawada and some of these are located on road margins. The reason why
they have developed there is because on either side of the road the land was vacant. The sides were not
developed by the site owners. That is why these slums are a problem. Many of these slums have been
relocated, and in some of the slums where there are no objections from the site owners and it is not
developed we are taking up this development. Along with the Municipal authority we provide roads, street
lighting, drains and our intention is that it is a road. Even if these slum people are relocated somewhere this
road will serve a purpose for other people who actually enjoy these sites. So along with the civic
infrastructure provisions these people are xxx which involves finance, individual finance. These latrines are
xx only on a loan basis - part loan, part subsidy. Subsidy from government and subsidy from ODA. There
other part is through a loan, they have to pay. So suppose the amount is repaid there is no problem, even if
they construct the latrines on xxx suppose at any time the road is to be developed and these encroachments
are to be removed. Will the repayments still be made? Then what will happen to the latrines? As long as
they stay they will enjoy these latrines and they pay this loan. Suppose before the repayment is made they
have to be relocated somewhere. If they are relocated somewhere else the latrine can be of use to other
people. Who pay will for it?
DS Can you explain what the roles and responsibilities of the MoH are?

MA Primarily, regulatory and monitoring. With regard to sanitation, MoH inspect sanitary technologies and advise on the health impact of each to the population. Both urban/rural areas are covered - normal activities such as water quality monitoring, groundwater pollution monitoring etc are undertaken. Drafting and implementation of rules/regulations (for WS&S) in provincial branches (CHAEM). Typically, MoH staff visit provincial branches on an annual basis.

DS What role does the MoH undertake in low income urban areas (ie, with regard to regulation and monitoring)?

MA Not an MoH role, but DNA (Direccao Nacional de Aguas)

DS Can you explain why this is a DNA and not an MoH role?

MA [Pause - discussion in Portuguese with colleague]. MoH simply do not have the resources to undertake this role. They have only 1 laboratory in each province and the central labs in Maputo. Where there are resource persons available, they are overloaded with other priority programmes such as vaccinations etc. There is a political conflict between the two ministries (DNA - MoH). Although in theory the DNA has some resource persons working on the ground in the provinces who are responsible for collating health and hygiene statistics, and although these resource persons report back to their respective ministries there is little effective inter-ministry co-ordination (it was stressed that co-ordination was a significant problem for the success of the programme)

DS What health promotion activities are undertaken by MoH with regard to low cost sanitation?

MA The MoH does not possess the resources to undertake preventative rather than curative actions (especially a problem with regard to trained personnel). There is only promotion of water supply health issues, with no work on sanitation. There are plans to establish a health inspectorate with an interdisciplinary responsibility. The main mechanism for health promotion is through the health community centres and personnel in the provincial CHAEM's

DS What lessons have been learnt about participation of the community through the health promotion experiences that the MoH have?
MA
There is potential for fatigue to set in when there are a series of community meetings scheduled for water supply issues, sanitation issues, solid waste issues etc. This can reduce the effectiveness of the individual message being promoted. The community accepts the need for attention to health and hygiene messages but is unwilling to implement them given the cost implications involved. Community members fail to see the difference that heeding health promotion messages can make given that they and their children have reached adult life.

DS
*What are the strengths and weaknesses, in your eyes, of the PNSBC programme?*

MA
Animators only discuss sanitation issues (cross reference to tpeanim.doc however). That the programme needs to pursue different technological options.
DS Perhaps we could begin with your giving me a broad picture of the planning framework in which urban sanitation occurs in Ghana. What are the main factors and elements of the planning framework.

BD What we do here in planning is that the plot owners apply for a permit to develop their land and if it is a residential development we make provision for a toilet. It can either be...it is mostly the water closet type which they usually apply for, but in the older parts of Accra before formalised planning was done, people were not really using on-plot toilets, they had communal toilets in the older parts..they have these communal toilets where you go out from your house and some of those toilets were pour flush where you do your thing and it goes down to a collector. In the older parts of Accra, where we also have a lot of low income people, the toilets...either they are public ones or they are ones in the house which is normally the water closet. But in the early 1970's some parts of central Accra had what you called central sewage, so some people in these parts connected to the central sewage system so they used water closets which emptied into the central sewer which then goes into the sea. The other aspect of sanitation is grey water, grey water is mostly...there are two ways of disposing of it, one way is to just throw it about, the other one is that where there is a drain to throw the water from the kitchen, from bathing into the drain. So the drains take away the water. So in the low income areas, these are some of the ways in which these things are done. When the people come for the permit sometimes they include the water closet but for sometime we have found out that people in densely populated areas had difficulties in locating WC's.

In the past, one other mode of toilet was the bucket toilet, the pan latrine. Most people were having that one. Sometime during the early 1980's there was a programme by the authorities to phase out the pan latrines because it was thought that they were quite unhygienic. The mode of disposal where somebody had to carry to the disposal site was not also very good..so there was a programme to discontinue its use. In its place it was proposed that where there was space, people should have a KVIP in their houses, so that the KVIP would take the place of the pan latrine.

DS So that was a local by-law? Did it refer to all new developments?

BD Yes, not even new ones. The existing houses that had a pan latrine were requested, or asked to change them with the KVIP and where also there was the central sewer system they also requested to replace with the WC. But that wasn't very successful somehow even though originally some money was made available for conversion to KVIP. The people complained that the money was not enough so they were not able to convert all of them. So there are some people in some areas where they still have the pan latrine. So in brief that may be the planning framework.

DS What do you mean by space to have a KVIP? Is there a minimum plot size that is prescribed by planning law for the use of household toilets?

BD Yes, in the planning regulations, the space for toilets is supposed to be 3' x 6' as part of the house, but the KVIP requires more space because you need to have the whole...part of the outside of the building. So that
would be a restriction on some of the areas where they already had a ... on which it is just on that the building ... but you need a little bit more space before you can develop the KVIP.

**DS**
Would it be possible to say to what extent that restricted the use of KVIP?

**BD**
It is difficult to quantify because we have not really done anything to say that the toilet was not built because the space was not available. It is a bit difficult to say how much was because of the lack of space.

**DS**
Are those planning regulations still in force today?

**BD**
Like how much space should the toilet take? Yes.

**DS**
Does that apply to both formally and informally developed areas? Or does planning regulation only extend to formally developed areas?

**BD**
No it covers all kinds of categories, both formal and informal. But in the informal areas, or the high-density areas it is normal that some of them do not really go according to these regulations.

**DS**
Plot sizes is one of the elements that I can see would be affected by planning regulation, another I can see is in relation to groundwater pollution. What planning regulations exist there?

**BD**
On groundwater? We don’t have any clear cut policy on how much you can go [site groundwater resources away] from your toilet. We don’t have such a regulation to say that because of the groundwater position you can do this...we don’t have that.

[Comment from a colleague of Ben Doe present in the room:]

Because Town Planning doesn’t have it [the regulations] doesn’t mean that it doesn’t exist

The municipal authority as the unit is called Medical Office of Health Unit. They are responsible for taking on some aspects of sanitation in the city, and she says they have a law there, but planning does not have a law which says don’t put your latrine here because of water pollution.

**DS**
I am interested to see where responsibility lies for regulation...With regard to groundwater pollution, there are no planning regulations in force. Are there any other sanitary codes with say regard to open defecation or subletting of plots and the responsibility that landlords have for subletting?

**BD**
We have a planning regulation that stipulates that any residential development must have all the accompanying facilities such as bathhouses, like toilets and all those things. So if a tenant is living at a house he is deemed to have made provision for all these facilities. On open defecation; it is a very interesting issue - there is no law as such but it is classified under public nuisance so that if you are seen defecating outside you can be arrested and charged under public nuisance. But what is interesting is where some people are caught defecating in open fields, they were arrested and taken to court but the judge found them not guilty by claiming that if authorities had made provision for alternative defecating areas they would not have been defecating there. This caused a great deal of controversy because normally public toilets in the central area are meant for passing populations, populations which come to the town and then go back, but they are not really made for people who live in houses to come out of houses, that was the practice in the beginning but now that should no more be the case. But unfortunately, that judge did not charge the people under the Appendices

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nuisance law which he could have used anyway, but somehow he freed them and claimed that the city authorities had not made any provision for them to defecate so that is why...But they still arrest them and some judges prosecute and charge them.

DS
*I think that it really leads into another issue which is that you can have planning regulations, but how is it actually enforced in practice and I would like to have your opinions on that dilemma?*

BD
The structures that we have here is that the planning department makes provisions in the planning schemes and the plan intended to be enforced strictly by the municipal authority. There is a department of AMA which is called the Metro Works department and together with the MoH department they are supposed to enforce all the provisions both on buildings and on sanitation. The aspect of sanitation is also partly taken by the MoH department - they see that water is not polluted and that provisions are made for toilets and so on. They go around and check on these things and then the works department also checks on the building lines and so on. So we prepare the plots here as town planners and then we also, in fact, do some implementation by way of seeing that developments which come up for application conform to the layout of the schemes that we have. If you are in the field and you see a development which does not seem to conform, even though we cannot take direct action they can force the Metro Works department to move them. They have the responsibility, the legal responsibility to take direct action to effect conformity to the provisions of the plan.

DS
*And when you say to ‘effect conformity’, that basically is through a series of sanctions against those individuals who have broken whatever set of planning regulations. What would that normally involve? Would it be, for example, a lengthy court process or an on the spot fine?*

BD
It is normally a lengthy court process, we don’t unfortunately have on the spot fines. We have to take people to court, in other cases provision is made where the structure can be removed and in the case with sanitation there is a provision whereby someone can be taken to court for not making provision for that facility in the house.

DS
*The enforcement agencies; how regularly are they out in the community? How regularly do they actually seek to enforce planning regulations? Is it a continuous job?*

BD
It is supposed to be a continuous job, but it doesn’t happen that much in practice. For example, the Metro Works department have certain people they call building inspectors - they are supposed to go around almost every day to check on developments which are coming up, to ensure that they conform to the plans, and they have put up the structure. And also the MoH have also a wing which goes around - they call them sanitary inspectors and they go around to see if plots are conforming to sanitary provisions but even though they are supposed to be going around every day they normally are not because they don’t have the capacity to let them do that. For example, they don’t have vehicles, they don’t have motorcycles, they have to find their own means of transport so that affects their performance.

DS
*What do you think would help to improve the enforcement processes that are in place?*

BD
You need to take a look at the laws themselves and try to modify the laws and also the sanctions behind the laws should be looked at. Then also you need to resource the people who are supposed to go around to look at these things. Also we need to give them the [ability] to remove unauthorised structures and so on. Like if somebody puts up a controversial structure it could be demolished or forced to move it. The position of the law; now the law is a bit cumbersome in prosecuting offenders, so if we have to look at that also to see how we can get some of those [elements changed] in the prosecution of offenders, as in the case that I mentioned. We need more clearly defined laws so that the judge may have a clear [course of action].
Intervention from colleague (not picked up by tape recorder)

...well the thing is that [planning law] states that all developers must make provision for toilets in their homes and the ... are putting up some of these toilets because they realise that the majority of homes do not have toilets. But apart from the fact that they are providing it doesn't mean that they don't want to provide toilets in their homes. Even though they [landlords?] are obligated to provide toilets they normally don't.... as far as we know, what happens is that people are beginning to convert their old toilets, part of the building including the toilet to other uses, but there is a law which says people must make provision for it, but we are finding it difficult to implement that law by insisting that you can convert your toilet; if you want to have people in the house, let them have a sanitary facility in the house. It is not like the municipality, it is rather saying that we are providing you with public toilets so it does not matter if you don't have toilets in the house.

DS
I want to make it clear that I don't expect planning authorities to solve all of the problems, there has to be a partnership, there has to be co-operation; what I'm interested in because I don't know much about planning regulations is in what ways it impacts, or what the major issues are.

We talked about some of the issues which you think might well affect enforcement (you talked about modifying the law and sanctions and resourcing), of those issues which do you think would be the single most effective to implement which would make a difference to enforcement practices?

BD
Well it should be a combination. Because if you have a law, sanctions are not [respected]. People are afraid if there are sanctions - if I do this what happens? But the law has to be there, clearly stated and the sanctions clearly stated before if you do this there will be a sanction. And again the enforcement, you know, the law can state a sanction, but if the people enforcing it are resourced, they are able to get to where the problem is, then they cannot be able to go there, but because they are not able to go there and apprehend offenders which the law continues to punish, it won't be able to be effective. So it is a combination of a whole lot of factors, you can't really say that you are singling out one single factor.

DS
With the sanctions issues, with regard to sanitary facilities, in what ways do you think sanctions can be altered?

BD
The example that I gave, the judge dismissed the case because according to him there was a clear cut regulation on [what happens] if you defecate outside, in public - this is the penalty and then he mentioned where you should not defecate and then the various things that should be done. Then the judge - it is very clear to him that this is the offence and this is the punishment. But if that is not there, then the judge uses his own discretion as to what he should do, and in that particular instance he decided that they should not be punished. But if there was a clear regulation then that would have been [avoided]. And again, if the law on ... if you rent out the house without toilet facilities, if the tenant report you that you do not have toilet facilities in your house, and you are the landlord, then the law is clear as to what will happen to you - you will pay a penalty of this, you will go to jail for this. It is clearly stated, and the people who should enforce that law it will be clearly stated. If the tenant reports and you are taken to court, that should bring some changes. The law should be very clear on the offence and the punishment.

DS
Presumably, that implies that people have confidence in that system?

BD
Yes.

DS
I am interested to try and find out whether any of the planning regulations with regard to sanitary provision were formulated to reference to users or whether there is still an ongoing dialogue?
BD
In the past the issue of consultation wasn’t very high on the agenda of most planning and sanitation boards, the issue of participation, partnership has been coming up in the last 20 or so years. In those days, the model was based on the British system where a group of lawyers or qualified planners sat down and drafted these regulations, but these days before you do some of these things you have to sit down and talk to some of the users, you know, how they perceive the law and their contribution and so on. So in doing these laws now, we would be able to involve the user communities.

DS
Do you have any specific examples where community input has altered a particular sanitary regulation?

BD
I can’t think of any...

DS
What is the mechanism then by which users are consulted? How is that achieved?

Colleague intervention

...what happened was that ... thought that KVIP’s were appropriate, especially in low income areas where there was a problem, but later on from persistent complaints from community, then they realised that couldn’t run around the community. So it came out of a dialogue with the community who were managing through their local assembly man to have them changed. So it isn’t a government issue, but through the [representative]...

DS
So it implies an informal representation, or lobbying on a continual basis?

BD
Before the decision was taken there was also a seminar which was organised by the municipality to discuss the issues and that was one of studying what to do. But when some of these failed, and they failed because the KVIP complex works on the fact that they use one hole for some time, but where you have big populations the rate [of filling] was so fast that before you could come back, before you finished the first hole it was full because the population was so big. So those who used it would complain and when they looked at it they realised that because of the high populations the KVIP’s were not very [good], but where populations are low and it can have time to decompose in the first hole, then it was OK. But the consultation is normally through a seminar and workshops and now when we are preparing these schemes what we do is consult the people, take data, tell them why we want the data, their opinions and so on. And when we prepare the plans we are also required by law to display those plans for about two months and publish it and receive the comments from the community. So that is one way of getting the community to be involved in our planning process.

DS
What would you consider are the main challenges that planning faces with regard to household sanitation in urban areas? Can you identify factors that you think are the major issues that need to be addressed in the next few years?

BD
As I said earlier, the sanitation aspect of planning is undertaken by the planning department and the waste management department and then the MoH department which are all under the AMA. You see, in the ...development areas that I mentioned earlier on, people are more using WC’s but in the densely populated areas, what we can do is to educate the people on the fact that they needed to make provision for toilets in their homes - they should not depend on public toilets to service them from their houses so if we are able to bring in that education and bring in the laws to support it, provide resourcing for the people who are supposed to enforce those laws and regulations then we should be able to achieve a certain degree of success with on-plot toilet facilities.
...in the sense that we recommend, basically we recommend the WC, but in some of these areas we have a water problem, so even if they had the WC, management becomes a problem - so they may [put it down] but because of the experience of the AMA we couldn't do [this], but in most instances since we haven't been used to working with KVIPs and all the other systems, to recommend any, or selling the idea, has become quite difficult. People are not informed that there are alternatives to the systems that we work on, i.e., those that are more convenient for them and therefore they knew that instead of what we normally recommend...I believe that if these people knew of alternatives which could be efficient some of them would want to [put them] in.

DS
Is there any health promotion activity that is going on or technology promotion that is taking place? Presumably this isn't a role for the planning department?

BD
Well, the institutions which play the lead role...for example the KVIP was idea developed by a University, when they realised that the WC was a problem because people do not have water, those people in low income areas do not have water in their homes and buy water from outside, so if they buy water and service the WC's then they would have a problem, so they came up with this idea of non-water based solutions, one of which was the KVIP, so maybe we have to go back to them to look at other technology which can do without water which can be efficient. Or systems that use little water but which are efficient and which can also fit on the plot. Another way is like...the seminar that we had in 1994 some people came up with ideas on how people are doing it elsewhere, alternative technologies and so on, some Indians they have ways of not using much water - so maybe we should begin to look at these areas again to look at what technologies are there which use less or no water but which are efficient.

DS
You mentioned earlier that one of the technologies that was being promoted and which the AMA was looking to introduce. That was the case ... is it still so?

BD
So far the WC is very common in toilet programmes. The other one is the KVIP.

DS
In planning law, when reference is made to household toilets is it implied by that it means WC?

BD
Yes, I think so.

DS
Are there any other points that you would like to raise?

BD
The other issue is about the size... in the low income areas, the size of the plots and the developed portion...and the way that they live...the KVIP, as I mentioned, is dependent on the population that is using it. So if in a house, the population is not big enough, then to me, I think the KVIP can be used because to take the odour out into the space, if it is downwind, then you don't have any odour. Because the thing we the WC is that it is expensive since you need to have a cesspit emptier and the space itself is not big enough for the house. It looks like until we get a new technology that would replace the WC and KVIP we may still have to do with the KVIP in homes that do not have big populations.

DS
The problem with KVIP's is that they are an avowedly low cost option they are still relative expensive for low-income communities.

BD
Yes they are, they are. That's why when we started it [the programme] they put in place some money that they can give to the people so that they can afford it. But somehow that money got finished ... but if you talk to the VIP, they were handling it so they would be able to tell you exactly why it did not succeed.
EB

So, like I was saying, when you look at the present institutional arrangements it's a little bit confusing and everybody has to depend on the planning. Maybe when you come to the basis of that we all agree on one principle that we should be encouraged to have those facilities in their households in terms of latrines, for example. But the methodology for that, I think is quite hazy for the moment - whereas we are promoting institutions where we can build capacities at the local level [at least when we are looking at the institutions, looking at the rural and urban situation]. In the rural areas, we are insisting that the we should have household latrines. We have gone to the extent of hiring a consultant to do a study for us - a study on how to implement a revolving fund for latrine construction, now we want to put in money such that people can really have access to credit for their own latrines and actually these are also meant for small towns.

At the same time that we are putting in this mechanism, we are training people to do it, and the idea is that trained people will have some kind of business. Once you have access to the credit you can then go and contract somebody - you know that is the relationship between you and the person who is trained to do that kind of work and you negotiate and then he does it for you. Of course, there will be some kind of [...] at the community level, but there is another school of thought that is saying no, we have money, we have the contract money, so we will give you a contract - OK - go and do so many latrines and we pay you. So you may come to my house to construct the latrine or facility when I am actually not prepared for it and how to let the people be responsible for it [responsible for the facility] I think is a big problem because the software bit of it has to go into this whole project. So we have this two schools of thought and especially when it comes to water supply that is more difficult for us now. But what we are doing now is to do a lot of training of local artisans, and what we are doing is taking people from each community and train them, such that they will at least be present within the community to ensure that the thing is properly functioning. And again there are people who are saying no don't be that way, just say how many wells do you want to construct here - you want to construct 10 wells? OK, I hire you, I give you so much, these are the specifications, go ahead and do it. And then what they are saying is that after that then you can start thinking about the whole process of integrating the community into the programme. That is one way, but we are saying no we can start right from the onset, getting them involved in the whole process, letting them make their own decisions on what they want, what they can afford, and you know, building up the capacity within the community for these things to be able to be implemented. So that is what is happening now.

When it comes to the urban areas like Accra where we are involved in Jamestown [we have an urban programme] and we have chosen Jamestown for now. [Pause] - I think there are about two suburbs - the second one we haven't really gone into it, but Jamestown is where we are concentrating now. As for now in terms of facilities, when talking about facilities I'm really referring to household latrines, we tried to focus first on schools because our strategy is that you can start this whole awareness campaign with schoolchildren, once they get used to using these facilities at least when they go back to their homes they will be able to say look we have this in the school, why can't we have it in the house? So we are focusing on schools for now, but again we have a problem because these are schools within the city and we don't think that you can provide this type of KVIP - it really has to go with water, water supply. There we have got into some kind of trouble because when it comes to water supply for the schools somebody must pay, and there is confusion over who should pay for water supply in the city, or for the schools. Whether it is the Ghana Education Service or the City Council - now certainly the GES is not in a position to pay for the water supply. The Council is saying yes and no at times - so there is no definite answer from them and that is where we have a problem now. I give you one example - you go to Jamestown now and get near the lighthouse, there are a series of schools there and we have actually targeted them for these latrines and I was suggesting that we could have septic tanks in there because they are all enclosed - there is no point in
having these alternating pits within the city. So we looked at it and said look, we can provide the latrines, but we at least want to ensure that there is water, and that is where we got into this trouble. But in fact the water supply to all these schools has been disconnected because they haven’t paid their tariff. But interestingly enough, if you go across the road there is a private nursery and because it is a private institution and the guy gets money there is water flowing and the pressure is good - but just across the road there is no water. So there is water for the kids to use, there is water for washing the kids and taking care of them and so that is the kind of problem we have where you see a private person having the facilities because he can pay it and then an institution is not being able to have the facilities because of the bureaucracy which is inherent in the whole set up. So this is the kind of dilemma that we have now. But what we are for sure going to do is implement this programme (refers to credit programme study) which is quite comprehensive by itself but you will find that a lot of questions that you are asking have been asked in this questionnaire here. And again, there is slight hitch with this because this is actually trying to promote household latrines and we are prepared to put in that seed money, so that people have access to credit, but again there is a problem - the problem is how do you do it? We are not prepared presently to put money into the district assemblies for them to run the programme for us. We know that if we do that there will be a problem - the money will just vanish in no time, and we are saying get at least a banking system running within the district and a bank at that least will help in recovering some of the costs and you can relate the bank with the district assembly and the two of them work together to find a way of recovering the cost. But what we are also saying is that at least in terms of the interest it should be such that the district assembly will absorb that interest; this is a way to motivate people to take the credit without paying any interest. The argument is that if you look at the amount - and the interest is small - that they will be paying it is so small as compared to what they would have been paying as a district assembly in terms of sanitation provision. So, there is this problem going on and they are now presently struggling with putting it into place what they call - I don't want to call it a co-operative bank - but ...

DS
A savings and credit bank?..

EB
No - it's a community bank of some kind. But fortunately for us also, there is an NGO, the Presbyterian Agric. Project that is there. That is in a way providing credit to the farmers but they have their own mechanism and because they are some kind of religious body they can stick to the rules. It's based on trust - but when these things come you can never be sure, and that is why we are insisting that there should be a banking system. But gradually we have started moving into urban areas and cities again it is our thinking that one of the constraints to having adequate sanitation is the lack of capital that people have and the way to address it is to provide that capital in a way that is just like you are doing for small towns.

Out of this survey (reference to consultant's report) it was very clear that people wanted some kind of household latrine, but I think that the question which keeps cropping up is how do I get it? I don't have the money, is there a way I can pay. We are saying we will give this money, but we are asking that they pay over two years, which is good enough. From the survey that this consultant did, in fact two years is just the right timing for them.

DS
Can you explain what the mechanism is for that?

EB
Our contribution is just seed money that we will put in to the bank. Now it is going to be a revolving fund, like I said and the only snag about it is the interest and what we are saying is that as long as people pay back - if they decide to pay so much every month, or every quarter, that will be paid back to the bank but in terms of the interest the district assembly will absorb that, so that the beneficiary will not have to pay the interest but just the initial sum from the bank and that's it - paid over two years. But there will be a mechanism that will ensure that there is regular payment and also in terms of the construction it is done according to specifications that have been given. There will be a technical unit which will supervise all construction.

DS
And the technical option that you are looking at, can you clarify that?
EB
There are two things, but there are three options. In certain areas, especially rural areas and small towns
we are looking at these alternating systems (VIPs) whether they are Mozambique slabs or Sanplats or
whatever as long as they are good enough and operate nicely - and we think that is the cheapest option to
go in for. When we start moving into the urban areas then it becomes more complex because now the cities
are being planned and they have to go by certain standards so we shall start thinking about the WC. Now
when you start talking about WC you start talking about water - water supply - and again if you go to
Jamestown there is not much area for you to have a septic tank unless you do if for a group of houses to
have one septic tank it is just impossible, it is really crammed up. But fortunately, and this is what we want
to do in Jamestown, there is a sewer that is running through which is not yet completed and that is because
people have not paid - but if you can pay you will be connected to the sewer and that again we are
prepared to put in the seed money so that people have access to the credit to be connected. The last time
we talked about it with the City Council and NGOs that we want to work with it, it was about 10,000 cedis
(at that time) - about US$2 - connection fee and now I guess that it will have gone up. That is what we want
to do, but again the sewer is also under one the World Bank rehabilitation programmes and that will be
expanded beyond Jamestown - but if you are in Jamestown you will see the sewer lines running - you will
see various appurtenances there. But no households are as yet connected, so that for those areas that have
at least the sewers we want to connect them and we will pay the front money to people to have access, at
least to be connected. So that is the other option. Now where there is no sewer and we are in the city we
have a big problem and that is in terms of It is not possible to have on-plot sanitation because if you have
time and you can walk into Jamestown you will see that is crammed, really crammed up and there is just no
space - you even have people sleeping on the streets - and there again the other option is to have a
communal latrine with WC's and you pay and use it for a certain group of houses depending on what area
that we have. There is one experiment going on now which is very successful where we have a private
person has actually been encouraged to establish this latrine - you can either do it for a WC or for a pit
latrine. So he has the two forms - you have the WC in a row like that [gestures] and the pit latrines. One
you pay 20 cedis for the pit latrine, and I think it is about 30 cedis for the WC. So you can have that option.
So that is at least for the cities that is what we are thinking about. But it is really a problem now, in terms of
on-plot sanitation, the space. It is a big constraint and it is a question of political will - if a City Council and
the government can, like it has been done previously, where they had to decongest a particular area and
move them out and there is quite a lot of land about and people have been settled elsewhere like in Medina
where people were moved from one part of Accra to another. It is only if you have that political will then you
can decongest Jamestown quite easily and get the place put into shape.

DS
Do you think that on-plot sanitation is feasible in any other districts in Accra - you mentioned that in
Jamestown the plot sizes are just not big enough - but are there other areas where it would be
applicable?

EB
Medina - yes for now because again its a yes and no answer [coughs] because those new areas that are
being ... if you go to those areas slightly beyond Medina it is feasible because that area has been well
planned and areas have well demarcated so that you must necessarily have some kind of WC in there.
Those who moved into Medina in the early days just had small, small areas for them so again there is a
question or a problem of space at least for those initial settlers but those who are now settling .. and I have
to stress that the area was not planned - they said you go there, this is for you - and what the people did
was just to look at the average area that they each occupied where they were previously and kind of marked
out the same areas for them so that is a major constraint, but that is a small section of Medina. But for the
new developments which are coming up, yes that [on plot sanitation] is possible.

DS
Do you have anything else to add about the political context in which urban sanitation occurs - can
you expound on that?

EB
If it comes to planning in the cities, it requires a lot of political will. It requires the City Council to say, this
whole area is meant for this, let's say a park or a children's playground, and if you go to a place like [...] another suburb where roads have been planned, and you see that the roads look very beautiful on paper
but you go there and people have encroached on these areas and nobody - I don't know why - can really touch anybody for encroaching on certain land which has been earmarked for certain things. When you really investigate you come to find out that the one who has encroached is some relation of the City Mayor. There is a good case where a pipeline was being constructed but because it was going to go through somebody's house it had to be stopped. That person was somebody who was high up. I must be honest this is a country where our politics is very fragile, I mean especially in our situation where illiteracy is very high you have to choose an opposition which appeals to those who are illiterate to get their votes. When you want to do something there is also the question of people not understanding exactly what you are about, what is the plan, what is the city plan, what is all about, they do not see any visible benefits and so it will take some kind of education to really get over to at least appreciate what the plan is and why people have to go by plans. I think it all revolves around the political set up because it has to go through politics and at least the commitment to really go out and enforce the plan - to have built roads, to have built on areas that have been earmarked for certain things and people have built houses which are not up to standard within the metropolitan area and they have not said anything about it. At least for Ghana now since 1957 and Independence Jamestown for example should have had a new look, completely, but because of the politics it has always been ignored. At least in the first Republic when the government of that time really meant to develop that place - if you see the blueprints you would just marvel at why it has not been done.

DS

What do you think can be done to enable people to do with the problems that you have just raised?

EB

In terms of sanctioning, it is like I said, it is a commitment. For example, you take the case of the City Council they should have the powers, and they do have the powers, there are bylaws to demolish. There are bylaws, it is just that nobody is enforcing them, but the City Council or the urban council, whatever the case may be, has the right to really punish anybody. But it is that commitment to do it which is not there and it is not there because they are looking at the political climate and say look if we go now and demolish all the houses in Jamestown and say look we are going to put up a new modern buildings for rent etc., they will look at it and say look if we do that they will say this is a whole large area, what are the implications, we will lose our popularity. Given the fact that these are people who do not understand what your plans are, do not understand what your intentions are, and probably have not even seen, and again we have the problem of not being able to reach out to the people and explain certain policies and plans and even have a discussion with them, at least let them be part of the whole process of planning. I think that accounts for the inability of people to really comprehend what is happening, and they think that anybody coming to demolish or do something just trying to be very rough with them. It takes the whole process of education, political commitment and also at least some financial motivations to get these things done. You can motivate people financially, government can say it is setting up an amount of money for certain standard houses for an average household located somewhere - you just don't have to get them to move as they did in Medina and create another slum there - but if at that time they were asking them to move they had put up reasonable houses for an average household with all the facilities then I think people would have been more than willing to move. But even if such a scheme comes about, people would say they did it perfectly, they are going to do it again, at least it will be an improvement over what we have at present, and I think they would be more than willing to move or even make changes, if that is there. But for now, politics has to do with financial [...] and once you are able to do that you can get over it and say we can do it. It has happened under the Habitat programme, where they built houses and people moved into those houses, and they are comfortable.

At least what they have done is a lot of education and realised that those houses are at least an improvement over what they used to live in and they are comfortable, they have their toilets there so there is no problem

DS

But to try and tie up our discussion, is I'm interested in what you perceive are some of the major challenges for urban sanitation [and I know you have mentioned some of them] but if you could try to distil them, that would be interesting for me. Point 2 is do you think there should be anything else that I haven't mentioned which you think should be covered?
In terms of coverage, I think we have covered the ground that relates to urban sanitation. Like I said, I think the main challenge is - I'll just put it bluntly - it is related to more (i) the political commitment (ii) an awareness programme, if you are able to get a lot of people...I'm not saying educating them, but maybe that's what I mean, but I'm not by education saying the formal education going through primary school, secondary school up to University level, no. Just making them aware, educating them to make them aware of the need for certain facilities. And if not the need for certain facilities but to appreciate the need for having a very good environment and that is one thing that is lacking in all government programmes. What you do find in most government programmes is that there is a programme and it is just going down and nobody is prepared for it and government people forget that there is a high illiteracy rate and you have to deal with that, get over that block first before you can then start introducing anything. Again, after that I think that one of the things that can be both fit in the government, and the government in the people is to have dialogue and a participatory approach. If you want to design a programme sit down with the people who are going to be involved and participate and let them be part of it. I think that this jargon that this is a government programme is no longer tenable. It is a government programme and it is a government of the people, it is the people's programme and not his programme. So this thing of creating awareness, being more participatory and more open and more transparent in the way we do things and also having the commitment at least to say look, I may be very unpopular but this is what has to be done. I think in Europe this is done, people do things and they become unpopular but after a while, I am sure Margaret Thatcher is an example, but I think people now come to understand at least the way she was thinking. But that is going to extreme. But here it is for people to say this is what has to be done and we are doing it - but let's get over these blocks. You can never develop a country or a nation when you have very high illiteracy rate. What are you developing? You are developing people and you must really count on those people and put all your resources on the people and one is to at least educate them and make them aware and let them be a part of the whole process. This I think is the biggest challenge that we all have.

For example, the last time you were around we went to Nima, you realise that the programme that was implemented by WaterAid and ProNet actually went through a process of educating people making them aware of the need to have the facility and also involving the people in the whole process, letting them be part of the decision-making process and that is how ... and that's a hard area, very tough areas to get into, but at least they were able to make inroads and it is that whole process that we all have to go through. If you just want to go straight to the point and have a programme, you never succeed - no programme does: at least I'm learning from that now.
DS
Perhaps we could begin with your giving me an overview of the planning context as it relates to urban sanitation (with reference to on-plot sanitation). Perhaps you could be me an indication of some of the institutional arrangements that exist with regard to planning?

DA
Let me look at it from this approach then. This department, the Town and Country Planning Department is mainly concerned with the provision of land for this type of objective, for example, within our planning schemes we make provision for different configuration of residential areas and so each residential area will have a determined set of facilities which will be provided. Let us assume that we are planning for a low-income residential area, we have to look even at the grouping, that is in terms of the ethnic composition of that residential grouping. For example, it is known that within the Muslim community there are practices in terms of how they clean themselves - it is a bit different from what you have in a Christian community, so planning wise taking this into consideration of providing the land which should cater for this community. With regards to sanitation, can you be more specific?

DS
I mean human waste, and excreta disposal.

DA
So we are now concerned mainly with excreta disposal. Hitherto, most low-income areas had been without toilet facilities within their homes. They had to try and rely on the Municipal assembly to provide public place of convenience, but we realise it has been very difficult for the city authorities to maintain the public facilities so now we are changing from the situation where the communities will have to rely on public facilities and then to encourage the private households to have toilets in their homes. But you realise that within Accra, especially within the low-income residential areas the plot sizes are very small, the houses have been developed as compound houses and so land to cater for this type of private toilet was a problem. In low-income residential areas, development had proceeded the planning, so planning activity is now trying to see how best they can upgrade existing facilities without doing a redevelopment of the whole place. So where land becomes a problem to provide for these private facilities in private homes, the authorities are compelled to look for land within a community and provide public toilet facility. But the low-income areas, the population is so dense, very, very high and there are people queuing for the public latrines.

DS
So what you seem to be suggesting is that public latrines were one means by which the authorities could catch up with developments which had proceeded faster than planning regulations.

DA
But in the newer low-income areas which we are making conscious attempts to plan, we are trying to encourage households to make provision for private toilets in their homes.

DS
And by 'encourage' what do you mean?

DA
We plan to insist that whatever ... lands are submitted there should be adequate provision of these toilet facilities, that there is a ratio.
So do you prescribe a minimum area, or that one room has to be set aside..?

Yes, for example in the low-income areas, the provision is for at least three bedrooms.

Plot sizes are small, do you prescribe a particular type of sanitary technology?

Normally on the drawings which are submitted to us here it would indicate a WC, but when they go to implement it they put in the bucket latrines because they realise that if they do not have water, and if you provide a WC it will not have any purpose to them. So they rather prefer to go in for these bucket latrines.

The space that you are prescribing in planning regulations, is that based on an assumption of a particular type of technology?

We haven't made any conscious effort to indicate that this is the type of toilet facility that you should have, we have not been very precise, because as I have mentioned earlier they would normally indicate on the drawings the WC's but when you get to the environment and they are building and you don't have access to water, how do I build a WC?

Are there any other regulations that are laid down at a planning level that may affect the decisions that householders take about the use of a particular type of sanitation technology. Is there anything in relation to the pollution of groundwater sources, are there regulations concerning open defecation, or for subletting of plots?

Normally, at the planning committee we have somebody from the Ministry of Health who is represented at the committee and after the plans have been submitted here, he (the Medical Officer, who actually represents the Waste Management Department) looks at these aspects, that is the WC and all those things. So before they even issue the permit, the building permit, he has to go to the site and inspects to see whether they want to locate the septic tank or whatever they want to use. There are instances where some of these draughtsmen just look at the plans, they have not visited the site, they just look at the drawing and presume that it is a flat area. They just locate the septic tank anywhere but the onus falls on the health and safety division to actually go and inspect that what is indicated on the plans is really feasible.

And does the health officer do that..?

Yes, they actually do it. That is why it is normally advisable that even on the site plan they have even indicated the contours so that they will know how the slope is.

Is there a sanitary code drawn up by AMA?

That question would be better addressed by Mr Armah and Dr Attiapa.

Perhaps then you could give me some more information about water sources. What bye-laws affect the siting of a WC in relation to groundwater within the plot or the site?
When the respective developer submits his plans to the office, the schedule officer is expected to visit the site and the ground conditions - he examines the ground conditions as well, the relation to distance from wells and the rest, so that we realise that where the groundwater is high, the planning officer can make appropriate recommendation, even before it gets to here. We have instances where developers have built in marshy areas, so right from the word go the planning officer can recommend the development of an appropriate technology in such marshy areas.

DS
What I would like to know is how theory relates to practice, and whether users abide by planning codes and what enforcement is carried out to make sure that those codes are accepted?

DA
When it comes to enforcement, I will mention... taking a cue from the [longkeeps] that I personally observe as far as public toilets are concerned, it gives an indication that most of the developers do not go by their plans which have been approved for them. As I mentioned earlier, the requirement is that every house that is put up must have its own toilet facility, as much as possible, but because people have not been doing it, you have people queuing, and remember these public toilets are for people who are meant to be in transit, not for those who live around the facility. This is an indication that most of the landowners do not go by what is actually approved for him. If you go to Nima and you request for their building plans you will see that they have made provision for a WC or toilet [in the plans], but when you go to check the number of WC's or toilets in the house, you might get zero in most cases. But again, if the system was working very well before if somebody had been sent out to develop or construct, the building inspector of AMA is supposed to go and provide at each stage of construction of the building, but maybe because of logistics and personnel problems, we are unable to do any effective supervision. It is really a problem. So even if you come out with the best technology for an area, yes they will absorb it in their plans to get the permit but when it comes to the actual implementation some of them might not. It will take some time to change their attitudes.

DS
Who has responsibility for enforcement after building work begins?

DA
The building inspectorate division of AMA.

DS
Which is different from here...?

DA
Yes.

DS
What sort of sanctions are applied when enforcement is achieved?

DA
I suggest that because you want a detailed response to this issue that you speak to the Metropolitan Chief or the Building Inspector.

DS
Concerning plot size - is there anything in planning codes which specifies minimum plot sizes in formally developed areas?

DA
Hitherto, it boils down to land ownership in Accra. Here we have cases of families owning land, government land in these areas are not very much, we have schools owning lands. So with family lands for example, depending on the number of people in a family, the plot size which goes to a family member for they might decide that every member of that family should benefit from the parcel of land and in sharing, the land is not so big - you see individuals holding on to very small parcels of land. So what we are trying to encourage
now is amalgamation of land into these areas, so that have can have meaningful plot sizes. And again, since land is a little expensive in Accra within the low income residential areas there are standards, or minimum plot sizes - we have those standards - the frontage of about 50, 60 by about 80, 90 feet and between 70-100 might be the highest plot size in low income residential areas. We must also look at what most people can afford.

DS
Within that standard [plot size] is that making an assumption about the inclusion of a household toilet?

DA
Yes

DS
I am interested to find out what you consider are the main challenges which are facing the planning environment, the planning context for the provision of on-plot sanitation in low-income areas?

DA
Number 1, if you take Accra as a city, we radically have to look at areas where we can accommodate the low income people, and given that land is a bit expensive in Accra, there has been a tendency to accommodate low income people in areas where the land prices might be reasonably low. And 2. you have to look at ...with regards to on plot sanitation, we have to look at the type of facilities that they can conveniently afford and use. If you provide them with a WC and you don't service them, what happens, how do they use it? If you are thinking of the KVIP then you also have to look at the water table and if you to dig, maintain it - the maintenance aspects. You also have to look at the cultural and traditional values of these people - it is very very important to have that. From the planning point of view, another problem that we think that we have to grapple with is how do we enforce that whatever is recommended is what they actually develop.

DS
To what extent are planning regulations developed with consultation with the local community?

DA
Normally, when a planning scheme is prepared for an area, we normally publish the case for public comments but an observation is that most of them would not react to this published case. It is only a few individuals, the literate ones, who might show some concern, to react ...so unless we have this public forum where we really take these things to them to explain, we may not have a good response. I want to give you a case, they have made provision for a lot of public toilets along this ... highway, these KVIP’s. You go there now, you see the people squatting by the drains and doing their own thing. If you ask them why they are not using the public toilets that have been provided, they say they cannot afford [them]. If it is a WC, it is too expensive; if a KVIP they cannot afford that, so what can they really afford? But for how long can a government continue to subsidise?

DS
So what do you see as the way forward?

DA
For these type of people? To reduce poverty - how do we alleviate poverty? So that at least their basic necessities can be fulfilled. It might really take some time to change people’s attitudes and people’s income levels. You might have a programme of provision but people cannot even afford to pay. It is very unfortunate but if the landowners take it upon themselves to ensure that at least they make provision for some adequate facilities in their homes, then I think there may be a way out. You see, most of these landowners want to develop ...the tenants are living in rooms, they do not think of the comfort and amenities that should be provided to the occupants. But if for example, your building plan comes and the planning office insists that, for example, every 2 to 3 rooms there should be a WC and bathroom, ... people would be forced to use what they have at home - but you see instead of developing say a block at a rate of about 50 per cent, you see some of the landowners developing up to about 80 per cent. But for residential development, at times the planning office will say that they have about 50 per cent ... but if we can enforce some of this then I think it will be a way out.
DS
As you mentioned, then logistics becomes an issue.

DA
There was a time when they were trying to develop some bungalows for the ASS headteachers and we had some plans at for the Accra office which encouraged KVIP and the planning committee said that the KVIP wasn't something which should be encouraged in an area like Accra. KVIP's in rural areas was fine. [The reasoning] was.. we think that KVIP technology.. you see the area its a governmental building conservation area and that is where the school was located and they wanted to encourage a KVIP for a headmaster. Are we saying that he cannot afford to use a WC? So we have had to discourage it. What we are saying is that water is not much of a problem in those areas, where water is a problem fine, but not in areas where we already have water ... we are really under-utilising the sewerage system in Accra. What is the use of it? So if even in the low income areas, if they had extended this system to the sewer, I think that when they have the WCs the flushing of them ... we have a problem, you see we provide some assistance but the maintenance culture is a little bit lacking, so we think ... the means of disposal, but it is there, but I think that if we take a critical look at it could be improved upon even for those low income areas who are not benefiting from it.
DS Can we begin by your giving me an overview of the programme you have with regard to rural sanitation in this area

FW The water and sanitation programme has within its sanitation aspect an emphasis on rural areas. What we are doing at several communities is to acquire household sanitation facilities, basically VIPs by assistance...we kind of subsidise the construction costs by 50 per cent. At the district level we have a district water and sanitation team who disseminate the information to the communities and the communities then apply; individual households apply for assistance. We have trained for the three districts that we are dealing with, latrine artisans, so that when the individual households apply the applications are vetted and those that qualify are packaged and contracts awarded to the trained latrine artisans. The district assembly pays some of the costs (the subsidy) and then the latrine artisans construct the latrines for the householders. The district assembly then applies for reimbursement...

DS How long has this programme been running for...?

FW Initially, it was supposed to be for four years. The full programme, the national programme is up to the year 2009. But the initial project, the first stage is for four years.

DS And it started in which year...?

FW It varies from region to region, but I think that we got it last year - so we still have about three years to complete.

DS At the current moment there is no similar project being planned or implemented in urban areas?

FW I don't think there are any like that.

DS What I would like to do is to discuss your experiences based on the rural programme and to see in what ways they might relate to the situation in urban areas. Can we start with what the appropriate role of the community is in sanitation?

FW I wonder whether the community understands their role. Because in the rural communities it is now that we are mounting the education, so they understand that they must keep their environment clean and that they must dispose of their waste in the proper manner so it is difficult for me to say right away that the community understand their role. But their role is actually for them to dispose of their waste, keep their environment clean...
DS
What about issues such as community management and O&M...?

FW
It seems that because we know that communities have problems with communal latrines we are deemphasising communal latrines. The facility for the household... it is much easier for people to keep it clean and use it in the proper way and so we are not going to encourage communal latrines which can easily fail. People do not care if they are clean or not.

DS
Can you explain how your communication and education programme has worked in practice. What was its basis?

FW
In fact, as I said, it has just started. If I'm giving you a reference it will not be for this programme but for previous rural sanitation projects. I know that in the early 1980's there was a similar water and sanitation programme in the upper regions - there was the latrine component, some latrines were built on a pilot basis - in some towns I saw that some were not being used so if the people do not get the education right away before the construction starts we do not expect people to use them. My reference is from other projects and not this one because we have just started and we do not have any experiences.

DS
What was the basic mechanism for the communication of ideas behind the use, operation and management of latrines. What was the mechanism and how was it introduced to communities? Can you say what you have found worked best?

FW
I should say that from the previous projects that I know of there wasn't any very clear cut mechanism for communication. There were some trained volunteers who were supposed to contact the communities, pass the messages to them, assist them in the xxx of these facilities, but those earlier ones were not actually household facilities in the real sense. In our present project, the mechanism for communication starts from the regional level through the district level and we are going to have what is called a pattern organisation. So at the regional level you have the regional water and sanitation team that disseminates information to the district level which has the district water and sanitation team. Then they communicate direct with the communities and when the pattern organisation goes they reinforce the messages. In previous projects that wasn't done we just have the attitude of informing the people.

DS
How is that message communicated? Is it done through health education workers or key agents in the communities such as elders or chiefs?

FW
In the present project it is supposed to be ..., in fact at the community level we are supposed to form water and sanitation committees as the basic [agency] who will take care of communal facilities, but at the household level everybody is supposed to be involved. So, the district water and sanitation team members there is a hygiene education officer. It is supposed to be a three-member team and then there is a community development person. So these people are being trained so that they communicate with the individuals and other community members on basic hygiene and health messages. They convey the message and we try to track whether the messages are going down well or not.

DS
I am interested in the point relating to trained latrine artisans. Could you explain that arrangement in more detail?

FW
That is one way of involving the private sector. These are private individuals, they probably were mason somewhere, bricklayers somewhere so we, at the district level, try to identify people and then to ask them to show interest by applying. We put them together and give them basic training and from that basic training
we see who we think will work well. In each district we train about ten of them, we select ten and train properly in the theory and construction of the latrine and even how to market the latrines. That is one way of involving that aspect of the private sector so when they are trained it is then left to them to contact one of the communities. They are to look for the markets, contact the people, explain to them the benefits of the latrine, how they can get them. Then the individuals they continue to apply and they take the applications to the district administration and to the district water and sanitation team members. When they have verified and seen that the people are serious about getting the facilities they package these applications; the contracts are awarded to the same latrine artisans who did the promotion and then he does the construction. So the latrine artisans actually is a private contractor.

DS
**Is it possible to say how successful that arrangement has been?**

FW
At present, it is difficult to say how successful or whatever it has been because it has just started and the first contract are being awarded in xx districts. The other two districts have not yet started to award the contracts. But I think that personally it is a good arrangement and that there will be more success than in the previous project.

DS
**Can you explain why you think it will be a good arrangement?**

FW
Yes, because if I am the contractor and I am promoting the facility if I do not do my work well I know that I am not going to get the job. You have to approach the people and convince to ask for the facility. The other good aspect is that we reported to the district assembly to take charge of payment that is their own, so if they pay they know that they can get their money from us, and so it seems to be, at least for that district, it seems to an incentive. If they promote it well, the people request, the contracts are awarded, the artisans do it [construction] well and they are paid. Getting the money back is very cheap. So that is why I am thinking it is quite a good arrangement. Instead of us running from here and doing and then they think it is an outside project and we want the people to see the project as their own.

DS
**Do you see any facility for adapting that arrangement with the private sector in rural areas to a similar arrangement in urban areas?**

FW
I think that it shouldn’t be a big difference, basically it will be easier to have private people trained to do the same work in the urban centres using the same promotional aspects. As I said, if you put a private person in charge of promoting the facility and if he does it well he assured of this work and therefore he knows that he has to do it well. If he doesn’t do it well he doesn’t get the job.

DS
**You mentioned the means of financing the programme. It was 50 per cent subsidy and 50 per cent user contribution, can you explain the rationale behind the use of a 50 per cent subsidy rather than a loan arrangement?**

FW
I do not really know the rationale, but I think that the issue is this; that most of the rural communities would say that they are poor, so the idea is that if we are encouraging them to obtain these facilities we will try and meet them half way. They contribute half of the cost, that is the idea. Whether there is anything further, that I don’t know.

DS
**The initial 50 per cent user input, this will be for a KVIP, what are the total unit costs?**

FW
We think this will be in the region of between 120,000 - 200,000 cedis.
DS
*So that potentially might be...*

FW
But it could be lower than that depending on the type of materials that we use. We are encouraging the beneficiaries to go for local materials so that they can pay less.

DS
*So there will be a range of costs, from something like 60,000 to 100,000 cedis.*

FW
Yes, 60,000 to 100,000 cedis that's right.

DS
*Would it be possible for the communities to offset some of these costs through their own labour?*

FW
Certainly. What we are saying is that if they are able to do the excavation, that will be costed; if they are able to provide any local materials, local wood and grass, that will be costed.

DS
*Even though there may be some offsetting of costs, potentially you may have tens of thousands of cedis to pay. In what way is money within rural communities used more productively within the community. Is there for example, a savings and credit system which operates.*

FW
Not in the formal way. Most rural communities do not have banks so they save their money in animals, in beds, in storage of food stuffs, so to think of credit in the real sense I don't think it will exist in that sense.

DS
*So people will potentially be looking to household assets to finance costs for construction?*

FW
They can sell bowls of maize, or catch an animal and sell and finance it from there.

DS
*In urban areas, do you think that there would be opportunities for establishing a system of savings and credit.*

FW
That shouldn't be a problem in urban areas because the financial institutions are already there, some households have acquired the habit of saving already, so I think it should be much easier in the urban areas.

DS
*What do you think should be the role of the community in ensuring the continued financial sustainability of sanitation?*

FW
The beneficiary has a role to ensure that whatever he has requested he meets part of the costs. This should be explained to them before even the project starts so it is left to them to know where they are going to get the money from. It should be made clear to them that the facility is not a gift and that they must contribute towards the costs.

DS
*Does the same apply for O&M costs?*
FW
Yes, because for the subsidy that we are meeting.. the subsidy is for construction costs. As for maintenance costs that is left to the community or the beneficiary. It is made known to them that they must meet 100 per cent of maintenance costs, the same thing as water facilities, the initial capital costs we assist them, but the maintenance costs is their duty and they meet it 100 per cent.

DS
I am interested in finding out in what ways the political situation locally determines the technical option chosen or determines the performance of sanitation programmes. Are you aware that this may have a big role to play?

FW
I think that the political arrangements to date, actually facilitates easy contact with the communities, easy communication because the district assembly has been empowered. It is the highest authority at the district level for any developmental issue they take decisions, award the contracts, ensure that people are doing it the correct way so in this way they have their destiny in their hands. That is the decentralisation policy that the government instituted almost ten years ago. Because of that they have easy contact with the communities. Before then, it wasn’t easy. Any project at the regional level would find it difficult to communicate well with the communities, but now it is a clear cut structure. Each district assembly has several sub committees which deal with special subject areas, so it is much easier.

DS
I am interested in looking at how agencies interact in order to provide sanitation programmes, and I would like to know what your experiences have been? How does that relationship work?

FW
I think that now there are changes. Previously many projects went in one direction to the communities without consulting the districts without consulting the district or municipal assembly and so it was difficult for the municipal assembly to know what was happening in their own communities. Even within the municipal assemblies or district assemblies even though there were rules, there were incursions - one person wanting to do the job of another, so things were not going on smoothly. But with the current structure and with reference to how our own project is structured we do not go direct to the communities, we necessarily have to pass through the district assembly, explain things to them and let them know it is their project, let them take it as their project, and they then deal with the community. So by this relationship we expect things to go smoothly. In the past, as I said earlier, the relationship wasn’t all that smooth... and once you have frustrations, pressures within the district or municipal assemblies on people wanting to perform the roles of others, and people neglecting their own roles.

DS
Do you have any examples of these conflicts of roles?

FW
Yes, there is this problem of district co-ordinating directors wanting to perform the roles of planners. Some planners were employed and sent to the district assembly and they could not work because the district co-ordinating directors did not allow them to do their work correctly. They did not even see the need for a planner, so some of the planning people left.

DS
What I would like to try and finish our discussion on is a point which may allow you to summarise some of the things you have talked about before, but perhaps prioritise them as well, and its really concerning what ways you feel the rural programme can be applied to urban areas, and what the major challenges would be?

FW
But I think that it is possible to use the same approach in the urban system, but I am not sure whether the same subsidy would be applied in the urban sector even though the urban people are poor. I think that the major problems in the urban areas would be a question of land, shortage of land. In the rural areas, they don’t have much land problems - when one pit is filled you can shift to another. In the urban centre, the
house is completely built if he plans a plot for a VIP latrine, you construct it for him, in the next few years if it is filled, where do people go to make the shift. In some of the urban centres where they might be using hand dug wells, the issue of location of toilets [is a problem], also I think that for some of the latrine facilities in urban areas it is difficult to get water. So the issue of the type of toilet has to be looked at critically before they can be used in the urban centres.

DS

**In terms of the key elements of the programme, would you see the need for significant alteration of that programme?**

FW

I think that you can use the same approach in the urban centre. The element of the beneficiary providing funding for it has to be applied, the question must contribute, they must be made to know that they are responsible for maintaining the facility to make sure that it is run properly. Hygiene education aspect has to continue. But the basic structure would remain the same.
DS Perhaps we could begin with your giving me an overview of the programme that AMA have implemented in Accra.

NA In 1986, the AMA recognised that a large number of houses were operating pan latrines, in fact at that time it was estimated to be 25,000 and we were having difficulty servicing these toilets. So it was necessary to replace these things with a more acceptable system, and following a conference which was held in late 1986 the consensus was that the KVIP would be an acceptable substitute and the German government was willing to support it by giving some seed money of DM350,000 for operating a revolving fund. The design had been selected and the bills for quantities established and therefore the cost of labour was also established.

DS What were the criteria that were used to frame the programme?

NA The major issues which arose were affordability or the income levels of the people to afford the repayment schedules and the willingness of the people to participate; then the other criteria was the suitability of the area, the location by way of aesthetics and then of course, the soil conditions and then the developmental level of the area that was considered, whether it was fully or partially or just developed and it was also the requirement that it met that space was available in conformity with building regulations to allow for the construction of a sanitary toilets in the area. These were the basic criteria. The soil quality and soil conditions these were purely visual but then in the process of excavating, it enabled us to agree to carry on or not, because we had to start from the excavation before we knew whether the area is generally acceptable. But it is known what type of soils are around from the town planning officer.

DS From those five criteria, was a shortlist of sanitary technologies drawn up or was it assumed that it would be KVIP’s?

NA At that international conference (sponsored by UNDP) a shortlist of technologies was taken, including WC, septic tank, pour flush, KVIP, single pit and alternating pit. - these were the three basic technologies that were looked at.

DS And the decision to choose KVIP above the others was based on what in particular?

NA Well it was mainly cost, the cost of the facility and therefore the ability for the beneficiary community to pay the household repayment and therefore the cost would determine how much seed money would be available for the revolving fund.

DS And in the revolving fund which was set up was there a target number of latrines which was established?

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Yes we did. In view of the fact that there were 20,000 pan latrines we had a target of a 1500 latrines to be built every year.

How were the target groups chosen and how were the areas selected? Was there priorities in terms of geographical areas and how was affordability determined?

We have these pan latrines predominantly in the low-income areas so the priority area was to look at the high-density low-income areas and then in some of the areas to ... the fringes that were springing up but without water being available - that is the new development areas, the fringes of the city were also looked at. But preference was given to the depressed communities such as Nima. [One area] was particularly chosen because it ... the workplan had installed in each house already a pan latrines but because they had a structure it was easy to convert the pan latrine by simply digging under for the pit, for a pit latrine. Those were the priority considerations; the deprived areas and then the areas where there are predominantly using pan latrines. As for the affordability, a proper survey was not conducted except by interviews during the reconstruction phase when we developed a form and from the form we tried to collect some information. And since we knew from our development the costs of the rate of construction and therefore the maximum instalment that was necessary, it was placed before the... whoever led the community, normally it was one man leading a lot of people to do it. But we try to find from our form what type of employment, economic activities in which people are engaged ...

Despite a lot of publicity, we still felt that the response was still only average, we were expecting that we would get a large patronage but it didn’t take long to realise why our response had not been very encouraging. The idea of a KVIP was originally intended for domestic use only, but in upgrading parts of Accra the KVIP was used as a public toilet facility in the areas. It did not take very long for all these KVIP’s to malfunction because they were overloaded and therefore it gave a very poor image of the KVIP. It took some time... we had to do pilots [surveys] in the affected areas and used these pilots to educate the people, and that was how we were able to move forward at all. But each time the preference has always been that they would prefer if they would fund a WC but then if you go into the costing and they realise how much is involved they find they are not able to afford it.

And is it possible to say what the range of income for those individuals who were targeted with KVIP’s?

We did not go into those basic things, and actually those are things that are sometimes very difficult to get [person] to give out. But most were either self-employed or junior civil servants or junior officers who cannot afford the cost. The other factor was that most of these houses were tenement buildings and committing yourself to get the toilet built by subscribing to a fund to pay for the downpayment to enable the construction to be effected wasn’t attractive because some tenants could not seal the security of their tenancy and then some of them did feel that the landlord might use the facility of a more improved toilet to increase rents, ...and then also they [the tenants] were not sure that they would be there long enough to take the full benefit.

When you were looking at implementing the programme in the communities, was anything done to identify key actors in order to help promote the programme?

I would say that...the preparation for the take off wasn’t really done very well, we only relied on our publicity machinery putting up street announcements and then getting some opinion leaders who we took as pioneers for the programme by having the units installed in their premises and using that as a means of
educating the people, but we started that in five pilots. We didn't involve traditional leaders except opinion
leaders, then the other drawback to the publicity was that it was ... we did not widen the net to look at these
craftsmen from the parent organisations who would have a better selection of personnel on a particular
exercise. I would say that the publicity was poorly executed.

DS
In the survey that you carried out during pre-construction [phase] was anything done to try and
establish what the felt need was for sanitation amongst the community. You said earlier that people
had said that WCs were a priority, can you give me any more information about how community
needs and aspirations were involved in the planning of the programme?

NA
As I said, the whole programme of the KVIP scheme arose from the fact that there in operation these pan
latrines which we all considered hazardous and difficult to manage, so the idea was simply to go in and
phase out these pan latrines. It was not the felt need of the communities themselves, but rather the service
organisation was providing the emptying, collection service feeling that we needed to get the people to
move away [from pan latrines], perhaps that was one reason why the programme did not move as fast as it
should. But we never assessed what the real needs were.

DS
In what ways are community participation in the programme now encouraged?

NA
We would be moving now into identifying these handicaps, our next programme is going to look at an
intermediary who will go into the community and organise for clients and also organise the builders and
when he has sufficient enough clients and therefore men to build, the funding will be released and they will
get built.

DS
That is for a programme that you are planning currently?

NA
Yes, after having done a review of what is happening on the ground, we had a discussion with the World
Bank and these are the findings that the present delivery system is not centred around the community
themselves but rather from our angle. So instead of we trying to get customers, we need to get an
intermediary between us and the community who will do the marketing and get all the necessary people to
participate and then we want to give funding. The other aspect was the financing mechanism, the financial
ratio of 75:25, 75% being the loan to be looked at. The other problem was that as soon as you finished
erecting the KVIP they ceased to have responsibility for having... they need to continue to make payments for
the outstanding balance and this also withheld a lot of money from the fund being made available. It
resulted in us going round to the houses and making physical connections, and sometimes you see
alternative methods used to force the payment, like giving notices, publishing names in the papers and then
to the offenders we are going and putting a padlock on the... locking the facility.

DS
Can you give me an overview as to who was responsible for the programme, who they collaborated
with if there were other collaborators, whether there were any partnerships established?

NA
Our main donor agency was GTZ and they ceded money to the waste management department of the
AMA. The convenience in placing the implementation agency here was because of other aspects of the
funding from Germany of the solid waste management activities of the department). But strictly speaking,
construction should have been a function of our engineers department which is the waste department, but it
has been so disorganised that it was necessary for this department to be reorganised to take it up and
therefore set up a unit we called Urban Sanitation Improvement Team (USIT) in which we have one
representative from our health department, and one from the Metroworks department and the third from the
Town and Country Planning department, and our representative (Ansuh-Tutu's office) to constitute
themselves into a team that will do the approval.
The waste management took, met and interviewed the prospective customer (householder) and then the householder made available this block land on the site and that was brought to the USIT team who then made a visit and when they were satisfied that they complied with the building regulations they issued an approval on the site location, so these units collaborated with us. The builder is a private contractor who has been engaged, what we did was to have a certain number of such tradesmen, carpenters and masons trained to take care of constructions.

DS
You had representatives from different agencies responsible for implementation, how did that work in practice?

NA
Very difficult, especially for arranging meeting and inspections to approve the sites. Sometimes you didn’t get all four, normally you would get two (health department and our representative) but it was difficult to get Metroworks and Town Planning person to go. We needed the Town Planning department because of the aesthetics aspect and to look at the land use of these areas. But I would say that the USIT team didn’t work as anticipated.

DS
If the team was being reconstituted now, what factors would you put in place to enable it to work in a more appropriate manner?

NA
We would have to streamline the application procedure, instead of first constituting the team we would have a flow pattern for applications. Instead of bringing them together (at a meeting) we would rather have in the offices we would have a desk for these activities and let the applications flow through these offices. The question of the inspection would then be done by agreed specific dates of the week, and that should make it work and so we know that once every fortnight on a particular day they would be doing applications so that a certain number of applications would be treated. We did a trial of it and we had more success than previously. The other reason why it was impossible was the workschedules of the officers. If they can do inspections at least once a fortnight then it shouldn’t be too bad, because construction only takes about two weeks.

DS
The Urban Sanitation Improvement Team had representatives from different agencies. Were you aware of any conflict of interest amongst that team?

NA
There was no doubt about that. The other agencies which are traditionally involved in approving building regulations, they considered our involvement an intrusion and inappropriate therefore. I do agree with them but this was a very simple scheme which needed to be carried out fast enough to make the impact that was desired and this is one of the bigger drawbacks which there was with regard to construction and approval. By setting up the arrangement we broke away from old system, bringing in the private sector to do the construction which would have been otherwise directly contributed and would have taken years and years. But taking a lead role - that is their real function. It is their function to approve development and then supervise development, so I would say that the agencies were not very happy about this. Secondly, we have not been very happy about too many agencies being involved in approving development, for example, the medical people have been only already looking at sanitation and domestic services because it is about time that we looked at the training of the individual involved, the building technology should be made to know more about the health issues involved, supervision and control of development. I believe this is being looked at the University of Science and Technology. In fact, one step forward has been done in converting environmental health officers from the purely medical side, they are now exposed to the engineering sciences and they will then be converted into environmental technologists so they can combine the health and engineering issues. A few have just started...a course started about 5 years ago but it is funding which is holding us up so it is intended to have this core of people, some who have skills in engineering, some who have skills in health.

DS
So the major benefit of having an interdisciplinary role would be what?
We need to have the engineering linking up with the environmental people so that we have a better mix but we have always looked at these other disciplines in a water tight compartment, it is about time that we started to see how they criss-cross with each other.

I'm interested to find out what the householders' responsibilities were under the programme that was implemented?

The basic requirement of the householder was the provision of block land on which we could locate the site and then they are responsible for undertaking excavation to show their commitment to the programme and at the same time reduce costs otherwise the excavation of the pit will form part of the cost. And then they are expected to make the downpayment of 25 per cent in cash or kind and then after completion, to make monthly payments for the loan of 75 per cent granted by the revolving fund.

And at the time, was it made clear that they [the householders] would be responsible for emptying?

No, they were made to understand that emptying would be undertaken by the AMA

Can you give me any information about how householders filled those responsibilities?

They would normally arrange their block land, if they didn't have we would show them the way to getting it done by getting a draughtsman to do a block plan for them. The payment of the 25 per cent deposit (either in cash or kind); we showed what was their material requirements and if they were able to provide some portion of it, not necessarily (all of it) but up to the specified contribution, we are carrying them, we assisted them in going down to let them know that either they mobilise discount, or if they have some block which is quite common in these places.... so we either, in the case where they need to make a cash payment, we were able to say right we will make the provision for you to make monthly payments and then you reach your 25 per cent and then we start. We also help them where they difficulty in mobilising money. We also had occasions where if there are some difficult tenants or other householders within the plot to go and have a discussion to explain the rationale and the benefits, how they should all contribute to it if it is possible for a toilet to be built. So this was an area in which we did not do very well because of a poor starting position, but where there was real progress... sometimes they were invited even here for a discussion, the representatives plus the landlord (where the landlord did not live in the house).

Perhaps we could move on to discussing the financing of the programme. What was the basic mechanism of finance for the programme?

From the customer or client angle, there contribution was 25 per cent of the estimated cost of construction. The project then made available 75 per cent balance and all these were utilised in procuring materials, the iron rods, cement, blocks and roofing sheets - we had a unit building the custom slab, the blocks were bought in the market. As much as possible, we tried to get most of the inputs from the manufacturing source rather than the shops. So for example, steel and iron rods we went to steel mills; cement we went to the cement factory and ordered. We were given special concessions because it was intended to benefit the people. So with these monies we then mobilised the materials and of course the project had also as part of it support a truck to do the transportation and delivery of materials at no cost to the project. This aspect of manning the truck was absorbed into waste management department's costs.

What about repayment rates?
Repayments were spread over 54 months. We also had a collector who went around the houses to ensure collection of payments, others willingly moved to make payments. Each job has an account open so we kept regular record of what is contributed monthly and if there should be non-payment over a two month period it was seen as very serious arrears.

DS
**Do you have an idea of what the level of repayments were over the project?**

NA
Right now it [the VIP] is running to about 180,000 [cedis] so the 25 per cent concerns about 40,000, and then we pay the 140,000. The 140,000 is paid over 24 months in equal instalments.

DS
**From the analysis of repayments, is it possible to set a figure for the number who have repaid?**

NA
We can get that from the accountant. Let me say that in the initial stages repayment levels were rather high, but later on it fell very, very far behind, I think something to the extent of below 50 per cent and a general concern was expressed that the cost of collecting the arrears was such that we were actually losing up to 30-40 per cent. In view of what has transpired over the few years that ratio of loan (25 per cent downpayment; 75 per cent loan) has been considered to be rather a losing arrangement to the fund. It was felt that if we allowed them to pay 50 per cent, leave out the loan and subsidize by 50 per cent we would be saving a lot of money. So it looks to me as if we were losing more than 50 per cent.

DS
**Is that something that is still hypothetical...?**

NA
No, in fact we are supposed to started this because the World Bank is not expanding the support for ...we don't know how to, so the World Bank is looking to...in fact the two have talked together and we want whatever is available in the existing revolving fund to start this scheme, but we need to do a workshop to do the preliminaries, we need to identify the intermediaries that I have been talking about, we should do the marketing and get the customers. And it is to these people that the money will be paid to for them to get the 50 per cent from the customers to undertake the construction, so we need to do that education and in fact the consultant has just been appointed but not contracted to come out and take the workshop and selection of the beneficiaries. As soon as that has been done, we will start working on a 50-50 basis.

DS
**Is it possible to say what factors affected either willingness or ability to pay?**

NA
Yes, we realised from our look at repayment performance was that (1) it was not the idea that they weren't able to afford repayment but that some of them didn't see the need to repay after they have paid a few more months, and especially where they do not see the AMA being involved anymore in the operation of the toilet, after the KVIP has been built for 2-3 weeks and then they started using it, and then we cease to have any real connection [with the people] except for the collection of the fees. The other things that we ought to realise is that it is also always felt that if the government has given you assistance and you are part of the government, you may forego this portion of the loan. In areas where there has been serious cases of non-repayment, it is because the lead person has moved out of the area (the initiator or the one who really motivates everybody) has left the scene, or sometimes there are cases of bereavement and they are unable to make all the payments of behalf of everybody, so the main benefactor ceases to be available. These are the cases that have come before us as contributing towards the non-payment, but not the level of repayment.

DS
**What work has been done if any to establish the user satisfaction of the programme?**
NA
We didn't do anything at all. I have always been very close that after the completion of the toilet we did not go back periodically to inspect why and whether they are maintaining, and if they are maintaining, how they maintain it whether it is in conformity with the guidelines. If they have problems, how did they come about and how can they be resolved? There are cases where we have designed a VIP latrine for a particular household but next door neighbours have been invited without there knowing that they are doing damage to the design because they are now overloading, they are allowing one or two from adjoining houses to use the toilet and they are not even aware that they are infringing one of the design principles. After post construction activities have been very very poor. Once again the basic problem has been that we are very thin on the ground, we also thought that decentralisation - some districts should undertake on some of these activities on behalf of the private person, we have got branches of this department where they are also working on the plan. But definitely our contact with them after completion has been very very poor, very negative and therefore we are not even able to find problems so that we may advise on future programmes.

DS
The last area is to get a broader overview of strengths and weaknesses of the project. Is it possible to identify major points within each.

NA
I think the first weakness is the information gathering at the beginning is not intensive enough. We have had situations where there have been land disputes between adjoining neighbours...which means that our block lands have to be looked at more closely. The other weakness is the very poor location of the facility because we localise our inspection of the houses...we need a wider perspective around the area. Then we expected customers to do the excavation but invariably we find that they are not doing so, and therefore we should have changed the system to accommodate excavating the pit, because if you left it to them estimating that they would excavate the pit in one month, it may actually take three months, and this gave the impression that building the toilets was an expensive business, so that if we incorporated excavation into the cost it might speed up issues and therefore encourage you. The other weakness is the question of repayment. If we are going to have repayment there should be a system where they can repay at a point [in the community], rather than coming all the way to... (here). But we have been looking at the political structures - there will be what we call unit committees within the community and is intended that a lot of this revenue collection should be charged to this committee but they are not set up yet. The other weakness is that after post construction activities being particularly lame and therefore not making possible to have a continuous review of operational systems and therefore looking at design modifications.

DS
What about the major strengths?

NA
Having the facility within the compound gives residents a sort of relief and privacy rather than queuing [at public toilets]. If it is well organised and well maintained it improves on the health status of the people, particularly where there are children. Otherwise where they don't have a toilet, there is a tendency for the children to use chamber pots which causes a lot problems in the house. So I think that the strength is that you have a facility which is easy to maintain and not expensive either. Of course, the short period of delivery [is a strength].

DS
What do you [from your experiences] see as the major challenges for the further promotion of household sanitation?

NA
I would look at instead of having a donor agency or even the AMA doing it, whether we couldn't therefore bring this into the financial, banking system into supporting the house owner...letting the private sector undertake these things but only within guidelines that are put in place by the AMA just as you would to build your own house for a prospective owner following building regulations. So the...I see that we want to look at even the building material to make it suitable for...even acceptable for the building code. Sometimes we want to look at reducing the cost as much as possible by looking at the possibility of using other
materials, sometimes someone was advocating the use of asbestos sheets but then they didn’t think it would be safe and secure enough for people. In areas, we are looking at the design of the single pit or the alternating pit and then looking at the building materials so that local, readily available materials will be acceptable. I also will be looking at ...prefab units and therefore having standard designs. But I think that an area that we should be looking at is how to readily convert KVIP’s to flush toilets if the need should arise. Suppose I build a KVIP and I want a WC, what do I do? Do I have to pull down all these buildings and start again, so we may want to look at a transitional design that will enable you to move to the next stage.

DS

Amongst the challenges identified, is there any one challenge that is at the top of the priority list...

NA

I would say they were interconnected, but this question of emptying is always coming up. They always want to know...they get worried how long does it take to fill up and if it fills up and I don’t have it emptied, what do I do next? We all agree that the idea of using a VIP latrine was an intermediate step for those that are unable to afford the more acceptable WC - that is a thing which is going to take a very long time before we have them - so I say we will have to look at design modification as one of the top challenges.
Interview with ODOROI DONKOR

Project Officer, ProNet

Monday 11th March 1996

45 minutes

DS
Can you sketch the project that ProNet have in Maamobi concerning household sanitation. Can you give me some background to the project and what the objectives were?

OD
As a matter of fact, the programme was implemented by an organisation called ... ProNet used to be part of an organisation called ISODEC. There was this Urban 1 project which the government was carrying out and one of the areas that was identified was Maamobi. The programme aimed to improve water supply, sanitation, electricity and roads. Water supply, electricity and roads was given as a contract to some government agencies, but when it came to sanitation what the government agencies implementing the project decided ... our sanitation, low cost sanitation is something...to...and anything that they want an active community involvement to carry out the project, because the place was big and the money allocated for the project was small. So there was a need to run a revolving scheme so that as the money comes...as the money comes.. people are repaying their loans, more households can benefit. So they were looking out for an NGO in Accra who is involved in sanitation so they came to ask us, so after that we entered into an agreement with that government agency to carry out the programme in Maamobi.

DS
So what was your actual role [in this arrangement] - from planning through to installation? How did you interact with the programme?

OD
Our role basically was to plan with the community, to carry out ....the promotion, design the facilities. We also got information from the local sanitation committee that would have to overlook sanitation at the local level.

DS
So the programme ran from...which year?

OD

DS
And what were the major outputs from that programme?

OD
97 VIP latrines.

DS
And can you comment on the sustainability of that programme?

OD
I think it has been one of the biggest problems because we thought...you see Maamobi is a very low-income community. Initially we thought that the rate of payment, payback would be faster because ... carry out the programme very fast but we realised that ... the rate of repayment was very low, so we could not really get the actual amount forecasted over a few years to carry out ... at the end of 1992 we were still receiving money provided by the World Bank to carry out that programme. The community payback has not been
enough for us even to carry out [improvements] for ten houses so you can imagine, you can appreciate the low rate of payment. I think one of the biggest problems was also the same committee that we put in place was not very effective.

DS

*Why was that?*

OD

In the sense that the committee was elected by only one person who was using the assemblymen as their lead person in the community. I suspect that they did not want to bring [people to the committee] who would give them problems. So they selected people who were very close to the ... so they could get through what they wanted. Some of them were quite wise but they still don't have...the [assemblymen] are still stronger than them. Collectively, we go to government agencies implementing the programmes and then the sanitary committees sit down collectively to discuss progress. It is only when we are there that we realise and that we begin to streamline things. But the moment we leave the scene, I mean, he [assemblyman] changes things and we have to go back again. So ..... the committee who is supposed to collect the loan because we state that because it is a community project we are not going to...we have done everything for the collecting of the money. We want to see how serious you are in getting the programme running; so collect the money yourself. We have to put everything in place, I mean design, the form for collecting the money for them. What they have to do is get people from the community and maybe pay them some commission and to go from house to house to collect the money, but they were not given to doing that. Somehow or another we had to come in and help them do that so they were collecting the money and paying it at the community office. Later on we realised that some of the people who we had asked to go and collect the money; the sanitary committee could not pay them commission so they go and collect the money and they would not pay all the money to the office because of this commission. That was a big problem. Something like a 100 houses would be giving the money, but 200,000 cedis would not be accounted for.

DS

*The money was going missing...?*

OD

Yes, missing. I think that was one of the problems the people came into, I mean, [repayment] rates were very, very slow and the people they also gave money without...collecting money without getting paid...not being paid into the bank for what they are contributing to...the small amount that is always...I mean that we had in the bank to carry out the programme.

DS

*What impact did the knowledge of that have on repayment rates?*

OD

Now most of the people who have paid don't even know that money has been collected and has been squandered; they don't know. There is now a new assemblyman, you see who is trying to pick up from the old assemblyman. What he is saying is let's see where you got to in terms of implementing the programme, how much money was collected, how much was paid into the bank, who are the people involved in the collection of the money, who was receiving the money. Let them be clear who has it...the bottom line from which we can also start from. And because he cannot...I mean it would be a real big blow to him if he had to, if he had to give way to that. So he has not been very co-operative in trying to locate an assemblyman to continue with the work. And unfortunately, a few of the guys who were taken on to also go from house to house and collect the money are not doing anything, and so the assemblyman is using that to not cooperate with the new assemblyman. He is saying that those who are collecting the money are not there; until we see them and know how much they have collected and how much they have paid back then I can't give you a proper account. In any case he can't because for about one year of the project he was working and all the money was being paid into his pocket, so we didn't have a concrete picture up to that point, maybe the two years after we could.
DS What lessons have you learnt from that experience both for the organisation of assemblymen and for the collection of loans? What lessons have you learnt that you would apply in a hypothetical new project?

OD I think that in time to form the community management group that would have to oversee a programme like that. The person who we used as the entry point or the lead person in the community - the key man - they should be neutral bodies appointed by... I think public opinion should come together with the community and choose their own person... it will then become the whole responsibility of the community so if there are any problems the community can hold them responsible. In this case the government agency implementing the project appointed only one man and we gave him... you see, the big mistake was allow him to choose his own people who formed the committee of management. So the community really don't... we are carrying on our promotion, the people in the....office to pay their initial deposit and fill the contract forms, they don't know how the committees came about, they don't even know most of the committee members. All they know is the assemblyman; everything comes through the assemblyman. So one of the problems now is we don't know who to go to. And if the situation is such that the committee of management should find a solution to this, if he feels that this is going to affect him he will just sit on the information, that is the biggest problem. So I think that that aspect, the committee of management - they should be informed, they hold responsibility.

DS And the level of repayment for the project, you mentioned that it was only 10 per cent of the households that had fully repaid...?

OD Yes I think so, a little over 10 per cent of the households have paid some money have paid back their money. Some of them in full, but I think that only about 0.5 per cent have paid in full. The rest have also paid but now I don't think there is any collection of money.

DS Other than the problems that you have already mentioned about the way in which the money was collected what factors do you think contributed to that very low repayment rate?

OD Well, I think that considering the amount of income people earn and the amount that you are expecting them to pay at the end of the month, you realise that somebody who is supposed to pay about 157,000 cedis [total cost for a VIP] is supposed to pay a monthly fee of 6,000 (cedis), maybe his total income may be about 40,000 [per month] - they have to pay rent, have to pay for his family, for electricity, for water, so even 6,000 cedis was too much for him. A few times we would have to come in and get the money from the people, and what I would say is that well everybody was complaining about the monthly amount and so... OK, I have personally said on a few occasions to people who cannot pay the 6,000 - 'What can you afford at the end of the month?' Which means that the 24 months repayment becomes 36 months or something. So I personally tell them to pay less, so it means that the income of the poor, as compared against what they have to pay was too much for them to pay. They were paying less [than agreed], far, far less - about 20 per cent less, some of them in some cases maybe 25 [per cent]. A few managed to pay in the region of 50 per cent.

DS In some of the other interviews that I have been conducting, people have mentioned the cultural context in which low repayment rates have been made. Perhaps there was a legacy of that in this project - do you think that was a factor?

OD No, because during the promotion, people would have been made aware that the money that we have on account would not be for every household in Maamobi. The reason why we are asking them to pay back the money is to ensure that we are having 100 per cent coverage of the township. That was thing that we
told them, so it was very clear in their mind that because we wanted to do more that was the reason why we were asking them to pay back the money.

DS
Can you comment on any initiatives that were made to establish saving and credit schemes? Was anything like those schemes considered?

OD
Yes, when we are going to leave the scene in 1992 when the money from the government was getting exhausted and the payment in the bank was now not enough for us to continue the project, we were going to contract a ... you know we have these local bankers who go around from market to market collecting money and at the end of the month what he does is to collects one day of the money and keeps it. If he collects money for 30 days he takes a single day's money and gives you the 29 days' money. So we were also going to do that, we were going to contract a suitable person in the community who would go from house to house...

DS
So this is a sort of established, but informal method of money lending...

OD
Yes

DS
And the advantage is that you have got someone from the community who many people know and who has a vested interest in recovering the money.

OD
Yes, so at the end of the month he gets given a commission so he will then collect the money and pay it to the assemblyman or some representative who has the pot money who can then take it to the bank. That was the arrangement that we were looking at ...we had a few of them that were prepared to do the work but I think somewhere along the line there was also a problem. There were problems with the steering committee again, so it could not take off in the way we wanted. I think that if it had happened the collection would have been very fast - they would still pay a less amount but more money would have been collected than before.

DS
If you were now asked to design a model for repayment on this scheme, with the benefit of hindsight, would you seek to include factors like this before establishing it...

OD
Definitely, yes.

DS
So you would use an informal financial sector, but you would also use...what other elements?

OD
I think we would have flexible repayment rates. Considering the areas in which we are working in, you still can't be very rich in terms of payment because if you are telling them to repay the money and the rate of payment at the end of the month is far above what they can pay that will be a nonsense. So the payment should be less, or there is a need for some flexibility. People should pay what they can afford at the end of the month. That would mean that the money should come in at ...maybe the construction is very slow.

DS
You mentioned that part of your responsibility was in designing the facility. Could you explain to me why the VIP design was chosen and what experiences, if any, do you have from that choice?
OD
The reason why we chose that (design) was that in the community there were no public latrines at all and the latrines that were there were the bucket latrine kind which was quite a nuisance for the people. Almost everybody, people were just... toilets in the alleys, so we thought about a low cost latrine which people could easily handle. That is why we came by the VIP latrine, as a matter of fact. The biggest problem we experienced was that we were trying to build the latrine for the population in the house and in that place [Maamobi] it was very densely populated. At that time the density of the population was about 20,000 and for the average household there were about 6 [people] or something. So in some compounds you would have some 60, some 20. Initially, the programme was very slow so we were forcing people to get the pipe and .... in one of the houses the population was about 70 and we built for them a two seater latrine and in less than two years, two pits were full. So we have to go back again and look at the way we carry out the programme. So we have to bring in another seater and analyse the design again - make it a bit large to take care of the larger houses. I think the latrine worked very well. I think one of the biggest problems involved the Muslim community - there is much ablution when they go out to the latrines, so the filling rate that we was expecting was faster. That completely altered the filling rate of the latrine. As a matter of fact, it wasn't even two years before we completely desludged one pit, - 6 months, 9 months, 1 year we had to go back and desludge. After one year if you wanted to go it would be full. Although we thought it [the VIP] was appropriate, the population could not really make it function in the way it has to function. In a few cases, we had to call in a septic tank to come and desludge and that was the only way we could get rid of the stuff.

DS
You said that people weren't using it in the way that they were meant to - does that mean that they were using both pits at the same time...?

OD
No, we were suprised that after one year one pit gets full. So if [one] pit gets full after one year the other one will not have decomposed so we are forced to empty the other one...

DS
What about plot sizes in Maamobi. I am interested to find out if the plot sizes affected the choice of design

OD
Yes, there was an instance where we had to redesign a latrine because some of the spaces in some of the houses was too small, the population was very big, so we had to extend the tank which means that the tank now takes a bigger hole than the actual design because whether the people really need it, but because of space if we have to go by the design that we are having. When they have provided a small tank that does not work very well, we have to redesign the tank to make it bigger.

DS
In the households that were selected for the programme, were the plot sizes consistent with what was average throughout Maamobi or were they significantly larger [in general terms]?

OD
Average? Because there are two places where plot sizes were compact in Maamobi and in some cases if we had continued than about 25 of the houses would have built some type of latrine.

DS
And is Maamobi in general known to have a very large population?

OD
Yes, yes

DS
What about the housing density?

OD
Very high

Appendices
DS
*Is it possible to give me an indication?*

OD
You know, if you went to the houses, most of the houses have a compound, with many families, maybe in terms of feet maybe 85 by 100.

DS
*And you might have how many families on a compound plot?*

OD
In some cases, you might have about 15 families, in some cases.

DS
*Have you had any feedback from householders about the functioning of their toilets in such a highly densely populated area?*

OD
Yes, they come back and tell me that our latrine is getting full fast, its filling rate is too [high] and what can we do about this?

DS
*What about odour nuisance, not only within the compound but also between compounds?*

OD
I think that is one of the problems ...before then there was this public area <section unable to transcribe>.

DS
*By insects you mean flies...?*

OD
Not flies, there were some very small insects, they look like mosquitoes but they are not. The issue of flies did not come up very much...one of the big problems we encountered was with maggots, [coming up from the pit] and climbing onto the seat and coming out and we realised that ...the two pits get full at a certain time... continue to use the latrine ...so it happens that the maggots get out.

DS
*You mentioned that some of the latrines were not kept clean. Can you quantify the extent to which that was a problem with the project?*

OD
In a place like Maamobi, ...that is mostly in houses where the landlords don't live in the house so there was no [pressure] like this person must go an clean the latrine like this, so people just leave it...I think about 40 per cent of the latrines were like this.

DS
*What about maintenance of the latrines?*

OD
That was one of the things that we discussed with the people. In terms of maintenance, I don't think we saw that people carried out very efficient maintenance on the latrines.

DS
*Going back to the implementation, what was done to establish what the community needs and aspirations were? To what extent was the community consulted about the type of latrine to be used?*

OD

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There was nothing like that. The government really wanted to upgrade some areas and it was looking at giving some economic assistance to the community and sanitation was one of those things which came up late so as a matter of fact the design that we have .... this is what we have, this is what we are trying to promote, these are the benefits, but as a matter of fact the community were not involved. We thought that in terms of low cost sanitation that was the best option for [all).

DS

From your experiences with this programme, what do you think are some of the key elements for ensuring the effectiveness of the programme?

OD

I think that the community should be part of the programme right from the very beginning. If that is carried out and the community accepts the programme, it means that at every phase of the programme you can expect community involvement, but if the community is not consulted from the beginning of the programme it becomes a problem because it becomes new to them...this is what we have for you, we are going to do it through this man, or maybe in our case we are going to do it through [this agency] they will not really give any of their support to this man. As I say, community should be involved in the planning and this needs to be made right at the beginning.
Interview: JOSE NAENE and HELENA COVANE
Position: Animators for Jorge Dimitrov and Urbanizacao districts respectively
Date: Tuesday 9th July
Duration: 45 minutes

Notes:
Both animators are working on WEDC's research. The interviews were conducted with the assistance of Tomas Brandberg who interpreted Portuguese-English. Instructions to relate only what the animators had actually said were given prior to the interview beginning. Portuguese was not the animator’s first language however, and in retrospect there may have been an argument for conducting the interview in Changana (this however would require Candedo’s assistance and I was concerned about the possible bias that would have introduced - Candedo is effectively the animators manager).

DS
How long have you worked for the programme and how long have you been animators?

JN
I started working for the project in August 1994.

DS
Do you live in the community?

JN
I work here but live in Laulane.

HC
I started working for the programme in September 1994, and I live in Laulane.

DS
Are you both animators for this district?

JN
I work in this district, but Helena works in Urbanizacao.

DS
I would like to know what the main roles of the animator in the districts?

JN
The animator is promoting the sale of improved latrines; sanitary education; explain to the population about improved latrines and who we work for; and the advantages of improved latrines.

DS
What does the promotion (or selling) of latrines mean?

JN
There are a number of different activities - meetings with the community...

DS
How often do you have the meetings?

JN
Perhaps once a month ... we go door to door...

DS
What do you actually do when they go from door to door?
JN Identify the need of the family; the conditions of the family; bring propaganda about the programme; explain how improved latrines work; explain the advantages of improved latrines; the price (that it is cheap); that with these latrines you avoid lots of accidents; that small children can use the latrine; and that improved latrines help to avoid disease. The main point is to speak to people and try to convince them (about the improved latrines) and to convince them to dig a pit on their plot for rubbish, how to use water from the well (for example you should not drink it before you cook it), to use necessary fuel, how to purify water, uses of water for washing and cooking.

DS So your role is much wider than just providing education about sanitation?

JN Yes, these are important things. We also inform people about subsidised latrines for those who cannot afford any type of latrine.

DS You mentioned earlier that you have to explain to householders that you work for PNSBC and not the Ministry of Sanitation. Why is that?

JN It’s simple. We cannot mix up things. I have to say it because I am from PNSBC. It is to avoid confusion. When I go to a house and say I am from PNSBC it means that I can ask any questions about the latrine. I have to tell the truth.

DS Perhaps we could bring Helena into the discussion. When you talk to people in the communities what are the main reasons why people do not have a latrine (either a traditional latrine or no latrine)?

HC It is because people are not informed about the latrines...there is also a space problem, a terrain (or soil) problem and lack of money.

DS Of those problems, which one is most commonly mentioned?

HC It is not very often that people do not have any type of latrine, so most have traditional latrines...or share with their neighbours.

(Repetition of the question)

HC The first reason is that people do not have space, and so have to use their neighbours latrine.

DS In an area like Jorge Dimitrov, is it possible to say roughly how many people, what proportion, have improved latrines?

JN It is difficult to answer this question. There was a lot of rain towards the end of last year and the beginning of this, and as far as I know there are many who need latrines. For people who do not use latrines, you have to go there two, three or maybe even four times...a latrine is not like clothes, something that you can change everyday. It is necessary to have a ‘cold head’ in order to convince someone to have an improved latrine...
That is an interesting point, perhaps you could explain what the main barriers are in persuading people to have improved latrines?

The people need latrines, they need transport, there are people in compound houses where there is no common ownership of sanitation facilities and there are a lot of people who do not have an improved latrine.

Do the improved latrines have a certain reputation that affects sales?

When the animators are organising meetings door to door, people ask us to come more often, people agree that the things that we talk about are important and the perception of the latrines is very positive in the community. It does not matter if a family is poor or rich, they all like the latrines. Sometimes perception can depend on the type of soil.. there are cases where a householder should buy a complete latrine but only buys a slab and there are problems. People like the fact that they can upgrade their latrine when they have the money - they can buy a slab in the first instance and then buy the blocks to line their pit at a later date.

I would like to know a bit more about costs. Helena, where you work, can you say roughly what it would cost a householder to build a reed shelter to their latrine?

150 000 MT

That is much higher than the cost of the latrine

Yes, of course

Why 'of course', why is it much higher?

It is because the latrines are subsidised..

So even though the reeds are grown locally, they are still very expensive..?

(Candido explained that the reeds were not grown locally and had to be transported long distances (outside Maputo) which added to the cost of reeds.

The cost of transportation, is it possible to say roughly how much people spend on transporting their slab from unit to house?

For a long distance 30 0000 MT; if it is closer they pay 10 000 MT.

Do the handcart owners charge set rates, or is it dependent on the time taken to transport the slab?

It is dependent on distance.
Perhaps we could begin by your giving me a brief outline of the roles and responsibilities the Corporation has for urban sanitation.

At the Corporation, we are responsible for the supply of rural water and then also the disposal of sewage. On-site conditions is not sewage as such so we have a limited role in that. It is the municipal and district assemblies that are responsible for sanitation in the communities. In our work we have been able to advance more in water supply than in sewage. We have only one sewage system in the centre of Accra and we are hoping to expand that to cover a number of users. We have carried out a planning study on the Accra sewage system and then sanitation in general for the whole of Accra which involves sewage facilities as well as on site facilities. The study is to determine which areas are suitable for sewerage system and which areas can rely on an on site waste disposal system for the overall improvement of the sanitary conditions of Accra. The city does not include Tema. After the study the next stage is when we accept the report and look for more funding for the detailed design stage. With respect to the implementation of the other disposal systems that might have come up we then pass this on to the relevant assembly, that is the AMA or Ga district assembly.

By on site facilities what do you mean?

On site facilities we define like a septic tank system or a pit latrine or a bucket latrine. AMA is phasing out the bucket latrine which was started much earlier. And then where the ground is suitable we are going for the septic tank, which you drain once in two or three years depending on your family size and depending on the size of your septic tank. AMA goes round with cesspit emptiers and collects this and charges for a fee. Then they collect it and dump it in our waste treatment plants and we treat it.

At the moment, GWSC does not have responsibility for household sanitation, but you are conducting a study to see if on site facilities are appropriate.

We have a number of satellite sewage plants in Accra belonging to different institutions. The study is also tied in to how to pull all these things together and to have a common treatment plan of disposal. We have identified an areas where we can have waste stabilisation ponds but you have to lift the waste to those areas so it will involve pumping ... it will depend on the topography [of the local area] and the cost involved in transferring waste to our central treatment plants. The options will come out.

What were the main objectives behind the study?

Our obligation is to dispose of waste through the sewage system, so the study was designed to identify within the Accra area whether it would be suitable. But we didn't want to stop there, suppose that an area is not suitable for a sewage system, what do we do - do we just leave them there? So that is why we should find out all other means that are convenient for the disposal of waste in the area. Once it is identified we can handle the sewage aspect. The other aspect is that we know that there authorities who are handling them who could pass this information on to them for utilisation. But I don't think we are going to handle on site sanitation as a corporation because we might be taking up the role of the district assembly unless we sort those out it will not appropriate to assume that role.
DS
So at the moment, responsibility lies with the municipality, whereas you are an agency who deal with
the disposal of pit/tank contents.

MA
We could have taken it up as a responsibility to provide a sewerage system for everybody but we have
limited resources - even in water we have not advanced that much. So where a sewage system will not be
possible, we cannot handle the waste in that area. Because the district assemblies have a role in handling
that aspect, they take it up.

DS
What about the extent to which the corporation interacts with the community and whether the
community does any work assessing what the needs of the community are, what the aspirations are.

MA
We do that with regard to sanitation, we do it in rural communities. We have a department - the rural
community water supply division. What you are talking of is the urban, which we are not involved in on site
sanitation because initially we had the sewerage thing in mind and we wanted to get people connected to it.
It is our onus to dispose of waste, whether it is the sewerage system or it is the on site, at the time that
technology was probably not found suitable. But over the years with their inability to cope with providing
sewerage facilities the municipal authorities have the responsibility of keeping their cities clean and that is
why they handle more of their on site sanitation.

DS
What about the responsibilities that different agencies have for on plot sanitation. How does that
relationship work, are there examples of particular problems, conflicts?

MA
Because we haven't been involved so much in this on site systems I don't think there is any apparent conflict
between us and the municipalities. They might accuse us of neglecting our role of seeing to the disposal of
waste but because we are not coping with that and because they have the statutory right for seeing to the
management of waste in their communities we don't think there is any conflict. They have in their building
regulations that if you want to put up a house you have to make certain provisions, I think that it is probably
not possible for them to enforce all these provisions that is why there may be problems created for example
in the areas that you want to put up a building you must have access, the road network must be good, each
house must have a toilet facility and so on. If they were enforcing those things, waste disposal would not
have been a big problem and if these provisions are made and we get into the area and say you have to
move with your cesspit emptier so many times it is not convenient, because of the topography each house
can be connected to the sewer, we can go ahead and do it and they would not interfere. After we have
done it and connected the household it becomes our responsibility now to handle that issue but when it is
not in our system, the assembly handles it and there are no conflicts. But it is because of the magnitude of
the works, the assemblies are not coping with the disposal of the waste from those on site provisions, even
garbage, emptying cess pits or pit latrine and they are not able to cope with it.

DS
Are there any changes that you would recommend that would alter that ability to cope?

MA
I think the ability to cope is just to put in more resources because I have a feeling that the on site sanitation
and its disposal of waste is cheaper than a sewerage system because of the topography of Accra. Accra is
very flat so you may not be able to have cleansing facilities in your sewer lines if you go in for all sewers. Or
in that case you would have to go in for a lot of pumping stations and the operational costs would be very
high. But with areas away from the sea where the water table is not very low, you can have these septic
tanks and you operate them once in a while to empty it. Taken the number of houses involved, if you have
good equipment stock you can handle this easily.
DS
*What are the main challenges which face the corporation with regard to the provision of sanitation in urban areas?*

MA
As I said, it is the cost in providing the services, we don't have the resources, so we look at it in terms of prioritisation. It is only when you have the water to drink that you produce waste, then you think of the disposal of waste. But where you have not been able to provide water, why should you go ahead with the disposal of waste that people generate. So our priority is to get everybody to have access to good drinking water and the next stage would be to dispose of that waste.

DS
*Is that a realistic objective?*

MA
It is realistic except to the extent that the little waste that is being generated now they tend to cause havoc and nullify the benefits that would be derived from supplying the water. If you go back to polluting the water then you haven't achieved the objective. To that extent, yes it would not be a realistic objective to pursue it alone, but if you also look at the requirements of providing the water and disposing of it whilst others do not have it because in the sense that I am talking of, instead of disposing of the waste in bulk which becomes expensive, once you provide the services the people in their own way can dispose of their wastes without necessarily causing environmental havoc or danger to the community like these on site systems, it is a small system for the family and it can take them over years [to fill it] instead of the corporation providing a big system connecting everybody to it which would be very expensive. Even construction periods are long, especially in our part of the world, choice of contractors can take a long time and therefore by the time you even plan, get their money in place, award the contract, do the construction, your demand would have outstripped the planned period of the provision you are making and so it is a cycle you will never be able to meet your demand

DS
*From what you are saying, the implication is that on site facilities may provide greater flexibility in terms of planning.*

MA
Yes

DS
*You were talking about the sewerage system in Accra. Was anything done to determine the proportion of residents who are connected?*

MA
No studies have been done, but it is very small. We know the area that it covers, just the central part of Accra and by 1992 we know that about 400 properties were connected which is small given the size of Accra. Accra has grown so wide that in terms of percentage - I don't know about population distribution because the central area is quite crowded, but it will not be up to 10% of Accra so it is very insignificant proportion of Accra.

DS
*Does the corporation have a policy approach to on site sanitation?*

MA
No we don't have that type of policy but what we support is that whenever a system is suitable and convenient it is applied to the extent that the sewerage system that we have now becomes uneconomic to perform, doesn't service the required purpose and there are better substitutes related to on site sanitation, we could even revert to such a system, because it serves a good proportion, it is cheaper to operate and maintain and you have all the benefits of a clean environment.
DS
*Is there any work being done to establish if that system is economic or not?*

MA
The study will look at the system itself, take the topography and all that into account into the expansion of the system. The extent to which it is economic to operate, there are certain areas which it is definitely not going to cover because it is felt that on site sanitation would be better in those areas, but I think it takes into account some costs but I do not have the figures.

DS
*Does the corporation have any responsibility over the pollution of groundwater resources in Accra?*

MA
We have. We have to conserve water as well - whether it is surface water or ground water it is our responsibility to protect it.

DS
*What is being done to look at the issue of groundwater pollution from pit latrines?*

MA
We go by the normal rule of thumb about the siting of latrines, proximity to wells, we look at the topography where we suspect the direction of flow then you should not site a toilet upstream of the well. So it is this rule of thumb that we use for siting. But we frequently measure the quality of water and if we suspect the pollution is from a toilet we close the toilet.

DS
*You have powers to do that.*

MA
Yes we have closed toilets before, we have the power to do that. We just let the authority know - you write to them and advise them to close it down. Or they have a choice, to abandon the well or close the toilet, and most often the toilet is abandoned.

DS
*I suppose it is difficult to say what those householders do?*

MA
If it is a public one, they have to reconstruct or probably have to move to another site, or use the bucket latrine but I don’t know ... we haven’t found any alternative if it is a public toilet. Even if you have a septic tank it may still make the same effects, so we may have to relocate the toilet and then they would use it.

DS
*And from the monitoring and evaluation, are there any results that have been surprising?*

MA
No I think that it is not a record that we keep - we don’t have trend data, if there is an anomaly then we take action but we don’t record trend data for a particular area.

DS
*How does the corporation relate to the planning departments?*

MA
We are supposed to have a very good relationship. If the Town and Country Planning Dept draws up a plan for an area it is supposed to send us copies of the plan, and when we plan our distribution layouts for a site we locate them, and then there is a meeting of the regional planning committee which has all the utilities - electricity, water, post and telecommunications, they meet once a month to approve plans for an area. The thing is that this has not been working very well because the type of people who represent the various organisations are either not competent or not in a position to take decisions so they have probably just...
signed not knowing what they are doing and when it comes to implementation we have a problem but that co-ordination is on paper.
Interview: FN ARKO  
Position: Executive Secretary/Programme Manager, CEDECOM  
Date: Monday 4th March 1996  
Duration: 35 minutes

DS  
Perhaps we could begin with your giving me an overview to the work that CEDECOM has done on urban sanitation in Cape Coast

FA  
...environmental sanitation or urban sanitation plays a crucial part so when we started we knew that the situation needed a solution and we realised that there were piles of refuse all over the place, we also realised that there was a problem with people dumping of refuse and final disposal these were the key problems. We also realised that some of the problems facing the two areas was a lack of equipment so we tackled the problem by (i) having the long term and medium/short term in mind, so we constituted a task force to look into, to make an in depth study and then to make the necessary recommendations. This task force in turn requested that we got hold of a consortium to do the work, to investigate the situation and to come out with short, medium and long term solutions and the consultants came up with (i) short term solutions; they recommended that we undertook a quick exercise to remove the majority of the refuse - that was the first recommendation. The second recommendation was for us to station mobile trucks at various points in two areas which would be emptied once or twice or thrice a day, in addition to that to provide truckers who would [drive] these trucks to the final disposal sites. We did that - we cleared the piles of refuse ... and in the long term, they felt that the number of public toilets was not enough and that accounted for the unconventional way in which people relieve themselves, dispose of domestic and solid waste and what was a bit disturbing was the people would relieve themselves around the key tourist sites, so the recommendation was that we should provide toilets with a bath for each of the two areas. And these toilets would be sited close to the castles so that the communities around these areas could use the toilets and then refrain from relieving themselves on the beach. And this was done, CEDECOM provided twelve full toilets with bathroom facilities and then the World Bank took it up and came up with what CEDECOM call Urban 3 - it involves construction of new toilets, rehabilitation of existing ones and then provision of trucks and other equipment and then construction of final disposal points, sites which will use the trenching method. So in short, this is what we have done to really bring this situation under control. I would say that if we look back, and compare the present situation with the previous one there has been much improvement although there is still much to do.

DS  
Have you done any studies to try and quantify this improvement?

FA  
We haven’t done any field studies but then just a quick look round tells us that there has been an improvement, but there is still more work to be done.

DS  
So what is the current status of Urban 3?

FA  
The current status of Urban 3 is that all the necessary documentation has been finalised this month, and then contracts for construction works have also been awarded because as soon as the contracts are formally signed that is taken as the beginning of Urban 3.

DS  
When you talked about Urban 3 - contract of works and toilets - I assume you mean on-site and public toilets rather than toilets which are within the household?

FA  
Yes, but there is also a focus on toilets within the household [within urban 3]. Communities have done it as part of their project...there was a credit scheme whereby communities or households would be encouraged
or financed to change the aqua privy to the WC toilet and that will also mean that householders will have their own septic tank and it is all in the form of a credit then they are given time to repay the credit. It is a way of phasing out that particular facility.

DS
I would like to explore in more detail the household sanitation of urban 3 and the household financing element. But first, can you give me some information about what type of sanitation technology would be applied in households? You said that there was a decision to seek to upgrade from the aqua privy type to WCs. What was the rationale?

FA
The rationale behind it was the question of labour inadequacy. From time immemorial foreign nationals were used...for disposal of household liquid waste, but in time the number decreased and also as a result of the government's retrenchment policy...are compelled to trim down their labour costs so it became increasingly difficult for...to mix technologies. For example,...tried to contract out this work to a private company but the company ran into so many problems that they had to take it back again. So this system consists there to handle all the households waste collected to one point.

DS
Was there much discussion of other types of sanitary technologies at the time that decision was made?

FA
Yes,...unfortunately I wasn't party to that decision. The World Bank used their own consultant to do these studies...the report would then become the subject of discussion between the World Bank officials, the consultant and local governments and later on workshops were held for all the key actors and stakeholders where the consultant presented their recommendations.

DS
Would those workshops have included representatives from the communities...

FA
Yes, there were those persons who were supposed to be there for the communities.

DS
What were the priority target groups for the Urban 3 programme (in terms of socio-economic background)?

FA
The idea is to get the present householder, any householder...

DS
That would include low as well as higher income groups...

FA
Yes.

DS
Was there discussion concerning the affordability aspects of WCs in this part of the programme for a low income group?

FA
I wouldn't know, but I believe that the issue came up at discussion because they are looking at the level and rates of fees that existing sanitation would be charging. I think that what the consultant recommended was...you levy the fees according to their ability to pay, for example in the low income areas...not manage to pay, and where we have government landlords and such areas, where people are relatively [wealthy] we charge higher rates to compensate. That is the approach that was developed.
DS
Do you think that system [of cross subsidy] would work effectively in practice?

FA
It will work effectively but it is based on a number of factors, the acceptability, in other words the attitude of the people, whether the people are prepared to accept paying fees for these kind of circumstances, not the standard rate but whether in principle they accept the fact that they should pay the fees. In other words whether user charges had been accepted in the quality sense. Once you have accepted to get quality you have to pay.

DS
The user charges that you mentioned. How was that framed? Was the user expected to assume a significant portion of the cost of the toilet, or was there a split between loan and subsidy? What was the mechanism?

FA
Again, I will not be able to give you the details, but I believe that the system that was used was the communities bearing a certain portion and then [government] bearing the other portion...the community would not be able to pay everything but I believe they are using the revenue from other sources. But again, I have been looking at this whole idea of taxing people or using user charges to get...to pay for services also having a link to the kind of financial strength or the financial capacities of the taxpayers that is what the people are prepared to pay for it. Whether they generate enough income from their activities to enable them to...I believe that district assemblies must create the right environment to enable people to pay their taxes by supporting the key economic activities which the people are engaged in. They wouldn't do any more and then be able to pay their taxes. For example, if it is agriculture you have opportunities in pure agricultural areas...we want to assist communities to add value to their produce but if they were to earn more to pay their taxes, by helping to add value it would mean that providing them with assistance...the people will feel that here is an assembly that is helping us and therefore we are also obliged to pay our taxes...we need to create an enabling environment for people to earn more and therefore to be able to pay their taxes.

DS
From that there may be a problem over the cultural shift that people might have to go through in order to start paying for facilities and services which in the past have been provided for them. In what ways would you address that?

FA
What the people need is education; they need to be given certain coping measures to enable them to go through their transition and one will be public education to know the benefits of the use of...latrines, and then the corresponding responsibility that they have to build their toilets. And also they must have reason to believe that the quality of the service which is being provided [is an improvement].

DS
I'm interested to see how you would approach it because it is a very difficult issue to overcome. I'm trying to find as many different approaches to that issue as possible.

FA
The issue of waste is linked to people's hearts and hands, and therefore you have to adopt an advocacy approach; conscientising people - it is in their interest to have this facility and you have to support it by...responsibility. If you are not careful the new measures will be interpreted by the beneficiaries as an affront to their sensibilities. In other words, if you are indirectly telling them that they do not keep themselves clean, that type of thing, and that it where the advocacy [has to be used]. It may mean also talking to community leaders, talking to people in groups, if you get a core group to get the community to assemble, they become your agents who will spread [the message]. So this is how I would approach it.

DS
Within the urban 3 programme, is it possible for you to identify certain weaknesses, or strengths to the programme, with particular regard to household sanitation.

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FA
Let's take the whole thing together. The new system that is using trenching, I'm worried about the final disposal. Final disposal is quite disappointing at the end of the day. They are using the trenching method, I think that the project could have gone a step further by installing a system that processes the waste back into ... to support economic activity of the community. For example, I know that new technologies for processing waste need to be supported ... so it would save us another source of revenue to the district assembly to enable them to maintain efficiency, in order to reduce the burden of transition, because we are dealing with a situation where people aren't so used to paying for these services. Thus we must put in place measures which mitigate the effects. Coming down specifically to the low-income community, most of the houses in the low-income communities are family owned and that is where the biggest problem is. Who takes responsibility - there is a saying in our country which is that 'what belongs to all, does not belong to you'; maybe you would come and meet me in the house and I say that I agree that I will take this loan, then someone from Accra comes and says no this one has no authority to have ... I have paid, and they then set in motion a series of litigation. And also there are certain houses where some people have lived in for so long. Now ... have the authority to commit the original owner's house.. these are some of the issues.

DS
Are there any other weaknesses that you can see?

FA
Yes, the other weakness that I see relates to our maintenance culture, unfortunately we don't have [a maintenance culture]. I am not very sure whether the study was made to find out the situation as to what are the root causes of our inability to maintain such construction and what appears to be put in place; to ensure that the new toilets which are put in place would not suffer the same fate as their predecessors. I don't think that was addressed seriously. I think that what they tried to do was to come up with a revenue [system] that would strengthen the hands of the district assemblies but then are we saying that the present levels of revenue ... are inadequate? I would say no, because the assemblies are now being financed at a greater level. Assemblies which were formerly generating about 100 million are now getting about 500 million; so there are enough resources, I think the problem is not so much with money but with the attitude of the consultants, the attitude of the staff and the attitude of the people. So the issue of attitude is important; both on the side of the attitude of the local government institutions and also the attitude of ...

DS
Perhaps we could move on to another point: if CEDECOM were responsible for a programme of household sanitation, I'd be interested to find out what you consider to be the key criteria or conditions of such a programme

FA
The first one would be the density, population density of low-income areas. The second is the income distribution of the community, of the people who are involved. Willingness to pay would come into it, but I would look at it in two ways. Population density - there are lots of areas in Cape Coast where you have a lot of people living in small areas, and also the level of education of the people is very important. The higher the level of education, the higher the level of [hygiene] - one person may keep their [plot] clean because of the level of [education] and also we are not concerned with your own immediate environment but also concerned with the environment in totality because when people come to visit you they visit your town, if the town is not neat then I will not be comfortable.

DS
Are there any existing constraints that you would see in the way in which institutions works, or communities organised which would prevent the implementation of a household sanitation programme?

FA
Actually, .. the constraints to me are human and technical. Human in the sense that they look at it from government officials who are supposed to run ... would they be very serious with their work? Would they be punctual, would they be regular? Those who are supposed to collect revenue...would they do it honestly? or will they collude with the payees to [avoid payment]? So the problem as I see it is more than one thing...and then maintenance of the facility - will they appreciate the responsibility for this? will they adhere to the
maintenance programme? and also we know that every system has a maturation period - will those operators of this system adhere to that maturation period? For the problems that we are having, the systems in place have gone beyond their maturation period.
AN

...at lot of them have these facilities, like you go to Ward K, they have toilets but because of the toilets I earlier mentioned they are not using them...no one can dispose of it themselves, they are not able to do it so they have actually abandoned these toilets and currently there are a lot of open spaces in some of these places and people resort to open defecation. They haven't got a toilet in their house and there is space around, there is a gully somewhere or tree where he can comfortably do it - to free himself there. So they are the problems we are encountering.

DS

You mentioned the smaller plot sizes in the lower income areas. If people had sufficient funds or sufficient access to credit would those plot sizes be able to sustain a household toilet?

AN

In those low income areas, a lot of them if want help are getting it, the World Bank pays 50 % of the costs up front. Now we think that condition cannot apply in low-income areas. But if there is some assistance, I think everybody would want a toilet in their house. So if it would mean even creating a space then one or more could put up a toilet, depending on ground conditions. But we are saying that these are not depressed areas, most of the low-income areas are not depressed because they already have public facilities. Our problem is in very depressed areas where we don't have public toilets, they don't have household latrines - that is where you want them. And these are areas that are middle income areas that can afford it.

DS

What work has been done to animate the communities prior to the introduction of Urban IV?

AN

I think we talk to the assemblymen in various areas [pause] we talk to them. You know we have had Urban II, and this is Urban IV. Before Urban II there was a pilot project where we tried to see whether people would appreciate these household facilities - then maybe privatisation because even under Urban IV we plan to privatise all services. So we tried in one area that is a low-income area where they have these private pan latrines, household latrines, we tried to have some support from the World Bank to improve the services there, like regular services. We had to educate the people and it looks like they have achieved their aims, they are paying regularly, they are paying a fee at the end of the month (10,200) cedis. But after that pilot project we expected to take off in some other urban areas. But we had to go back to our old programme. So I think we try and do a lot to the assembly men, so we talk to him.

DS

The choice of VIP latrine. Given what you have said about what the way in which communities were animated for the pilot survey, how were the communities who were to receive these latrines consulted about technology choice prior to that programme?

AN

You mean the pilot project?

DS

No, Urban IV

AN

Everything depends on money. The project will actually take off in June [1996] so for now what we are doing is just informing them of the package that is Urban IV, but the assemblies do not yet have the resources to adequately deal with this question. But I think that if the project takes place we will have a programme that will take on board these things. But for now, we are just talking to them. The assemblymen goes there to
meet them and talk to them because sanitation is a big problem and it is a concern of everybody. Everyday we have complaints, people come here to complain that we don't have toilets, people are indiscriminately defecating all over the place, in the drains, in school plots and this kind of thing. The only thing we can talk to them and tell them that there is a package and it is coming. But then we need to do much more than that because it is clear that people are going to pay 50% of the cost, so we have to adequately inform them about these things, otherwise people tend to think that most of these things should be free - that it is the responsibility of the assembly to provide them with toilets, so they don't see why they should pay for them. The public toilets we have we are having problems... because it has been privatised, if you went there you would have to pay something, a lot of problems because of this. But we know that a few people might want some other technology instead of the VIP like a WC but as I said if the project takes off then we can address the programme to suit our circumstances.

DS
So the issue of community needs, community aspirations is something that may be integrated at the beginning of Urban IV. What about the choice of VIPs. One of the things about VIPs is that in a culture where there is a lot of squatting for defecation people find it difficult to start sitting. Do you think that is something that could affect people's aspirations for a technology choice?

AN
Well that is possible, that can obviously affect... we haven't done any study into it, so I cannot say anything about that, but obviously if somebody is used to squatting and you bring in a technology with which you have to sit, for some time he will be finding it a bit uncomfortable, but then I think with our present situation where the people have to squat, maybe you have to redesign it to the preferred pattern.

DS
One of the points you raised was the way in which the programme was going to be financed - 50% subsidy and 50% user contribution. What was the rationale behind using that split rather than say 75-25%?

AN
I think that the main thing was because of coverage, wanting to increase coverage and consequently it is 50-50. Maybe we will be able to provide many more latrines and also commitment from the people. Maybe the user contribution should be 25%, World Bank contribution 75%. The essential point is coverage, because if we are able to raise enough money to be able to reach so many people and basically that was the rationale.

DS
So for the VIP latrine, 50% contribution would in effect mean 100,000 cedis. Is there within the programme any way in which users can reduce the costs through their own labour?

AN
I think that the 50% that you are talking of includes labour, materials etc., so if the user is able to provide his own labour then of course that would be part of their 50%.

DS
If you were looking to expand the programme to lower income areas, what do you think would need to be done to try and deal with the problem of meeting the costs under that 50-50 contribution?

AN
Even in these areas that we are talking about there are some high income households there. In those areas, they can even afford 75%. We try to increase user contribution in some of these areas in that case there may be some extra money to support some form of programme in low income areas.

DS
Some form of cross-subsidy...?
AN
Yes, that kind of thing. So that it might not be uniform throughout the city, in some areas it would be 75-25, and different elsewhere

DS
Is there much confidence in savings and credit schemes for the financing of latrine construction?

AN
A problem is that in our system the interest rates are very low. But for our market, the interest rates are so low that you are not going to make any difference. We haven't gone in and tried this system. Under the pilot project we tried giving some of the communities KVIP's. The project was 40-60 but then the 40% user contribution was paid over a certain period, ten months or so. But you pay 20% cash down then 20% spread over a certain period, and a number of households went in for it, but somewhere along the line the project ended and we had to abandon the whole idea because families were not supporting it. But our banking system is not good.

DS
Banking etc. is the formal financial side. Is there any way in which the informal financial sector could be harnessed to assist in programme financing?

AN
In Tamale that would not happen. We don't have things like that.

DS
There are a couple of things left I would like to discuss. One is the way in which agencies interact in the provision of sanitation at the household level. Can you tell me who the main agencies are who have responsibility for that in Tamale?

AN
In Tamale the main agencies are the Municipality of Tamale and we do not have situations where other agencies have responsibility for sanitation.

DS
So they are responsible for planning, implementation and management?

AN
And maybe the Ministry of Health.

DS
And when a programme like Urban IV comes up, what roles are specified to those agencies? Is there a co-ordinated programme so that these agencies can interact effectively to ensure success?

AN
The only agency that has been trying to do something is the education services. We hope to provide school toilets. Most of the schools in Tamale do not have toilets. In addition to the education service there are various PTA's and the school authorities, who are starting to think about how they can come into the programme. They also have to make some contributions...apart from that I think that the programme is going to be solely run by the Municipality of Tamale and the project team that will be on the ground.

DS
What do you feel are the main challenges for the provision of sanitation in urban areas?

AN
I think we need to get a lot of household toilets, appropriate toilets then thinking of privatising the sanitation services because the assemblies who are the sole agents for provision do not have the capacity. But I think that if we try to privatised then we will ... try to play a role of... put in certain checks such that maybe the private sector does not unduly take advantage. I think then we can make some headway. Apart from that I
don't see how... sanitation is capital intensive, especially urban sanitation and until we get the private sector to take up the challenge...

DS
Is anything being done to try and integrate the private sector?

AN
We are doing it, with management of public toilet - we have privatised them, we provide the planning permission, we give it to them to run, they set up the units and they run the toilet. When they have operation problems then they come to the municipal assembly, if they want certain services which we cannot provide they come to the municipal assembly then we are also privatising latrine cleaning that used to be the responsibility of the municipal assembly. Privatised it, given it to the private sector and they are doing it. Initially, we have run into problems but I think with time...we have just privatised it towards the end of last year. We are also trying house to house refuse collection and our intention is to get the people used to the system, for we go to pick and at the end of the month they pay. But then we are hoping that by next year we will have privatised this. What Tamale is going to do is manage the final disposal site.

DS
The reason I mention it is because of my discussions with Mr Awindoago yesterday, and he mentioned to me a rural latrine programme that was training artisans to actually build KVIP's. I was wondering whether with regard to household sanitation, whether something had been done to try and replicate that model in urban areas?

AN
Tamale is not in that project..

DS
Yes, but I was interested in the approach, and I was wondering if the approach can be transferred?

AN
That is possible, but under the Urban IV project (that is building the 2000 VIPs) it is supposed to be giving out on contract to some of these artisans.

DS
So construction would be through the private sector anyway?

AN
Yes. It is supposed to be given to use strictly on a contract basis.

DS
And the quality will be maintained how?

AN
The project is made up of a project co-ordinator to be a civil engineer then a sanitation engineer will also be a civil engineer. So I think they are supposed to monitor the quality of the construction.